ELECTRA'23

R. C. PATEL
INSTITUTE OF TECHNOLOGY
An Autonomous Institute

Department of Electrical Engineering

Vision-Mission

Institute Vision

To build electrical engineers with a global perspective and a strong dedication to Societal service.

Institute Mission

To impart high quality Technical Education through :

- Innovative and Interactive learning process and high quality, internationally recognized instructional programs.
- Fostering a scientific temper among students by the means of a liaison with the Academia, Industries and Government.
- Preparing students from diverse backgrounds to have aptitude for research and spirit of Professionalism.
- Inculcating in students a respect for fellow human beings and responsibility towards the society.

Vision

To build electrical engineers with a global perspective and a strong dedication to Societal service.

Mission

M1: To transform the students from diverse background into skilled electrical engineers.

M2: To enhance industrial interaction to meet the changing industrial needs.

M3: To serve society with deep awareness of social responsibilities and ethical values.

HOD's Message

Dr. Vijay S. Patil
Head of Department

I feel privileged to present our department's “ELECTRA'23” magazine. This magazine is intended to bring out the hidden literary talents among the students and the faculty and teach leadership skills to them.

It will be a source of inspiration for the budding writers among the students. It will direct their creativity to new dimensions of mature expression.

I sincerely thank the editorial team for their constant effort and support in bringing out the magazine in its present form. I thank our Director, Dr J. B. Patil, for their continuous support in preparing these magazine issues.

Lastly, I thank all the authors who have sent their articles.

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SECTION – I

Technical Article

2022–23

Mr. Krunalkumar Gandhi
Assistant Professor

Freedom!

I stand in a cluttered room surrounded by the debris of electrical enthusiasm: wire peelings, snippets of copper, yellow connectors, and insulated pliers. For me, these are the tools of freedom. I have installed a dozen solar panels on my roof, which work. A meter shows that 1,285 watts of power are blasting straight from the sun into my system, charging my batteries, cooling my refrigerator, humming through my computer, and liberating my life.

Our world has been changing; we discovered fuel in 1859, which made our jobs quicker, and less labour was needed. But we realized the bad side of this useful resource was its waste which filled in the air, making it hard to breathe, heck, a lot of diseases and more curses.

After all this, we still depend on it, and we added another problem: pollution and terrible waste deposition. We all complain about this often, but do we ever execute what we want? We all know the answer, which has two letters: 'n' and 'o' no. But the future depends on us; we can only change the future, not the past. And that is why I am here to tell you all how we can secure our future in the energy sector.

SOLAR; FREE ENERGY, AT A PRICE

Even though it has a price, it is still one of the most efficient ways of getting energy. Using photovoltaic cells, these sunflower-looking panels do the job right, giving us sufficient electricity. It produced no smoke or that unpleasant smell of the good old carbon. The skies will be clearer. But carbon. The skies will be clearer. But then we ask ourselves, "Forget the price but we are lacking in space to place these panels, where will we find the space?"

Well, we have a solution, we have those barren deserts where no one lives, and there is less scope for vegetation to grow like the Mojave desert in the United States. We could use the oceans, they take up almost 70% of the area on Earth, and we could build a floating solar panel boat or even an artificial island for this.

WIND: FEAST OR FAMINE

Windmills could be another way of generating electricity since wind is good when it's little. Still, it's chaos when it's massive, like a hurricane or even a tornado. But still, windmills will be useful.

BIOMASS: FARMING YOUR FUEL

We could use our food waste or anything that decays when dead to make efficient fuels. You can farm it in your backyard. Biomass energy has ancient roots. The logs in your fire are biomass. But today, biomass means ethanol, biogas, and biodiesel—fuels as easy to burn as oil or gas but made from plants. These technologies are proven. Ethanol produced from corn goes into gasoline blends in the U.S.; ethanol from sugarcane provides 50 percent of automobile fuel in Brazil. In the U.S. and other nations, biodiesel from vegetable oil is burned, pure or mixed with regular diesel in unmodified engines. "Biofuels are the easiest fuels to slot into the existing fuel system," says National Bioenergy Center director Michael Pacheco.

NUCLEAR: STILL A CONTENDER

Nuclear fission appeared to lead the race as an energy alternative decades ago, as countries began building reactors. Worldwide, about 440 plants generate 16

Mr. Krunalkumar Gandhi
Assistant Professor

percent of the planet's electric power, and some countries have gone heavily nuclear. France, for instance, gets 78 percent of its electricity from fission.

The allure is clear: abundant power, no carbon dioxide emissions, and no blots on the landscape except an occasional containment dome and cooling tower. But along with its familiar woes—the accidents at Three Mile Island and Chornobyl, poor economics compared with fossil fuel plants, and the challenge of radioactive waste disposal—nuclear power is far from renewables. The readily available uranium fuel won't last much more than 50 years.

FUSION: THE FIRE SOMETIME

Fusion is the gaudiest of hopes, the fire of the stars in the human hearth. Produced when two atoms fuse into one, fusion energy could satisfy huge chunks of future demand. The fuel would last millennia. Fusion would produce no long-lived radioactive waste and nothing for terrorists or governments to turn into weapons. It also requires some of the most complex machinery on Earth. A few scientists have claimed that cold fusion, which promises energy from a simple jar instead of a high-tech crucible, might work. The verdict so far: No such luck. Hot fusion is more likely to succeed, but it will be a decades-long quest costing billions of dollars.

Harnessing Solar Energy: A Sustainable Power Source for a Brighter Future

Pranjal Patil
Second Year Electrical Engineering

Solar energy has emerged as a promising solution in our quest for clean, renewable power. The sun, our most abundant and reliable source of energy, presents an incredible opportunity for us to meet our growing energy demands while mitigating environmental impacts. In this article, we will explore the significance of harnessing solar energy, its benefits, and the technologies driving its adoption.

The Power of the Sun:

The sun, a colossal nuclear fusion reactor located 93 million miles away, provides an astonishing amount of energy. In just one hour, the sun radiates enough energy to power the entire planet for a year. By capturing and converting this energy into usable forms, we can tap into an almost limitless resource without depleting our planet's finite reserves.

Harnessing Solar Energy:

Solar energy is captured using photovoltaic (PV) cells, also known as solar panels. These panels are composed of semiconductor materials, such as silicon, that convert sunlight into electricity through the photovoltaic effect. As photons from the sun strike the PV cells, they dislodge electrons, generating an electric current. This electricity can then be used to power homes, businesses, and even entire communities.

Advantages of Solar Energy:

- **Renewable and Sustainable:** Solar energy is an inexhaustible resource. As long as the sun shines, we have access to this clean energy source, unlike fossil fuels that deplete over time.
- **Environmentally Friendly:** Solar energy production emits no greenhouse gases, thereby significantly reducing carbon footprint and combating climate change. It helps preserve our natural resources, air quality, and ecosystems.
- **Energy Independence:** Solar energy empowers individuals, businesses, and communities to generate their own power, reducing reliance on traditional energy sources and associated costs.
- **Long-Term Savings:** While the initial investment in solar panels may seem high, the long-term financial benefits are substantial. Solar energy systems can significantly lower electricity bills and offer attractive return on investment, especially as technology advances and costs continue to decline.

Technological Advancements:

Over the years, solar energy technology has witnessed remarkable advancements. Researchers and engineers have made significant strides in improving the efficiency and affordability of solar panels. Innovations such as thin-film solar cells, concentrated solar power, and solar tracking systems have paved the way for increased energy capture and utilization.

Solar energy storage systems have also gained attention, enabling energy to be stored for use during cloudy days or at night. Technologies like lithium-ion batteries and pumped hydroelectric storage allow for a more consistent and reliable supply of electricity, even when the sun is not shining.

Pranjal Patil
Second Year Electrical Engineering

The Future of Solar Energy:

As the demand for clean energy continues to grow, solar power holds immense potential to shape our future energy landscape. Governments and businesses worldwide are recognizing the value of solar energy and are investing in large-scale solar projects, expanding solar infrastructure, and implementing supportive policies and incentives.

Sweta Salunkhe
Third Year Electrical Engineering

Artificial eyes:
A trend started by Alastor "Mad-Eye" Moody from harry potter researchers is working to make this a reality. In January 2021, Israel Implanted the first artificial cornea into a blind 72-year-old man.

Bricks with energy:
Scientist have found a way to store energy in the bricks. Researchers in washington had found this.

Electric cars:
Car batteries are lasting longer, the charging station Infrastructure is growing, and self-driving technology is heavily invested in meaning. Tesla has some complex auto-pilot that can take over some driving controls.

Flying cars:
When there is no space left on the road, thinking we might fly in the skies is unreasonable. Many flying cars show this future is a realistic possibility. Example-jetcars.

James Mickson:
An assistant professor of Harvard University, Commented: "Technology will result in a civic innovation". The question is to evolve to exploit the advantages odd new tech and mitigate problems.

Airports for drones and flying taxis:
Our congested cities desperately need a pause, and relief may come from the air instead of the roads. Plans for a different kind of transport hub, one for delivery drones and electric air taxis, are becoming a reality, with the first receiving funding from the UK government.

Dancefloor generates electricity at London's first eco-disco!

Saurav Koli
Third Year Electrical Engineering

London's first eco-disco has introduced a unique and innovative concept that combines entertainment and sustainability. The dancefloor itself is equipped with a groundbreaking technology that harnesses the energy produced by the dancers, converting their movements into usable electricity. This revolutionary system aims to reduce carbon emissions and promote eco-consciousness in the nightlife industry.

The eco-disco's dancefloor employs a series of piezoelectric sensors embedded beneath its surface. These sensors are capable of converting the mechanical energy generated by dancers' footsteps and movements into electrical energy. As individuals groove to the rhythm, their kinetic energy is captured and transformed into a sustainable power source.

This ingenious setup not only provides an electrifying and immersive experience for club-goers but also contributes to the venue's overall energy needs. The electricity generated by the dancefloor is stored and utilized to power various elements within the club, such as lighting, sound systems, and other electrical equipment. By relying on renewable energy generated on-site, the eco-disco significantly reduces its dependence on traditional energy sources and minimizes its environmental impact.

Moreover, the eco-disco is committed to raising awareness about sustainability and inspiring behavioral change among its patrons. Informational displays and interactive installations are strategically placed throughout the venue, educating visitors about the energy-saving capabilities

of the dancefloor and encouraging them to embrace eco-friendly practices in their everyday lives. This holistic approach fosters a sense of environmental responsibility and empowers individuals to make conscious choices that positively impact our planet.

London's first eco-disco represents a remarkable step forward in sustainable nightlife. By integrating cutting-edge technology with entertainment, it sets a precedent for eco-consciousness within the clubbing scene. This innovative concept demonstrates that a vibrant and thrilling atmosphere can coexist with responsible energy consumption, inspiring other establishments to adopt similar practices and contribute to a more sustainable future.

The Bendy Touchpad: A Revolutionary Innovation in User Interface Technology

Shoeb Raju Patel
Final Year Electrical Engineering

The Bendy Touchpad is an extraordinary advancement in user interface technology that has revolutionized the way we interact with electronic devices. Designed to provide seamless control and enhance user experience, this flexible touchpad represents a remarkable leap forward in both functionality and versatility. In this article, we will explore the features and benefits of the Bendy Touchpad, outlining its potential applications in various professional settings.

Enhanced Flexibility and Portability:

One of the key distinguishing features of the Bendy Touchpad is its exceptional flexibility. Made from cutting-edge materials, it can be effortlessly curved, bent, or even rolled up without compromising its functionality. This flexibility enables a wide range of form factors, allowing the touchpad to be seamlessly integrated into devices of different shapes and sizes. Furthermore, its lightweight and slim design make it highly portable, offering professionals the convenience of carrying it anywhere they go.

Intuitive Touch and Gesture Control:

The Bendy Touchpad boasts an intuitive touch and gesture control system, designed to simplify and streamline user interactions. By responding to touch, swipe, pinch, and other gestures, it enables effortless navigation, precise cursor control, and efficient multitasking. Professionals can easily manipulate content, scroll through documents, zoom in and out of images, and perform a variety of tasks with natural and fluid movements, significantly enhancing productivity and ease of use.

Customizable Interface and Configurations:

To cater to the diverse needs of professionals, the Bendy Touchpad offers a highly customizable interface. Users can personalize the touchpad's layout, arrangement of buttons, and functionality according to their preferences and specific workflow requirements. This adaptability ensures that the touchpad can be seamlessly integrated into various professional environments, including design studios, architectural firms, research laboratories, and more.

Seamless Integration and Compatibility:

The Bendy Touchpad is designed to seamlessly integrate with a wide range of electronic devices, including laptops, tablets, and desktop computers. Its compatibility with different operating systems ensures that professionals can utilize its full potential regardless of their preferred platform. Moreover, its wireless connectivity options allow for hassle-free pairing, enabling quick and easy setup with minimal configuration.

Potential Professional Applications:

The Bendy Touchpad's flexible and adaptable nature opens up a plethora of professional applications. It can be used in digital art and graphic design, providing artists with a natural and intuitive drawing experience. In architectural firms, it can enhance 3D modeling and design processes, enabling precise manipulation of digital models. In research laboratories, scientists can benefit from its intuitive touch and gesture control for data analysis and visualization. The possibilities are vast, and the Bendy Touchpad empowers professionals across different fields to work more efficiently and creatively.

Wind Turbine Generates Electricity without Rotating Blades

Naresh Bhadane
Final Year Electrical Engineering

Introducing the groundbreaking technology of a new wind turbine that revolutionizes electricity generation by eliminating the need for rotating blades. This innovative design represents a significant advancement in renewable energy solutions and offers numerous benefits for sustainable power production.

Unlike conventional wind turbines with rotating blades, this cutting-edge system utilizes a different principle to harness the power of wind. Instead of relying on spinning blades, the turbine employs a unique aerodynamic design, which enables it to capture wind energy without any rotational motion. This breakthrough concept not only overcomes the limitations associated with traditional wind turbines but also presents a safer and more efficient alternative.

The absence of rotating blades addresses several challenges commonly associated with wind turbines. One major advantage is the mitigation of noise pollution, a frequent concern raised by communities living near wind farms. By eliminating the characteristic swooshing sound produced by rotating blades, this innovative turbine significantly reduces noise levels, making it more amenable to residential areas and other noise-sensitive environments.

Furthermore, the absence of rotating blades enhances safety aspects. Eliminating the risk of spinning blades eliminates potential hazards for birds and other wildlife, thereby preserving biodiversity. Additionally, the reduced risk of blade-related accidents enhances the overall safety of maintenance personnel, ensuring a secure working environment.

In terms of efficiency, this bladeless wind turbine boasts several advantages. The streamlined design allows for simplified construction and lower maintenance requirements compared to traditional turbines. The absence of rotating parts reduces the wear and tear typically associated with blade motion, leading to fewer mechanical issues and longer operational lifespans. These factors contribute to improved reliability and increased energy output over time, making this turbine a cost-effective and sustainable solution.

Moreover, the bladeless design is visually appealing and aesthetically unobtrusive. The absence of rotating blades creates a sleek and modern appearance that seamlessly integrates into natural landscapes and urban environments. This feature addresses concerns regarding the visual impact of wind turbines and promotes their wider acceptance and adoption.

In summary, the introduction of a new wind turbine design that generates electricity without rotating blades represents a significant milestone in the field of renewable energy. This innovative technology offers numerous advantages, including reduced noise pollution, enhanced safety, improved efficiency, and aesthetic appeal. By harnessing the power of wind in a unique and efficient manner, this bladeless turbine paves the way for a greener and more sustainable future.

Journal Papers

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A Comprehensive Approach to Electricity Billing Management Using Java Swing and SQL

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Abstract- **Electricity users frequently face inaccurate and delayed monthly billing due to certain limitations. Therefore, it is essential to have a reliable electronic platform that takes proximity into account for such purposes. The suggested approach automates the time-consuming process of paying power bills by visiting the Electricity Board. Additionally, it simplifies the computation and payment of electricity bills for user convenience. Java Swings, a versatile programming language used for creating websites, online applications, and web services, is utilized to develop the system. Structured Query Language (SQL) server is also used to create back-end databases. The system has two logins: an administrator login and a user login. The administrator has access to the user's account information and can also add the customer's information regarding energy usage for the current month. The administrator is responsible for providing the system with information on each user's usage of electricity. The system then determines each user's monthly electricity bill and updates the data in each user's account. Users can view their electricity bills and make payments before the end of the month.**

Index Terms— **Automation, Back-end databases, Electricity billing, Energy usage, Java Swing, Power bills, SQL server**

I. INTRODUCTION -

The objective of this research paper is to develop a reliable and user-centric electronic platform for the accurate and timely billing of electricity usage, overcoming the limitations of the traditional billing process. Electricity billing management systems are essential tools for power utilities that aim to enhance the accuracy, effectiveness, and security to their billing procedures. The traditional billing process is often slow, inaccurate, and prone to errors. To overcome these limitations, several existing methods of electricity bill management have been developed using various programming languages such as Java, PHP, Python, and C#. Similarly, MS Access server is also used to create back-end databases. These systems have been successful in automating the process of paying power bills and simplifying the computation and payment of electricity bills for user convenience.

The proposed system aims to develop a more reliable and user-friendly electronic platform for the accurate and timely billing of electricity usage. It uses Java Swings, a versatile programming language, to develop the system, and Structured Query Language (SQL) server to create back-end databases using MySQL Database. The system has two logins: an administrator login and a user login, where the administrator has access to user account information and can add customer information regarding energy usage.

The system determines each user's monthly electricity bill and updates the data in each user's account, and users can view their bills and make payments before the end of the month. The proposed system provides an efficient and comprehensive solution to the challenges faced by electricity users. It demonstrates the importance of reliable electronic platforms in streamlining the billing process and offers an excellent opportunity for power utilities to modernize their billing systems. Overall, this project can significantly improve the accuracy, efficiency, and security of the electricity billing process and benefit both utilities and customers alike.

II. METHODOLOGY -

A. Java:

Java is a versatile programming language employed in creating a wide range of applications, web applications, mobile apps, desktop software, and more. It is known for its portability, meaning that Java code can be written once and run-on multiple platforms without the need for major modifications. This makes it a popular choice for developing cross-platform applications that can be used on different operating systems.

Another key benefit of Java is its platform independence. Since Swing is built on top of the Java Virtual Machine (JVM), the system can be executed on various platforms that are compatible with Java, such as Windows, Mac OS, Linux, and others. This makes it an ideal choice for developing cross-platform desktop applications that can be used by a wide range of users.

B. Java Swing:

Java Swings is a popular programming language used for developing user interfaces and graphical user interfaces (GUIs). It is a foundation programming language for creating websites, online applications, and web services. Java Swings allows developers to create user-friendly and interactive interfaces that are both intuitive and visually appealing.

In the proposed electricity bill management system, Java Swings is used to develop the front-end of the software. The use of Java Swings allows for the creation of a user interface that is easy to handle and understand, making it simple for users to view and clear their electricity bills online. The platform is designed to give users a smooth experience, eliminating the need for physical visits to the Electricity Board.

For instance, it allows for the integration of multimedia elements such as audio and video into the user interface, enhancing the overall user experience. Additionally, it provides a wide range of customizable components such as buttons, labels, and text fields that can be used to create unique and personalized interfaces.
Overall, the use of Java Swings in the proposed electricity bill management system ensures that users have access to a reliable and efficient platform that is both user-friendly and visually appealing.

- Java Swings is a flexible and popular coding language for developing user interfaces and GUIs.
- It offers a range of pre-built components that can be easily customized to create unique and visually appealing interfaces.
- Java Swings is well-suited for developing cross-platform software that can be used on different operating systems and devices.
- Java Swings offers robust error handling and debugging features, which to ensure the software's dependability and error-free operation.

C. Model-View-Controller:

The Model View Controller (MVC) architecture is an important feature of the Java Swing framework used in the project. It is a software design pattern that divides the application into the model, view, and controller, three interdependent parts.

- The MVC architecture has three fundamental divisions: model, view, and controller.
- The model component manages the application's business logic and information(data).
- The data is rendered to the user interface by the view component.
- As a bridge between the model and the view, the controller takes user input from the view and updates the model as necessary.
- The use of the MVC architecture in Swing provides benefits such as improved modularity, reusability, and maintainability of code.

Overall, the implementation of the MVC architecture in the Java Swing framework in the project provides a robust and scalable structure for developing reliable and user-friendly software solutions.

D. MySQL:

Web applications frequently employ MySQL, a well-liked relational database management system that is open-source. It offers a robust and scalable system to store and manage ample amounts of data, making it an ideal choice for the back-end of the electricity billing system, MySQL communicates with the database via SQL, allowing developers to perform complex queries and operations.

- MySQL is used as the back-end database management system for the project.
- It stores all the data related to user accounts, electricity usage, billing information, and payment details.
- The system uses SQL queries to retrieve and manipulate data stored in the MySQL database.
- Enables several users to access identical info at once, while ensuring data consistency and concurrency control.
- Provides a way to create relationships between tables with foreign keys and referential integrity.

Additionally, MySQL offers a variety of tools and features for ensuring data security, such as user authentication, encryption, and backup and recovery options. Its compatibility with multiple programming languages and platforms, including Java Swing used in this project, make it a versatile choice for web development projects.

E. Flowchart:

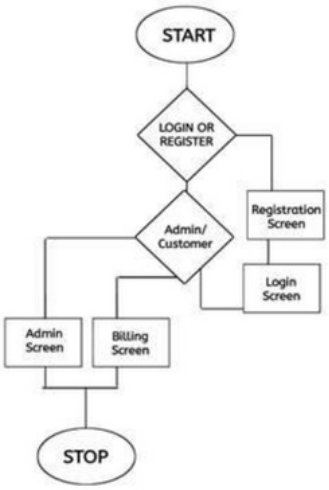
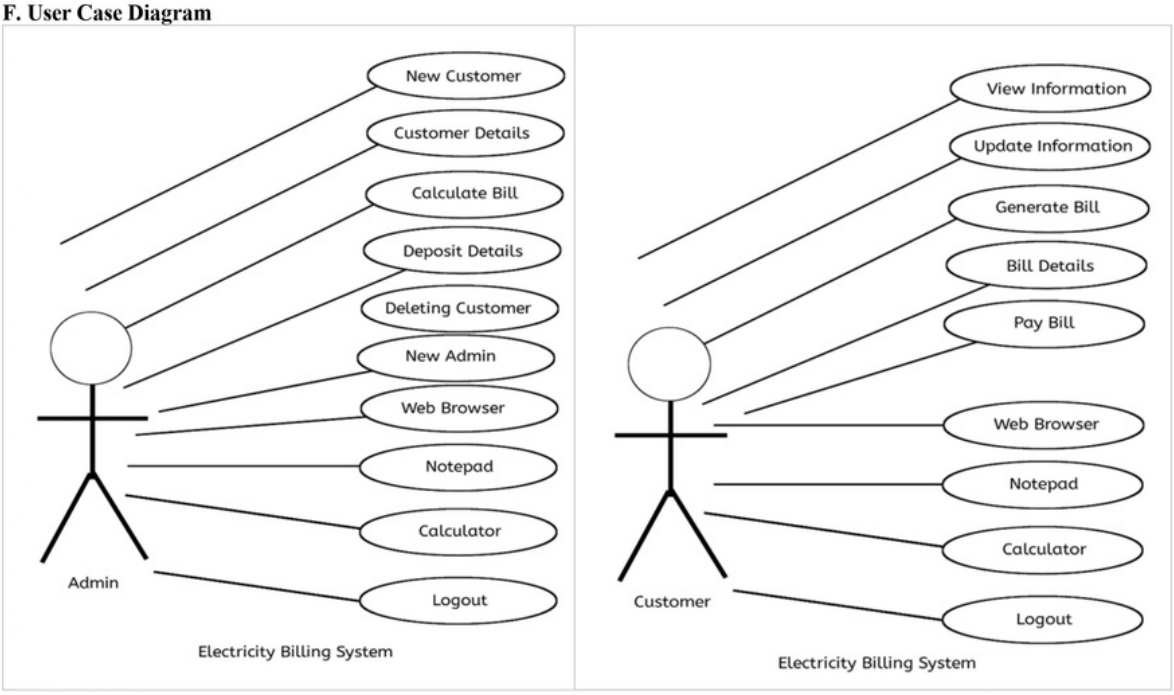


Figure 1: Flow Chart

F. User Case Diagram



III. BILLING SYSTEM MODULE -

a. Login Screen:

The login screen of the system comprises multiple fields, including username and password, and features two distinct buttons for logging in and signing up. Prior to utilizing the scheme, a user must first register their information. Upon successful registration, the user can login to the system using their unique username and password, and access various features and functionalities provided by the system. The login screen offers the convenience of logging in as either a customer or an admin, each with their respective login credentials and privileges.

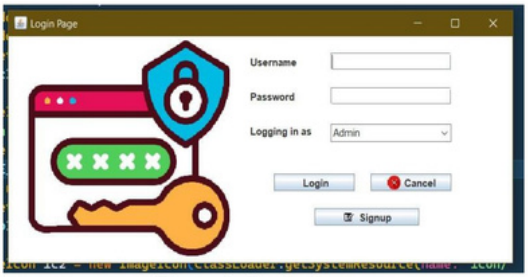


Figure 1: Login Screen

b. Sign-Up Screen:

To create an account, the user must fill out the necessary details, including their first name, last name, chosen username and password, as well as their meter number, which is automatically fetched from the database based on the username provided by the administrator. The signup screen of the electricity billing management system also offers the flexibility to sign up as either a customer or an administrator, providing distinct access privileges and functionality for each user type.

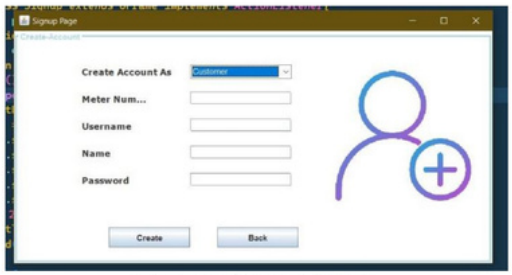


Figure 3: Sign-up Screen

c. Admin's Page :

The electricity billing management system's admin screen allows the administrator to access various functionalities, including the capacity to include new clients and see their details and deposit information. When adding a new customer, the admin can enter their email, phone number, address, state, city and name, the meter number is automatically generated and assigned to the customer by the system. This automated process eliminates the need for manual meter number assignment, streamlining the customer registration process.

The admin screen of the electricity billing management system provides the functionality to calculate the electricity bill of customers. The admin can select the customer's meter number and specify the month for which the bill needs to be generated. The system then retrieves the units used by the customer for that month from the database. Additionally, the name and address of the customer are automatically fetched from the database based on the meter number. This streamlined process saves time and ensures accuracy in bill calculation.

In the admin screen of the electricity billing management system, we have included some additional features like notepad, web browser and calculator to enhance the user experience and increase productivity. The notepad feature allows the admin to quickly jot down notes or important information without having to switch to another application, which can save time and improve efficiency.

Figure 4: New Customer

Figure 5: Deposit Details

d. Customer's Page:

The customer screen in the electricity billing management system offers various functionalities to the customers, as:

- Access to their personal information stored in the admin database
- Ability to pay their electricity bill online
- Option to check their bill details for any month up to the current date
- Capability to take printouts of the bill details for their records

Additionally, the customer screen provides access to a notepad, web browser and calculator, which can be used by the customers to perform calculations related to their bill and note down any important information related to their electricity usage. The calculator feature can be particularly useful in ensuring that the customers are able to cross-check their bills and identify any discrepancies, if present. Overall, these features enhance the usability and convenience of the electricity billing management system for the customers.

The electricity billing management system empowers customers to update their personal information like address, city, state, email, and phone number in case of any change or errors. However, to ensure accurate billing and record-keeping, customers are not authorized to modify their registered name or meter number.

Figure 6: Pay Bill

Figure 7: Update Information

IV. Tools Used for Development -

A. Netbeans:

Java and other programming languages can be used to create desktop, mobile, and online apps utilising the open-source integrated development environment NetBeans IDE. It offers a user-friendly interface and an extensive set of features, including code editing, debugging, and profiling tools.

NetBeans IDE also supports various frameworks and technologies, such as JavaFX, HTML5, JavaScript, and CSS. It allows developers to build and deploy applications quickly and efficiently, thanks to its robust code generation and project management

capabilities. Additionally, it offers seamless integration with version control systems, such as Git and Subversion, enabling easy collaboration among team members. Overall, NetBeans IDE is a powerful tool for Java development and has been widely used in various industries for many years.

B. Advantages of Netbeans:

- **Maven:** Maven is a crucial term that is commonly used in the context of NetBeans around the globe. One of the key advantages that NetBeans users appreciate is the ability to use Maven without requiring any additional plugins. Instead of importing Maven projects, they can be directly opened in NetBeans, making the development process smoother and more streamlined.
- **Easy to Use:** The quick turnaround time between installing NetBeans and starting to build useful apps is one of its primary advantages. Despite having a large ecosystem of plugins, not much needs to be installed or set up because everything is available as soon as it is launched.
- **Code Editor:** The NetBeans IDE provides a robust and user-friendly code editor that facilitates the development of high-quality and efficient code for the Electricity Billing Management System project. The editor includes tools like code completion, code highlighting, and syntax checking, which help developers to write code faster and with fewer errors.
- **Customizability:** The high degree of flexibility offered by the NetBeans IDE enables developers to adapt it to their unique requirements and tastes. Users can modify the interface layout, keyboard shortcuts, and toolbars, as well as install and configure various plugins and extensions to enhance the functionality of the IDE. This customization capability enables developers to create a personalized and optimized development environment, increasing their productivity and efficiency.

C. MySQL:

The Electricity Billing Management System was created and is implemented using the robust and dependable open-source MySQL relational database management system. Large volumes of data linked to client accounts and their electricity usage can be stored, managed, and retrieved via the system. It is used as the back-end database to store all the relevant data, including customer information, electricity usage data, billing details, and payment history.

- The system is made to be both scalable and reliable, and MySQL is used to handle large amounts of data efficiently.
- MySQL's performance and reliability are essential to manage the high volume of transactions generated by the electricity billing process.
- The use of MySQL in the Electricity Billing Management System ensures efficient data retrieval and reporting.
- The system can generate various reports related to customer billing, usage trends, and payment history. These reports help administrators to make informed decisions and take appropriate actions.
- MySQL is a crucial component of the Electricity Billing Management System, contributing to its efficiency, scalability, and security.
- Overall, the use of MySQL in the system is critical for ensuring reliable and effective management of electricity billing processes.

In summary, MySQL is a critical component of the Electricity Billing Management System, providing a reliable, scalable, and secure database platform that enables efficient management of customer billing and usage data. Its use aids in increasing accuracy, efficiency, and security of the billing process, ultimately enhancing customer satisfaction and trust.

V. Conclusion

The Electricity Billing System Using Java is an essential tool for power utilities that want to increase precision, correctness, and security of their billing procedure. It is a powerful system that can help utilities to reduce costs, increase customer satisfaction, and build trust with their customers. With its scalability, security, and cross-platform compatibility, the Electricity Billing System Using Java is an excellent choice for power utilities looking to modernize their billing systems and offers an efficient and convenient way to manage electricity billing processes for both customers and administrators. The system's user-friendly interface enhances the user experience. Overall, the electricity billing management system project is an excellent example of how technology can streamline and simplify complex processes.

References:

1. R. Raju, P. Madhumathy, G. Pavithra, N. Nithiya veni, ``A Comparison of Smart Electricity Billing Systems`` *Institute of Electrical and Electronics Engineer (IEEE) Date of Conference: 03-04 July 2020.*
2. Shaista Hassan Mir, Sameena, Yasmeen Bhat, Sahreen Ashruf and Nadeem Beigh, ``Smart Electric Metering System Based on GSM/IOT `` *Asian Journal of Electrical Sciences, ISSN No: 2249-6297, Vol. 8, No. 1, pp. 1-6, 2019.*
3. Zameema Benazir, Divya Prabha, Noorul Hamitha, Rajeshbabu, ``Electricity Bill Management System`` *International Journal of Applied Engineering Research ISSN No: 0973-4562 Volume 13, Number 5, pp. 3118-3122, 2018.*
4. Syed Assra Shah, ``Automatic Electric Bill Generation System`` *IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), e-ISSN: 2278-2834, p-ISSN: 2278-8735, Volume 12, Issue 4, Ver. III, PP 75-79, Jul.- Aug. 2017.*
5. Saikumar Pallagani, Krishnarao. Kundeti, ``Smart Electricity Billing System`` *International Journal of Engineering and Management, ISSN No: 2394-6962, Vol. 06, Issue: 3, pp. 526-529, June 2016.*
6. EnitJayanth, M.R.M.S.B. Rathnayaka, S.I Swarnajith, I.D.S. Jayasinghe, `` Mobile Based Electricity Billing System`` *International Journal of Scientific and Research Publications ISSN No: 2250-3153, Volume 3, Issue 4, April 2013.*

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An Overview of Matlab/Simulink Dynamic Model of an Electric Vehicle's Performance

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***Abstract*— The goal of this study is to develop not only an electrical car with a wide range of gear train components, but also an energy model of such a vehicle in MATLAB/SIMULINK. Using this technique of simulation and design, we regularly seek out the energy usage of the vehicle due to various forces occurring on the vehicle after completing a number of standard driving cycles. Several different types of electrically powered and hybrid vehicles are analyzed in this work's market research section. As electric vehicles gain traction as environmentally friendly transportation options, scientists are devoting more time to studying and simulating them. This work proposes a MATLAB-Simulink simulation model of an all-electric car to analyze power usage. A single action that accomplishes both driving and regeneration. The drive train components include a motor, battery, motor controller, and electric battery controller, as determined by their calculations. The simulation results are shown and debated. Energy efficiency and flow were evaluated based on driving and regeneration conditions, measured by torque and speed. This research establishes a baseline for future exploration and development.**

Keywords-Electric vehicle, Motor Circuit, Controller Subsystem, State of charge (SoC), State of Discharge (SoD)

I. INTRODUCTION

In the coming years, electric vehicles will be mass-produced for the first time, and there will likely be more studies and experiments conducted on the topic. The widespread use of electric vehicles is only one example of how technological advancements have made and will continue to make our daily lives better and more convenient (EVs). Electric vehicles are efficient because they can generate, store, and transmit power in addition to using it. This sets them apart from other types of cars that run on fossil fuels. They save money over time and are better for the planet than traditional gas or diesel vehicles. They use a reversible energy storage mechanism. Electric vehicles, on the other hand, are emission-free, simple to operate, and less noisy than their predecessors. Rapid adoption of electric vehicles in urban areas was driven primarily by women. As more individuals in the 1910s had access to electricity and charging infrastructure, electric cars became increasingly popular. Many original thinkers joined in on the trend. Porsche created the first hybrid electric car, which combined electric propulsion with a gasoline-powered generator. Thomas Edison, who was convinced that electric cars were the future, worked on improving their battery technology. The need for charging infrastructure is growing in tandem with the increasing number of electrical vehicles on the road. Recent years have seen widespread shifts in the planning procedures used by most industries as a result of new technological developments. The aerospace, automotive, and other industries already adopt a model-based approach for sophisticated embedded systems.

The ancient world made progress through a methodical process that included requirements, Design, Implementation, Check, justification or validation. With Predictive Model-Based Design, engineers may quickly test and verify specifications vs. requirements by using models early on in the feasible specifications phase. The engineer employs Simulink/Real Time and Embedding Coder's automated code generation tool to effectively convey the subsystems' and components' functionality. Assist with Hardware-in-the-Loop (HIL) testing as the cost of developing a new product reduces, simulation is playing a larger role in the design process. Model-In-The-Loop (MIL), Software-In-The-Loop (SIL), and Hardware-In-The-Loop (HIL) development modelling are all tools available to the engineer for simulating the design process in real time. Using simulation software allows engineers to complete and test products sooner, for less money, and to reduce the time spent on the design process.

II. METHODOLOGICAL SURVEY

Sai Krishna Vempalli et al., [1] presented throughout his work on EV design, modeling, and simulation, the author has paid special attention to the problem of field orientation control in 2018. In this research work, Yu Inoue et al., [2] built a prototype electric vehicle (BEV) to measure electric motor power consumption. In addition to the motor inverter, battery, and motor, a BEV also has a driver controller and vehicle dynamics in 2021. By 2018, Kroeze and Krein scheduled for fully dynamic EV simulators that include overcharging the battery necessitate knowledge about the battery's projected state of charge, as well as the IV characteristics and dynamic behavior of various battery types [3]. Using a permanent magnet synchronous machine, it is controlled by Lab View software that performed dynamic testing on a car by Sorina-Maria Ciornei et al., [4]. Kumar, R., & Saxena, R examined the open- and short-circuit performance of SRM drives for electric vehicles, analyzing

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the latter's responsiveness through measurements of speed, torque, and battery charge in 2019.

In 2020, Wei, D et al., [6] proposed an energy efficiency of the motor during the whole driving cycle is analyzed, as is the distribution of energy throughout the driving cycle examined the potential advantages of reducing energy loss. Most battery models are developed using simulations of electric vehicles, therefore progress in this area is crucial. An enhanced equivalent circuit model was developed by Abulifa, A. A et al., [7] in 2017 to precisely analyze the performance of LiFePO4 batteries by analyzing the dynamic parameters and comparing numerous battery models. This study investigated by A, L., and R, B. K. [8] in 2019, permanent magnet synchronous motors by examining their high efficiency and variable speed (torque-to-current ratio). A PMSM with a radial flux inner rotor was proposed in this study. In 2020, Author Gaurav and Gaur [9] investigated the proposed work and presented their research work on to build a 3.45 kW on-board prototype that conforms to industry requirements for connecting electric vehicles to electrical vehicle charging stations, power supply using MATLAB. To model the charging process for Li-ion batteries, used to generate torque for propulsion, see here. Chargers with many stages are preferable because of their ability to regulate voltage and current levels. When utilised for both static and dynamic charging, Inductive Power Transfer (IPT), is the only feasible technique of charging electric vehicles (EVs) using electromagnetic energy while they are in motion, and it presents prospects that are unequalled by any other technology. In 2019, Niculae, D. et al. [10] set out to assess the efficacy of energy charging techniques that make use of magnetically coupled coils in autos.

The author of this study looked into how to improve the performance of a parallel HEV by maximizing the efficiency of its battery pack, and they modeled, simulated, and analyzed the system. Moreover, technological factors are explored to lessen mechanical and electrical power losses and increase brake system energy absorption by Mohammadi, F et al., [11]. The report recommends an alternative method for quickly discharging the voltage stored in an electric vehicle's capacitor in the event of a breakdown. The PMSM's windings are used for this purpose in the driving system. For large machine rotor inertia and low system safe current, however, the classical winding-based discharge method may not be effective. It is proposed work by Chao Gong et al. [12] in 2019 to discharge the capacitor voltage using a current control algorithm to prevent any potential voltage surge. For the PMSM drive system evaluated, this technique shortens the discharge time to less than 3 seconds. E-bikes, often known as electric bikes, are bicycles that use an integrated electric motor to supplement human pedalling. When compared to a traditional bicycle, an e-bike reduces the amount of effort needed to climb hills. It's easy to use; just connect it to a power outlet and go. The use of electric bikes as a means of relieving mental and physical stress has been on the rise over the past decade and this work is conducted by author Hamid and Umar [13] in 2022. This research analyzes how the energy consumption and driving range of battery electric vehicles vary under simulated and real-world scenarios (BEVs). In this research work , researchers looked at data from 197 identical BEVs over the course of a year and over a variety of driving scenarios and seasons. The findings reveal that BEVs' electricity usage, travel habits, and charging routines differ greatly depending on the vehicle's intended use and the time of year. Researchers Hao, X et al., [14] observed that the New European Driving Cycle (NEDC) test's projected numbers for BEV electricity consumption and range were significantly off from the actual readings in 2020. In order to extend the range of EVs, the authors of this research propose installing a cruise control system (CCS). Electric vehicles' existing driving habits may cause them to cruise faster than the average traffic speed, which can result in kinetic energy loss owing to traffic ripples. The proposed CCS limits the car's top speed so it doesn't get too far ahead of the lead vehicle and keeps a safe space between them.

The design and simulation analysis of the suggested CCS was carried out in a MATLAB simulation environment in 2020, and the results showed a reduction in energy consumption of around 36.6% in urban driving cycles and 15.4% in highway drive cycles, as reported by Madhusudhanan and Na [15]. An efficient electric vehicle driven by a vector-controlled induction machine is the target of this project's design efforts. The efficiency of vehicle modelling has been increased by the use of a physical modeling approach. To further extend the range of the car, regenerative braking control has been implemented by Vempalli et al., [16]. This system recoups momentum lost during deceleration and channels it towards battery charging. Models and simulations of the EV have been run in Matlab/Simulink with the help of the Sim Power System/Sim Driveline toolbox in 2018. By 2020, flexible energy dispatch is possible with electric vehicles, but it is difficult to predict how much electricity will be needed to charge them and how much space would be needed for their batteries. Accurate predictions of electric vehicle behavior and charging requirements can be made by evaluating journey data and employing a novel neural network model, the R-ANN, based on space-time activity. This allows us to determine the storage capacity of groups of electric vehicles and the charging power of individual vehicles by Wenwen Fan et al., [17]. In 2020, fuel cell hybrid electric vehicles (FCHEVs) are efficient and ecologically friendly cars that have drawn the attention of governments and communities worried about environmental and energy challenges. This work focuses on the creation of a control algorithm for FCHEVs. Modeling power systems and controlling and simulating FCHEVs throughout time are at the heart of this study. The research suggests a new approach to estimating the slip ratio by tire modeling, and the control algorithm uses feed forward control and Proportional-Integral feedback control to achieve the desired levels of anti-slip and target driving torque. To comply with ECE braking standards by Hang Li et al., [18], the braking force is dispersed to optimize regenerative braking performance. The production of greenhouse gases is exacerbated by the widespread usage of conventional internal combustion engine vehicles (ICEV), making the electrification of vehicles a crucial area of study. By 2020, The use of electric vehicles (EVs) has many benefits, including decreased pollution, increased efficiency, and decreased upkeep expenses. In this research, we analyze the performance of EVs and ICEVs across a range of metrics,

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including torque, speed, and range. Analysis is carried out in MATLAB/Simulink, and the results are presented alongside a number of performance metrics by Poornesh, Kavuri et al., [19]. In 2020, one of the major benefits of hybrid and electric vehicles is their regenerative braking mechanism. To optimize available energy for recovery while adhering to stability requirements, this research suggested by Yongliang Li et al., [20] a solution based on Artificial Neural Networks to address the optimal braking force distribution problem. Up to 37% of UDDS (urban driving pattern) energy demand can be recovered using the proposed method. Aggressive driving is shown to decrease the amount of energy that can be recovered by up to 7%. Raising the energy recovery rate is a good way to save money on gas and cut down on pollution.

In 2020, Khalil Sinjari and Joydeep Mitra [21] designed a hierarchical coordination framework to control active and reactive power dispatch for a fleet of EVs connected to a distribution network. Proposed models and algorithms coordinate EV charging with reactive power support to improve power flow on the grid. By analyzing real-world charging scenarios, we show that coordinated charging can decrease charging costs and increase the number of electric vehicles (EVs) that can be accommodated in overburdened distribution networks. This is especially true if charging takes place in non-unity power factor mode. In the long run, our method can help the grid and EV charging run more smoothly, which is good for everyone. In 2019, the goal of this study is to create a method for simulating the energy requirements and battery level of a long-range electric car (EREV) and this work is carried out by Kusuma et al., [22].

The simulation approach accurately predicts energy consumption by modeling the EREV propulsion system and using driving cycle data. The results were consistent with expectations, validating the method. Future EREV designs may benefit from this simulation approach, but it requires more precise data and modeling to accurately predict battery states of charge [22].

Electric vehicles aim to be economical and energy-efficient while also being kind to the environment. Electric vehicles can only achieve this with properly engineered electric motors. In this research, Rachev, Svilen et al., [23] analyzed the effect of varying parameters on electric power losses in the drive of a small electric car while in dynamic modes. Simulations were run using a mathematical model of the electromechanical system, and results were presented in tabular and graphical formats. With this model, one may determine how to best design electric motors and control systems to fulfill specific user needs in 2019.

Onboard chargers for electric vehicles are the subject of this research, which details the design and simulation of such a device. This charger can be used with a 48V, 35Ah lead-acid battery and a single-phase AC power supply. An AC-DC converter and a Buck type DC-DC converter are incorporated into the onboard charger to control the charging voltage and current. Using MATLAB/Simulink, we are able to model the charging process for an EV's battery and see how efficient the charger is. In order to combat the depletion of fossil fuels and the resulting increase in pollution, this technology is crucial for the advancement of electric cars by Kamat and Jadhav [24]. Sarathkumar et al., [25] their research underlined the importance of electric vehicles in comparison to conventional modes of transportation that rely on fossil fuels, which have negative effects on the environment. They input driving cycles from SAEJ227 and EUDC into MATLAB/SIMULINK to model and simulate the operation of an electric vehicle. In order to assess the energy flow and capabilities of the electric drive for different driving cycles, the simulation results produce motor and battery characteristics. This research aids in the creation of electric vehicles that are both economical and gentle on the planet in 2020.

This research looks on the practicality of electric three-wheeled motorcycle taxis in Dar es Salaam from both a technical and user perspective. Based on the drivers' perspectives, the study evaluates two different types of electric power trains. The energy consumption of the car is estimated using a simulation model, and a Dar es Salaam-specific driving pattern is derived from GPS data. Depending on the results, a different power train option may be recommended by Wachter, Christian et al., [26] based on the vehicle's battery weight, energy requirement, and range. This article explained the value of using simulation models to learn about the inner workings of a vehicle and highlights the significance of electric car technology in 2020. It recommends simulating the charging process for an EV with a traction inverter model.

The author of this essay presented a new method of adaptive learning based on fraction calculus in 2021. This method is utilized by K. M. Sidorov et al. [27] to enhance learning performance in a signal processing context, and it has been shown to be both stable and convergent. Simsek, Mustafa et al., [28] in 2019, a novel method of assessing the magnetic field produced by a wireless power transfer system for electric vehicles was discussed by the author. In 2018, using finite element analysis and electric simulation software, they may take into account the system's electric behavior and magnetic reaction simultaneously by Guerroudj, Salim et al., [29].

In this study, we propose a method for improving the efficiency of HEVs through better engine and vehicle coordination. In 2020, the optimal solution to a constrained optimization issue is found by applying the paper's speed planning technique and energy management strategy. To prove the viability of the strategy by Fuguo Xu and Tielong Shen [30], the solution is tested in a traffic-in-the-loop powertrain simulation environment.

III. PROPOSED METHODOLOGY

Block diagram of the given model is shown below which consist of various blocks each block is explained ahead:

A. Block Diagram of System

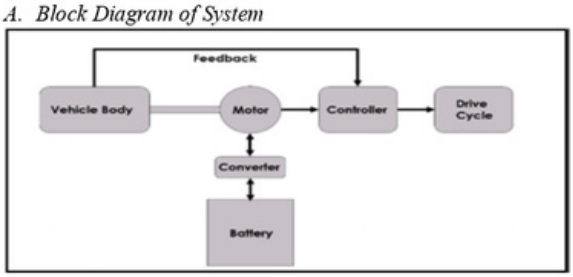

Fig. 3.1: Block diagram of electric vehicle system

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The basic structure of an EVS is depicted in figure 3.1. (Electrical Vehicle System). This section of the electric car consists of several different parts and a complex network of cables. In this case, the internal combustion engine (IC) has been replaced by an electric motor. The energy source, which is the battery pack, is transferred to the motor. Figure 3.2 depicts a critical component of the electrical vehicle system.

Essential parts of electric cars are the motor, chassis, controller, and battery pack. A wide variety of motor designs are employed in electric cars. Common types of electrical motors include brushless DC (BLDC) motors, brushed DC (DC) motors, and alternating current (AC) induction motors. The vehicle's body houses the tires, differentials, and housing. In the past, we would simply turn on the engine or the battery to get things going. These days, however, we often require operating power from batteries. Several modules make form a battery pack, each of which is constructed from individual cells.

The motor can't spin without some juice from the battery. Let's pretend that we routinely use a direct connection between the motor and the battery. There is no way to alter the motor's speed, thus it must always run at its specified maximum. The controller allows us to adjust the velocity of the motor. The controller can work with input from the driver.

B. Vehicle Body Subsystem

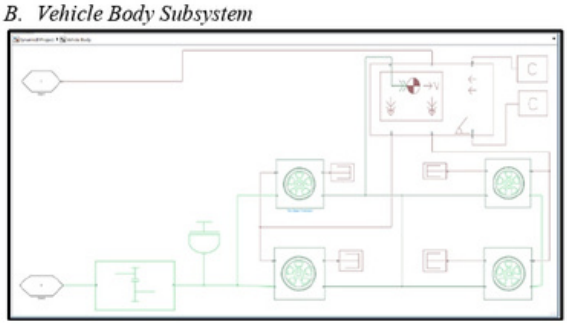

Fig. 3.2: MATLAB/SIMULINK Model of Vehicle Body Subsystem

The first thing we've made is a working version of the vehicle's body subsystem. The tires, differential, gearbox, and vehicle body are only some of the blocks from the simscape library that have been integrated to the vehicle body subsystem. The parameters of the block can be adjusted to suit our purposes. Put together the primary subsystem by linking the wheels, differential, transmission, and body components.

C. Motor Circuit And Controller Subsystem

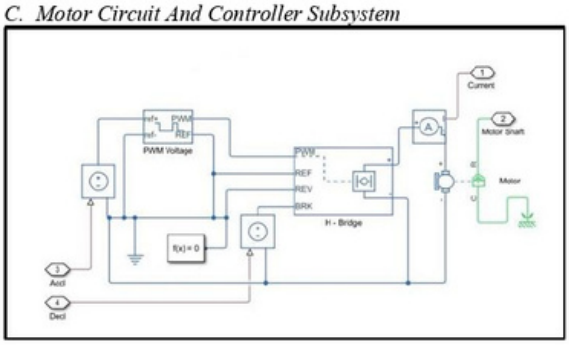

Fig. 3.3: MATLAB/SIMULINK Model of Motor Circuit & Controller Subsystem

The battery will supply the motor with regulated power, which it will use to convert electrical energy into mechanical energy. The motor circuit and controller subsystem MATLAB/SIMULINK model is displayed in Figure 3.3. The generated power is transferred to the mechanical rotating frame and gearbox. The motor circuit and controller block were both taken straight from the Sims cape library and used into the final product. We used a basic DC motor, and an H-bridge controller was used to direct its rotation. The H-bridge controller bridge allows us to perform acceleration, deceleration, and braking. To manage the PWM wave, we have included a voltage block that is both regulated and PWM. We can adjust the block's settings to meet our requirements. Figure 3.4 depicts the interconnections between the various blocks that make up a given subsystem.

D. Battery Pack Subsystem

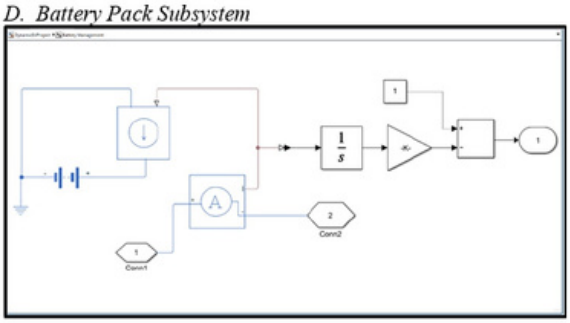

Fig. 3.4: MATLAB/SIMULINK Model of Battery Pack Subsystem

The battery pack will supply the power for the motor. The range before needing to recharge and the lifespan of the battery can be determined using state-of-charge (SOC) calculations. We utilized a lithium-ion battery so that we could see the SOC % in real time. Battery charging and discharging data can be analyzed with SOC. The blocks in the following diagram can be connected to form a subsystem as shown in figure 3.4.

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E. Driver Input Subsystem

Fig. 3.5: MATLAB/SIMULINK Model of Driver Input Subsystem

According to Figure 3.5, the powertrain block library's longitudinal driver block is responsible for producing normalized acceleration, while reference and feedback speeds inform braking commands. The signal builder block can be used to create a custom signal, or the built-in driving cycle can be used as a reference rate. The actual vehicle speed is used for the feedback speed calculation. As a result of the divergence in frames of reference, a signal and the actual speed deviation will be produced. The car will try to match the speed of the error by either speeding up or slowing down. Using the longitudinal block and the Signal Builder block, the Drive Input module of this system was built. You can see the interconnections between the blocks in the diagram.

F. Drive Cycles

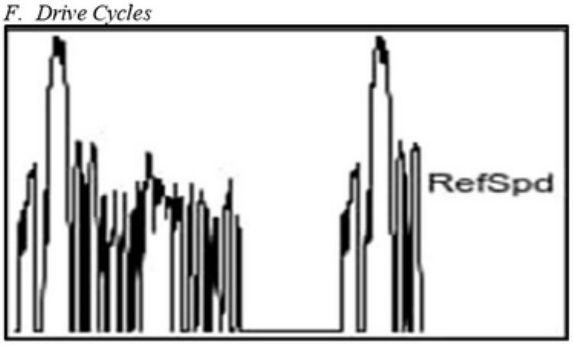

Fig. 3.6: MATLAB/SIMULINK Model of Drive Cycles

A timed drive cycle is generated by the block seen in Figure 3.6. It comprises mostly of time versus speed data with erratic acceleration and deceleration patterns, simulating real-world driving circumstances as nearly as possible. The factory preset driving cycle is FTP75. The Full Throttle option is also available. Spreadsheet data, a glider block, and a signal builder block can also be used to acquire information about drive cycles. The FTP75 simulation time is set to 2474 seconds by default.

G. Overall Model

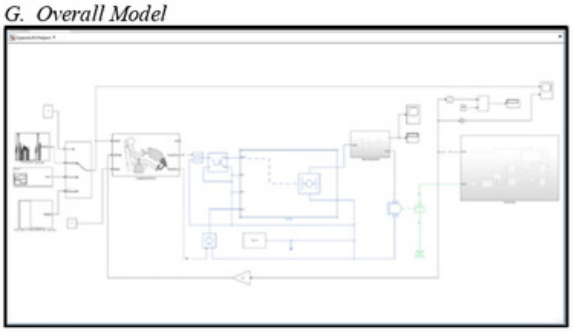

Fig. 3.7: Overall MATLAB/SIMULINK Model of Electric Vehicle

Including a construction element for power interfaces in Simulation. In order to investigate the outputs and actions of the electrical Vehicle model, you should add a scope and a display block. We were able to produce a standard reference signal by utilising the signal builder block in our system. We will provide explanation for the operation of the feedback loop by using a graph that contains the reference signal and the actual speed.. We can also estimate an electric car's typical top speed. Using the SOC graph, we can see how the battery charges and discharges in response to the command to accelerate or decelerate. Using the software model shown in the accompanying image, which depicts the vehicle's overall electrical model, we analyzed the SOC % and average speed.

IV. MATLAB/SIMULATION RESULTS

To begin, we used the signal builder to set a baseline velocity. We opted for a rapid pace of 100 kmph. The model has been simulated for a full minute. The first 400 seconds will include accelerated movement. For the next 200 seconds, the tempo stays the same before gradually slowing down for the last 400. We used the signal builder block to create the reference signal seen in figures. Various results are obtained Signal builder input waveform, Signal builder drive cycle output waveform, Signal builder drive cycle output waveform of the SOC of battery, FTP75 drive cycle output waveform, FTP75 drive cycle output waveform of the SOC of battery of FTP75 drive cycle.

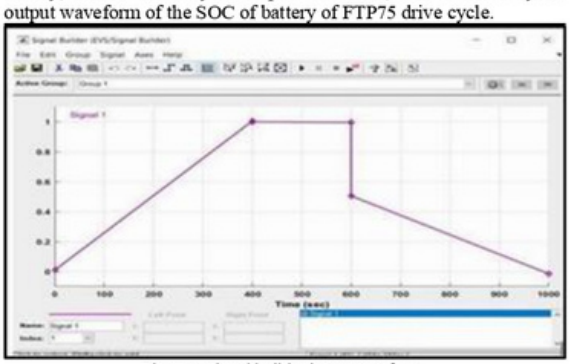

Fig. 4.1: Signal builder input waveform

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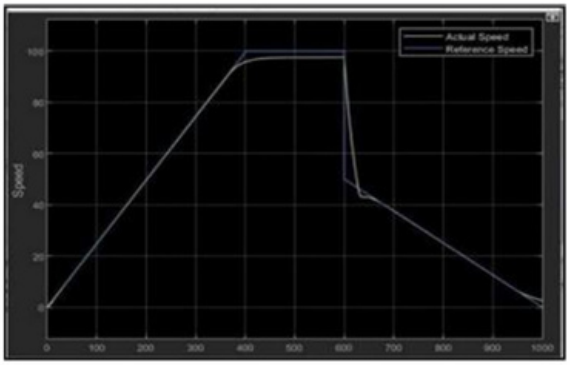

Fig. 4.2: Signal builder drive cycle output waveform

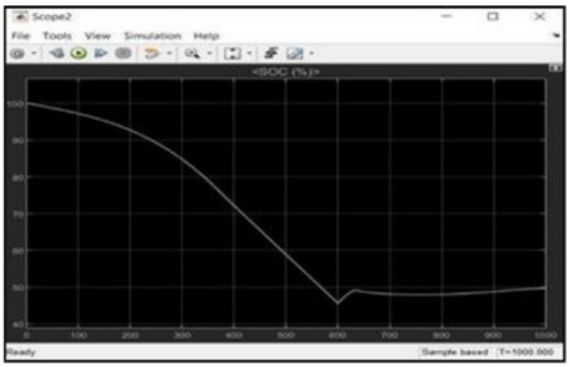

Fig. 4.3: Signal builder drive cycle output waveform of the SOC of battery

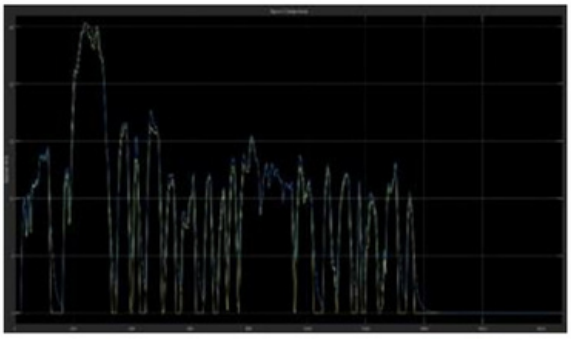

Fig. 4.4: FTP75 drive cycle output waveform

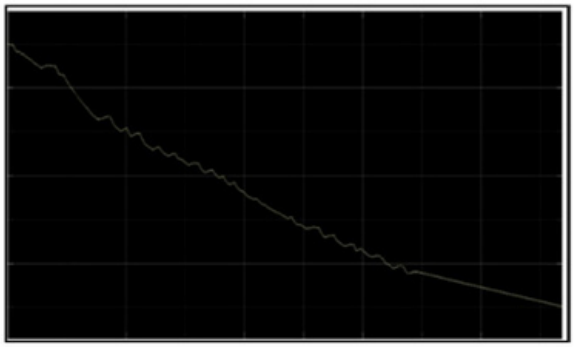

Fig. 4.5: FTP75 drive cycle output waveform of the SOC of battery of FTP75 drive cycle

V. Conclusion

The energy flow, functionality, and efficiency of the electric vehicle drive train can be studied with great benefit by modeling and simulation in MATLAB-Simulink. For this analysis, we ran the simulation in both driving and regeneration modes and compared the results. The motor's mode of operation is decided either by the required road speed and torque or by the polarity of the current and voltage supplied to the motor. Energy flows from the battery to the load when the engine is running, and back to the battery during regeneration. The controller's efficacy in eradicating error from the system is a key factor in the EV's overall performance. In this study, a P-I controller was utilized to correct the voltage inaccuracy, and a simple controller was employed to maintain a constant input-output power from the battery.

This research presents a reduced version of the electric vehicle design. Due to the high cost and difficulty of prototyping and testing, automotive designers must rely on simulation and modeling to help them choose the most efficient method of energy control, identify the correct size of the component, and cut down on energy use. One day, we'll be able to build electric cars that run on renewable energy sources like solar electricity. Regular gasoline has a higher calorific value than batteries. There is still a higher conversion efficiency for batteries than for gasoline. There is great promise in hybrid technology, and it could prove to be quite useful. In terms of transportation, it would be extremely beneficial to the environment if we could switch to electric vehicles instead of those that run on fossil fuels.

References

[1] Sai Krishna Vempalli, J. Ramprabhakar, S. Shankar, Prabhakar. "Electric Vehicle Designing, Modelling and Simulation." *4th International Conference for Convergence in Technology* (12CT) SDMIT Ujire, Mangalore, India. Oct 27-28, 2018.

[2] Yu Inoue, Takashi Kosaka, Hiroaki Matsumori, Nobuyuki Matsui. "Modeling and Simulation of Battery-powered Electric Vehicle on MATLAB/Simulink." 2021 *24th International*, 2021.

[3] Ryan C. Kroeze, Philip T. Krein. "Electrical Battery Model for Use in Dynamic Electric Vehicle Simulations." *39th Annual IEEE Conference on Power Electronic Specialists Conference* (PESC) 2018.

[4] Sorina-Maria Ciornei, Raul-Octavian Nemes, Mircea Ruba, Calin Husar, "RealTime Simulation of a Complete Electric Vehicle Based on

NI VeriStand Integration Platform." *10th International Conference & Exposition on Electrical and Power Engineering* (EPE) 2018

[5] Kumar, R., & Saxena, R. (2019). Simulation and Analysis of Switched Reluctance Motor Drives for Electric Vehicle Applications using MATLAB. 2019 *4th International Conference on Electrical, Electronics, Communication, Computer Technologies and Optimization Techniques* (ICEECCOT) 2019.

[6] Wei, D., He, H., & Li, J. (2020). A Computationally Efficiency Optimal Design for a Permanent Magnet Synchronous Motor in Hybrid Electric Vehicles 2020 IEEE *9th International Power Electronics and Motion Control Conference* (IPEMC2020-ECCE Asia) 2020.

[7] Abulifa, A. A., Ahmad, R. K. R., Soh, A. C., Radzi, M. A. M., & Hassan,M. K. (2017). Modelling and simulation of battery electric vehicle by using MATLAB-Simulink. 2017 IEEE *15th Student Conference on Research and Development* (SCOReD) 2017.

[8] A, L., and R, B. K. (2019). Permanent Magnet Synchronous Motor for Electric Vehicle Applications. 2019 *5th International Conference on Advanced Computing & Communication Systems* (ICACCS) 2019.

[9] Gaurav, A., & Gaur, A. (2020). Modelling of Hybrid Electric Vehicle Charger and Study the Simulation Results. 2020 *International Conference on Emerging Frontiers in Electrical and Electronic Technologies* (ICEFEET) 2020.

[10] Niculae, D., Iordache, M., Stanculescu, M., Bobaru, M. L., & Deleanu, S. (2019). A Review of Electric Vehicles Charging Technologies Stationary and Dynamic. 2019 *11th International Symposium on Advanced Topics in Electrical Engineering* (ATEE) 2019.

[11] Mohammadi, F., Nazri, G.-A., & Saif, M. (2019). Modeling, Simulation, and Analysis of Hybrid Electric Vehicle Using MATLAB/Simulink. 2019 *International Conference on Power Generation Systems and Renewable Energy Technologies* (PGSRET) 2019.

[12] Chao Gong; Yihua Hu; Guipeng Chen; Huiqing Wen;Zheng Wang; Kai Ni; "A DC-bus capacitor discharge stratagy for pmsm drive system with large inertia and small system safe current in EVs" *IEEE, Year* : 2019

[13] Hamid, Umar Zakir Abdul (2022). "Autonomous, Connected, Electric and Shared Vehicles: Disrupting the Automotive and Mobility Sectors". Retrieved 11 November 2022.

[14] Hao, X.; Wang, H.; Lin, Z.; Ouyang, M. Seasonal Effects on Electric Vehicle Energy Consumption and Driving Range: *A Case Study on Personal, Taxi, and Ridesharing Vehicles. J. Clean. Prod.* 2020

[15] Madhusudhanan, A.K.; Na, X. Effect of a Traffic Speed Based Cruise Control on an Electric Vehicles Performance and an Energy Consumption Model of an Electric Vehicle. IEEE/CAA J. Autom. Sin. 2020

[16] Vempalli, S. K., Ramprabhakar, J., Shankar, S., & Prabhakar, G. (2018). Electric Vehicle Designing, Modelling and Simulation. 2018 *4th International Conference for Convergence in Technology* (I2CT). doi:10.1109/i2ct42659.2018.9058161

[17] Wenwen Fan;Siyuan Zhang;Yuqin Xu;Yongzhang Huang; (2020). Analysis of Electric Vehicle Load Storage Resource Potential Based on R-ANN Activity Behavior Model. 2020 *IEEE 4th Conference on Energy Internet and Energy System Integration* (EI2), (), –. doi:10.1109/ei250167.2020.934662

[18] Hang Li;Jianqiu Li;Jiayi Hu;Jingkang Li;Zunyan Hu;Liangfei Xu;Minggao Ouyang; (2020). Modeling and simulation of coordinated driving and braking control for fuel cell hybrid electric vehicle. 2020 *4th CAA International Conference on Vehicular Control and Intelligence* (CVCI), (), –. doi:10.1109/cvci51460.2020.9338542

[19] Poornesh, Kavuri; Nivya, Kuzhivila Pannickottu; Sireesha, K. (2020). [IEEE 2020 International Conference on Smart Electronics and Communication (ICOSEC) - Trichy, India (2020.9.10-2020.9.12)] 2020 *International Conference on Smart Electronics and Communication* (ICOSEC) - A Comparative study on Electric Vehicle and Internal Combustion Engine Vehicles. , (), 1179–1183. doi:10.1109/icosec49089.2020.9215386

[20] Yongliang Li;Changlu Zhao;Ying Huang;Xu Wang;Fen Guo;Long Yang; (2020). Study on Regenerative Braking Control Strategy for Extended Range Electric Vehicles. 2020 *IEEE Vehicle Power and Propulsion Conference* (VPPC), (), –. doi:10.1109/vppc49601.2020.9330885

[21] Khalil Sinjari;Joydeep Mitra; (2020). Electric Vehicle Charging with Reactive Power Compensation to Distribution Systems. 2020 *IEEE Industry Applications Society Annual Meeting*, (), –. doi:10.1109/ias44978.2020.9334838

[22] Kusuma, Christopher Fernaldy; Budiman, Bentang Arief; Nurprasetio, Ignatius Pulung (2019). [IEEE 2019 6th International Conference on Electric Vehicular Technology (ICEVT) - Bali, Indonesia (2019.11.18-2019.11.21)] 2019 *6th International Conference on Electric Vehicular Technology* (ICEVT) - Simulation Method for Extended-Range Electric Vehicle Battery State of Charge and Energy Consumption Simulation based on Driving Cycle. , (), 336–344.

[23] Rachev, Svilen; Stefanov, Dimo; Dimitrov, Lyubomir; Koeva, Dimitrina (2019). *IEEE 2019 Electric Vehicles International Conference* (EV) - Bucharest, Romania (2019.10.3-2019.10.4)] 2019 Electric Vehicles International Conference (EV) - Evaluation of Electric Power Losses of an Induction Motor Driving a Compact Electric Vehicle at Change of Parameters and Loads. , (), 1–5.

[24] Kamat, Suraj; Jadhav, Seema (2019). [IEEE 2019 International Conference on Advances in Computing, Communication and Control (ICAC3) - Mumbai, India (2019.12.20-2019.12.21)] 2019 *International Conference on Advances in Computing, Communication and Control* (ICAC3) - Design and Simulation of Low Power Charging Station for Electric Vehicle.

[25] Sarathkumar, Tirunagaru V; Poornanand, Maramreddy; Goswami, Arup Kumar (2020). *IEEE Students Conference on Engineering & Systems* (SCES) - Prayagraj, India (2020.7.10-2020.7.12)] 2020 IEEE Students Conference on Engineering & Systems (SCES) - Modelling and Simulation of Electric Vehicle Drive through SAEJ227 & EUDC Cycles.

[26] Wachter, Christian; Schuttoff, Martin; Rinderknecht, Frank; Goletz, Mirko; Ehebrecht, Daniel; Lenz, Barbara; Kuhnel, Meike; Hanke, Benedikt (2020). IEEE 2020 *Fifteenth International Conference on Ecological Vehicles and Renewable Energies* (EVER) - Monte-Carlo, Monaco (2020.9.10-2020.9.12)] 2020 Fifteenth International Conference on Ecological Vehicles and Renewable Energies (EVER) - Electric three-wheelers as an alternative to combustion-engined autorickshaws in Dar es Salaam - Generation of a standard drive cycle, Power Train modelling and simulation of the energy demand of light electric vehicles.

[27] K. M. Sidorov;A. G. Grishchenko;B. N. Sidorov;V.I. Stroganov; (2021). Electric Propulsion System Simulation as Basis for the Electric Vehicle Digital Twin Development. 2021 *Systems of Signals Generating and Processing in the Field of on Board Communications.*

[28] Simsek, Mustafa; Bilgin, Berk; Adam, Halil Ibrahim (2019). *IEEE 2019 11th International Conference on Electrical and Electronics Engineering* (ELECO) - Bursa, Turkey (2019.11.28-2019.11.30)] 2019 11th International Conference on Electrical and Electronics Engineering (ELECO) - A New Approach in Co-Simulation for Battery Electric Vehicle Modelling.

[29] Guerroudj, Salim; Boulzazen, Habib; Riah, Zouheir (2018). [IEEE 2018 IEEE International Conference on Electrical Systems for Aircraft, Railway, Ship Propulsion and Road Vehicles & International Transportation Electrification Conference (ESARS-ITEC) - Nottingham, United Kingdom (2018.11.7-2018.11.9)] 2018 IEEE International Conference on Electrical Systems for Aircraft, Railway, Ship Propulsion and Road Vehicles & International Transportation Electrification Conference (ESARS-ITEC) - New approach for the evaluation of magnetic fields in dynamic wireless charging for electric vehicles.

[30] Fuguo Xu;Tielong Shen; (2020). Look-ahead Horizon based Energy Optimization for Connected Hybrid Electric Vehicles. 2020 *IEEE 3rd Connected and Automated Vehicles Symposium* (CAVS).

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Performance and Analysis of Smart Irrigation System Using Internet of Things

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Abstract— **This study provides novel recommendations for improving irrigation effectiveness. The final product featured an ESP8266 Node MCU, moisture sensors, a relay system, and a submersible water pump. The Node MCU ESP8266 system will determine how much water to supply based on inputs from two moisture sensors that measure soil dryness at separate locations across the field. This system will continue to collect data from the sensors until there is a enough amount of moisture in the soil, at which point it will immediately shut off the pump. This inexpensive form of irrigation will lessen the burden on farmers, save them time, and boost their efficiency. In greenhouse operations, watering is the most time-consuming and consequential cultural practice performed daily. The task of watering plants while they're parched is made easier with the help of an automated watering system. Knowing when to water and how much water to use are two crucial aspects of irrigation. The purpose of the automated plant watering system was to reduce the complexity of gardening. Sprinklers, tubes, nozzles, and other devices are just some of the equipment used in automatic irrigation systems. A Node MCU ESP8266 board is used in this setup. It's set up to monitor the humidity of the plants and water them as needed.**

Index Terms—**ESP8266 Node MCU, Sensor, Relay System.**

I. Introduction (Heading 1)

The Decent Irrigation System is a computerized and efficient water delivery for agricultural areas that was developed as a student project in agricultural electronics. Several types of sensors, controllers, and actuators are required to monitor soil moisture levels and adjust irrigation accordingly. Farmers may save both time and money thanks to the system's intuitive and cost-effective design and ensure that their crops receive adequate watering. Due to rising demand and dwindling supplies, rapid advancements in food production technologies are essential. This phenomenon manifests itself only in agricultural settings. This is fundamental to human societies and contributes significantly to the ever-increasing demand for food production. Agriculture has a crucial role in the economy and prosperity of countries like India. Since there are fewer springs and less water naturally occurring on the land, landlords have found that they may profit from irrigation. Irrigation is the practice of artificially supplying water to soil or land, typically for the purpose of watering plants.

This cutting-edge technology can be used for routine plant care in both tiny and massive settings. Watering the plants twice a day, in the wee hours of the morning and the evening, is often necessary. Therefore, it is suggested to set the microcontroller to water the fragile plants in the greenhouse twice a day. However, many viewers have problems maintaining their health and staying alive. Ultimately, this robotic device is meant to help out University Park. The system's goal with this prototype is to allow people to cultivate plants without having to worry about things like forgetfulness or being away from home. Agriculture plays a vital role in India's development as a culturally and economically agrarian country. Our country's agriculture is overly reliant on the monsoons, resulting in insufficient irrigation. For agricultural lands, irrigation performs this function. Depending on the soil type, plants receive water through irrigation systems. In agriculture, it is helpful to establish information regarding the soil's fertility and the humidity content of the air. There are now alternatives to relying solely on rain for irrigation. Power and on/off timers are the primary drivers of this method. A gateway unit will monitor sensor data and relay it to the controller, which will then adjust the pump's water flow based on the conditions sensed by the plant and the module.

The Smart Irrigation System is tested to ensure the sensors, controllers, and actuators all work as intended, and that the system as a whole functions as expected. The system's ability to detect subtle changes in soil moisture, adjust irrigation accordingly, and respond to human control will be evaluated. Implementing the Smart Irrigation System in a farm field and monitoring its operation are examples of its field applications. This includes verifying not only the overall system's functionality, but also the accuracy of the sensors, controllers, and actuators. Testing for reliability and durability is also necessary to make sure the system can hold up in the harsh conditions of an agricultural setting. Monitoring the system is essential to ensuring it is operating as intended and yielding the anticipated outcomes.

II. LITERATURE REVIEW

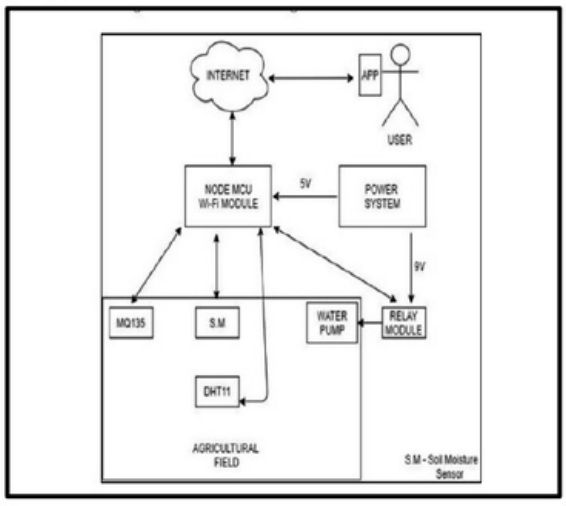
In 2013, Awasthi, A., and Reddy, S. R. N. [1] investigated the utility of WSN in Indian agriculture. A multi-parameter monitoring system based on low-power ZigBee wireless communication technology is built with the sugarcane crop as its primary target.
By sensing a wide range of soil and weather conditions, Dahikar, S. S., and Rode, S. V. [2] offer an ANN-based modelling and crop prediction methodology for determining which crops will be the most productive. Soil properties in 2014 were measured for things like acidity, phosphorus, potassium, nitrogen, sulphur, manganese, copper, iron, depth, temperature, precipitation, and humidity.
A prototype model for automatically regulating irrigation water and water navigation was presented in 2015 by Pratik A.Patil et al. [3]. Essentially, it's a prototype that consists of a mobile phone, a controller node, an actuator node, a sensor node, and a communication node.

A smart irrigation system that is affordable for a middle-class farmer is proposed in a research paper by Chandan Kumar Sahu and Pramitee Behera [4]. The primary goal of this study is to automatically regulate the water motor and choose the pipe's water-flow direction based on the soil moisture level detected by a sensor. In 2015, users will be able to receive updates on motor operation and water field direction via text message and email.
A paper on smart irrigation systems is presented in 2015 by S. Darshna et al. [5]. They're looking for ways to save time spent on tasks like monitoring the situation constantly. It also aids in water conservation by delivering water to plants and gardens automatically in response to their individual needs.
In 2016, K K Namala et al. [6] offered a study on an intelligent and smart Irrigation system that could be utilised to regulate the watering of greenhouse crops like tomatoes and peppers.
In 2017, C. Devika et al. [7] published a study describing an automatic plant irrigation system that can determine whether or not irrigation is necessary based on the soil's moisture content.
In 2017, Srishti Rawal [8] presented her research on how automating farm tasks can change agriculture from a manual, static industry to one that is intelligent, dynamic, and conducive to greater output with less human oversight. The author suggests an automatic irrigation system that can measure soil moisture levels and water accordingly to keep them at an optimal level. The brains of the operation are microcontrollers programmed with the ATMEGA328P running on the Arduino Uno platform. analysis.
Using state-of-the-art tools like Arduino, IoT, and Wireless Sensor Network, Sushanth G. and Sujatha S. [9] propose a Smart Agriculture System for 2018. The purpose of this study is to use new methods of automation and Internet of Things (IoT) to agriculture.

III. PROPOSED METHODOLOGY

Block Diagram and Circuit Diagram of System

Connecting the NODEMCU board to various sensors and actuators allows you to create a smart irrigation system. Soil moisture, temperature, and humidity are only some of the sensor data that may be received by the board and then used to operate the actuators like pumps and valves. The board can also be used to regulate the watering schedule for the plants at predetermined intervals. A pump motor is an integral component of any high-tech watering system. It is used to transport water from a well, lake, or reservoir to the irrigation system for use. Usually, the pump is driven by an electric motor that is connected to a control system. The latter can be set to turn the pump on and off at certain intervals. In this way, the user can control the amount of water being delivered to the plants via the irrigation system. The pump's motor also allows the operator to keep tabs on water pressure in the irrigation system and adjust it as needed. Infrared sensors are rapidly gaining popularity in the agricultural industry due to their ability to provide accurate and timely data on crop health and soil conditions. Soil temperature, moisture, and other environmental conditions can be measured using these sensors, giving farmers more information with which to make informed decisions about their crops.
Infrared sensors can pick up the heat given off by plants and soil. This radiation is then used to assess soil and plant conditions such as temperature and moisture. This information can be utilised for diagnostic purposes and to determine the health of the soil and crops. If the temperature is too hot or too low, or if the soil is too dry or too moist, for example, infrared sensors can detect these conditions. This data can be used to make adjustments to the timing of fertilisation and irrigation, as well as to detect problems at an early stage.



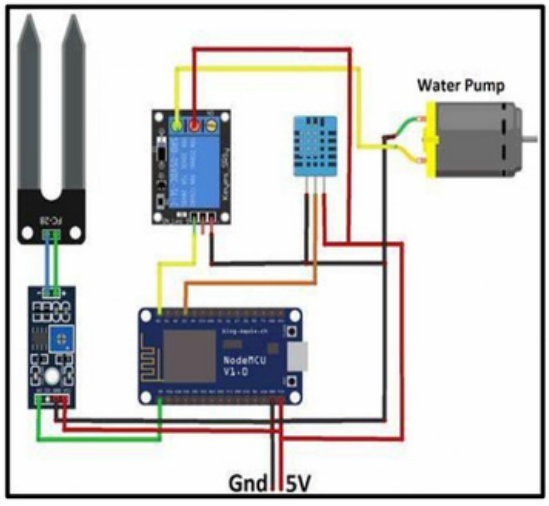


Fig. 3.1: Block diagram of smart irrigation system

Fig. 3.2: Circuit diagram of smart irrigation system

Sensors for temperature and humidity are essential components of any modern irrigation system. These sensors provide data to the system by taking readings of the ambient temperature and humidity. This information is used to determine the optimal watering schedule for the system's plants. The sensors allow for adjustments to be made to the irrigation system in reaction to changes in the environment, such as those in humidity or temperature. When the soil is too dry or too wet, the sensors can be utilised to adjust the watering schedule accordingly. This makes it simpler to provide plants with the correct amount of water. The sensors may also track ambient temperatures to adjust watering schedules accordingly. Because of this, the plants won't have to endure the extreme heat that could kill them. To keep an eye on and manage soil moisture levels, farmers and agriculturalists rely on soil moisture sensors. Soil moisture sensors can measure how much water is in the soil and how much water the soil can hold; with this information, farmers can optimize irrigation practices, boost crop yields, and cut down on water waste. Soil moisture sensors work by measuring the electrical resistance of the soil to determine how much water is in the soil. When the soil is wet, the electrical resistance is low, and when it is dry, the resistance is high.

The electrical resistance of the soil is measured by the sensor, and the resulting numerical value is utilised as a proxy for the soil's moisture content. The utilisation of ultraviolet (UV) light, a specific type of electromagnetic radiation, has a number of applications in farming. UV radiation has been used to increase crop yields, decrease pest infestations, and lengthen the shelf life of produce for quite some time. Recent advances in technology have allowed for more precise and efficient use of UV light in a variety of applications. This study will discuss the varied uses of ultraviolet (UV) radiation in agriculture, including its benefits and downsides.

IV. SOFTWARE USED

Software Design

Programming microcontrollers like the Arduino Uno requires the usage of a piece of open-source software known as the Arduino IDE. It is an outstanding instrument for the development of projects such as the college project on "smart irrigation system." Using the Arduino IDE, users are able to generate code in C/C++ and then upload it to the microcontroller. The code can be used to control a variety of components of the irrigation system, including the water pump, valves, and sensors, amongst others. Using the code, it is also possible to read data from the sensors, and the results may be seen displayed on an LCD panel. The code can also be used to govern the scheduling of the irrigation system, which enables it to be programmed to water the plants at specific times of the day or night. Users of the Arduino IDE have the ability to debug their own code, which makes it much easier to tackle any potential issues that may arise. The next step is to create a graphical user interface (GUI) for the irrigation system using the Arduino Integrated Development Environment (IDE). This will allow users to control the system using a computer or mobile device.

ThingSpeak

Gathering, visualizing, and analyzing real-time data streams in the cloud is made possible by a service offered by an Internet of Things analytics platform called ThingSpeak. The data that is transmitted from your devices to ThingSpeak is immediately visualized by the platform.

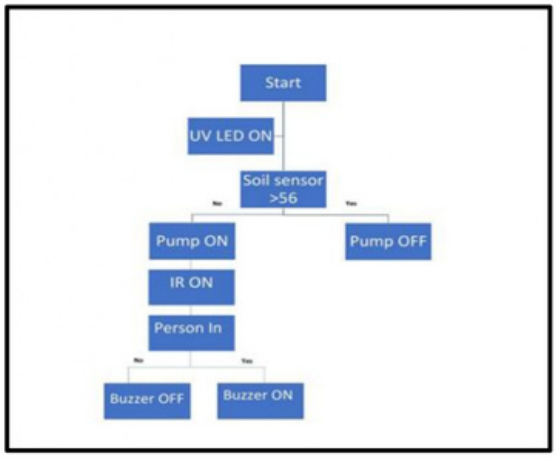


Fig. 3.3: Flowchart of smart irrigation system

Fig. 3.4: Prototype model of smart irrigation system

V. RESULTS

As we are aware, a soil moisture sensor can be used to estimate the amount of moisture that is currently present in a farm field, as is shown in figure 3.5. It has been determined that there is a moisture content of 94.94% in the soil, which places it in the range of 56% to 95%. It indicates that there is no requirement for us to start the motor. The temperature sensor that we have employed may be seen in Figure 3.6, which depicts the farm field chart 2 that monitors the temperature in the air. In the realm of agriculture, temperature is a significant aspect since it has an effect on the crops and can help determine the type of farming that should be done during a specific season or time period. Through the use of the Thingspeak application, it was discovered that the temperature in the atmosphere is 33%.

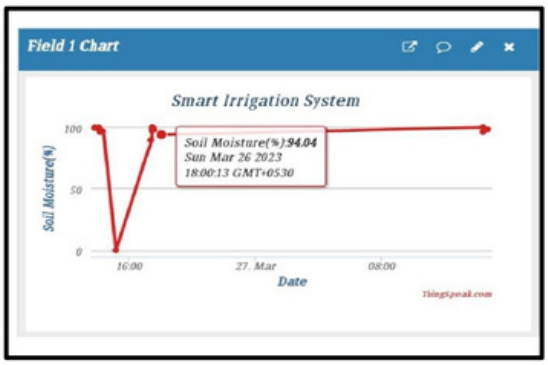


Fig. 3.5: Farm Field Chart 1

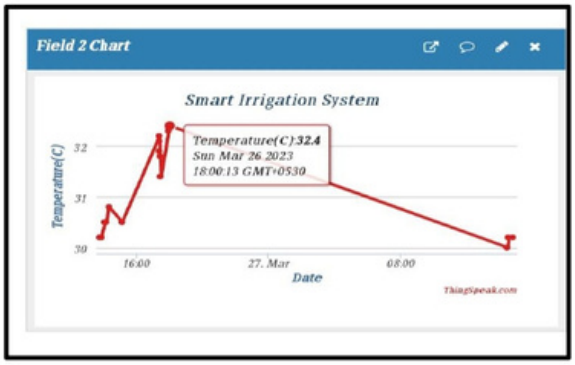


Fig. 3.6: Farm Field Chart 2

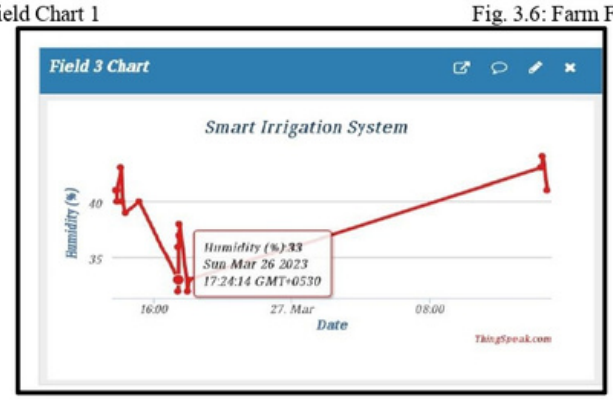


Fig. 3.7: Farm Field Chart 3

The farm field chart 3, which monitors the relative humidity in the air, is shown in Figure 3.7. To do this, we made use of a humidity sensor. In the realm of agriculture, humidity is a significant component since it has an effect on the crops and can help determine the type of farming that should be done during a specific season or time period. Using the application Thingspeak, it was discovered that the relative humidity of the atmosphere is 33%.

VI. CONCLUSION:

In comparison to other systems that are presently in use, the newly created system offers a number of benefits and is more cost-efficient. Because of its adaptability, this system can be beneficial in a diverse array of ecosystems, ranging from arid to humid environments. This solution is accessible and inexpensive to farmers that are interested in increasing their output via the use of automation technology. This project offered a good opportunity to learn more about existing systems, including their benefits and drawbacks, as well as the technique that will be used to track soil moisture. It is possible to turn on or turn off the sprinkler system by utilizing the way that has been suggested. In agriculture, irrigation is one of the most time-consuming processes, but it might be automated so that it occurs in reaction to changes in the moisture content of the soil.

One of the most significant users of water is the agricultural sector. The signals from the soil moisture sensors are used by the technology to calculate how much water should be applied to the crops. This prevents the crops from being over- or under-watered. The farmer may view step-by-step instructions for the process on the internet. According to the findings of this research, the incorporation of automation technology and the Internet of Things into agricultural production may offer significant advantages in the future. The fact that the technology makes better use of available water resources means that it has the potential to be an answer to the challenges presented by the traditional way of irrigation.

As a consequence of this, this effort has the potential to be of great assistance to all farmers who wish to make a contribution to the agriculture of the nation but are unable to do so owing to a lack of available labour or other commitments. Because this initiative has the capability of monitoring both the workers and the crops, it will be possible to prevent suffering losses as a result. After the

first installation, it does not need any maintenance and can be operated by anyone who has a smartphone because of how easy it is to use.

REFERENCES:

[1] Awasthi, A., & Reddy, S. R. N. (2013). Monitoring for Precision Agriculture using Wireless Sensor Network-A review. GJCST-E: Network, Web & Security, 13(7) (2013).
[2] Dahikar, M. S. S., Rode, S. V. (2014). "Agricultural crop yield prediction using artificial neural network approach". International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering,2, 683-686 (2014).
[3] Pratik A.Patil, Sangram V.Bhosale et al "Prototype for automatically navigated water irrigation system", The International Journal of Engineering and Science (IJES 2015).
[4] Chandan kumar sahu, Pramitee Behera, "A Low Cost Smart Irrigation Control System", IEEE Sponsored 2nd International Conference On Electronics And Communication System (ICECS 2015).
[5] S. Darshna, T.Sangavi, Sheena Mohan, A.Soundharya, Sukanya Desikan, "Smart Irrigation System", IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 10, Issue 3, Ver. II (May - Jun.2015), PP 32-36(2015).
[6] Namala, K K; Prabhu A V, Krishna Kanth; Math, Anushree; Kumari, Ashwini; Kulkarni, Supraja (2016). "Smart irrigation with embedded system", [IEEE 2016 IEEE Bombay Section Symposium (IBSS) - Baramati, India (2016.12.21-2016.12.22)] 2016 IEEE Bombay Section Symposium (IBSS), (), 1–5 (2016).
[7] C. M. Devika Karthika Bose, S. V., 2017. Automatic plant irrigation system using Arduino. Thiruvananthapuram, IEEE (2017).
[8] Srishti Rawal, "IOT based Smart Irrigation System", International Journal of Computer Applications (0975 – 8887), Volume 159 – No 8, February 2017.
[9] Sushanth, G., Sujatha, S., 2018, IoT Based Smart Agriculture System, International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), pp. 1-4 (2018).

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Drone (Quadcopter) for Transmission Line & Solar Panel Cleaning

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Abstract- **The Quadcopter for cleaning transmission lines is a collegiate project. The system's goal is to prevent defects in high-voltage transmission line parts including cracked insulators, broken wire ropes, and rusted power line couplings, which are highly prevalent since these parts are continuously exposed to harsh weather conditions. It keeps track of the soil moisture levels and adjusts irrigation as appropriate using a range of sensors, controllers, and actuators. Farmers may save time and money while still ensuring that their crops are efficiently watered because of the system's user-friendly and cost-effective design. The electrical affair of solar panels is reduced when dust covers the panels, but the air movement generated by flying drones can be used to remove this dust. This exploration design will study the effectiveness of quadcopter drones in contaminating solar panels. This exploration design will study the effectiveness of quadcopter drones in contaminating solar panels**

Keywords - **Component, formatting, style, styling, and insert are examples of (keywords.)**

I. INTRODUCTION -

For energy supply providers, inspecting and maintaining transmission lines represent a considerable financial expense. These duties must be carried out on a regular basis since failing to do so might result in material and financial damages. [1]. The electricity transmission system frequently travels over great distances, and some of its routes are inaccessible by land. The two results of typical irrigation systems are over- or under-irrigated land. The excess of water is comparable to how a scarcity of water limits plants' development and growth. Negatively affects plant growth. The typical irrigation system overwaters a few portions of the irrigated land. In addition, maintenance work is done at great heights and calls for the use of helicopters, ropes, and elevating platforms for jobs like installing bird flight diverters or maintaining power line equipment.[2].

Power line insulators are cleaned in particular while the line is powered on. Autonomous alternatives to conventional techniques are being developed through research in airborne robotics for industrial inspection. Aerial robotics' effectiveness has been demonstrated in a variety of industries, including civil engineering, agribusiness, the mining industry, and conveying systems. Furthermore, the use of Drones quadcopters for functions other than inspection has grown. In particular, drones quadcopters are already employed for crop spraying and agricultural surveillance. Clean energy generation is an important mitigation approach to address this problem of global warming. Sunbelt and Middle Eastern countries have greater possible Used for solar energy from anywhere on earth, but with significant land Defects that require washing renewal often and are expensive. Dust and ground on the board and retainers, each at a high temperature. In this concentration of heat, the installation of solar energy systems is a major challenge dry environment. The drone will draw power from the solar panel and it is programmed to flow in a predetermined path at a fixed location it uses solar energy to power and spin the orbiting plate drone base. Encoding is done automatically adjust the height as it should touch the target solar panel clean Using solar-powered drones like never before clean the panels It uses rotating panels supported by wooden rods surrounded by multi-layer fabric. [3] The solar panel is covered with earth silica (Oregon soil simulation) or wood dust and placed at an angle of 45 ° or 61 ° to the perpendicular, independently. Drones fly over solar panels or fly low (two to three bases) and high (five to six bases). The drone orbits the solar panel every ten seconds, the same affair can be attained in about four seconds through the solar panel. A trial rotor washer (low air drift) was the most effective in adding the affair of the solar panel still, the contrary is flying through the solar panel is that

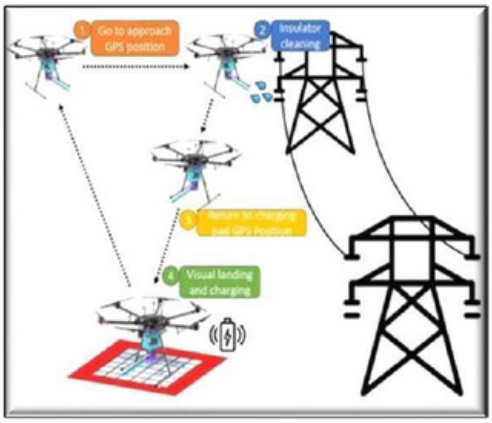
if the drone is designed to fly through the solar panel. Materials-wise, wood ash is easy to make from silica from solar panels. [5] So the Solar panel A pilotless rotor washer (low air drift) was the most effective in increasing the output of the solar panel if the drone is designed to fly through the solar panel, the opposite is flying through the solar panel. Materials-wise, wood ash is easy to make from silica from solar panels. If a 2% increase in voltage prevents loss of revenue, and the savings made by avoiding this loss can pay back the initial investment of drones, making the decision to invest in drones in solar panels worthwhile.

II. LITERATURE SURVEY

Association of unmanned aerial vehicles (UAV) in the past decade. Airmen found military transition programs in several areas Research.The main purpose of the literature review is to review a specific type of pilot Quadcopter or Quadcopter. Design/methodology/approach- the literature review includes a quadratic dynamic model found. [3][2] Today, the focus is on demonstrating autonomous quadcopters. Finally, the paper explores the possible applications of quadrotor analysis Overview of different quad networks, their operation, and traffic control strategies. [4][2]. Quad-copter is a popular drone mainly because of its unique features. The main advantage of a quad-copter is hovering or hovering and VTOL capabilities. This allows it to be used in almost any environment as a Quad-copter rigid surfaces and incomplete flight or limited mobility. A conventional helicopter with one main rotor and one tail rotor has the same characteristics as a quadcopter.

However, a quad-copter has no moving parts other than rotating motors and propellers, while conventional helicopters require a complex hub to activate the rotating motor shaft to initiate translational motion. Four models are less prone to vibration and more flexible when it comes to positioning the center of gravity. Due to the small size of the rotors, they can be covered more easily, making it safer to fly indoors. A typical quadcopter design, as mentioned earlier, has no moving parts other than the propellers. Motors and actuators are mounted on the frame, and the only way to create lateral movement is to tilt the entire frame. [4][3]Unlike conventional helicopters, quadcopters do not have a tail rotor to control; rotation a quadcopter has four rotors, where two rotate clockwise and two rotate counterclockwise. If the pair of clockwise motors rotate at a different speed than the counterclockwise motor, they will make a stance about the side axis. Our project can be seen as a small step towards a drone-free air for the Saudi Arabian military or security, UAV groups have been around for the past ten years. UAVs are finding uses in a variety of contexts, from military use to activity reconnaissance. The primary goal of the literature review is to provide an overview of a specific type of UAV known as a quadrotor or quadcopter. The Dynamics Models of a Quadrotor and the unique model-reliant and model-autonomous control mechanisms and their Correlations are included in the Design/Methodology/Approach - Literature Survey. Findings Presently, autonomous quadrotors are the main topic of research. In the end, the article looks at the prospective uses of quadrotor technology. It reviews several quadrotor types, their uses, and motion control strategies.

III. BLOCK DIAGRAM



Using drones requires a license and many safety precautions at best. Trained professionals should keep them away from property and people to prevent damage or injury. The operator must remain in sight at all times. These high-tech devices are essential to the safety of all involved with drone protection. This problem is only exacerbated when you put the flamethrower forward. Drones are deadly weapons that require strict control. He cannot approach people or property for fear of fire. There is also the problem of flying in windy conditions when the wind catches the drone or causes it to fly erratically. Another audience is concerned about operator protection other than hard hats and basic clothing. If this technology comes to America, we must assume that there will be stricter guidelines regarding handling, safety clothing, and other factors. These regulations may limit the ability to use unmanned aerial vehicles in certain situations and areas. As a result, the company cannot be implemented. This raises some serious questions about the potential of firefighting drones in the United States. By default, this is more consistent than what is spread across the country. Recently shared photos are up to Glowing. However, one must question the feasibility of this option for wide distribution.

IV. COMPONENTS

1. NodeMCU

The "Smart Irrigation Systems" electrical college project uses a NODEMCU board to improve the project's efficacy and efficiency. The ESP8266 Wi-Fi module serves as the foundation for the open-source NODEMCU Internet of Things platform. This low-cost, low-power, and fully integrated microcontroller board may be used to create a variety of applications. It is an excellent choice for activities needing wireless communication, such as a smart irrigation system.

The NODEMCU board can help the smart irrigation project in a variety of ways. It is first and foremost an easy and cheap alternative. Additionally, it is extremely integrated, making it possible to utilize it to control a number of system components, such

as actuators, sensors, and other devices. It also has a low power setting, enabling prolonged usage without the demand for battery replacement or recharging. Because the platform is open-source, simple customization and modification to meet the needs of the project are achievable.

2. Motor for a pump

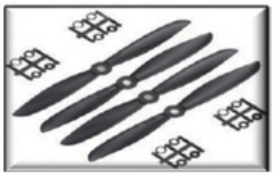

A complex irrigation system must have a pump motor. It is used to pump water from a source of water, such as a well, lake, or reservoir, to the irrigation system. The motor that drives the pump is often powered by an electric motor, which is connected to a controller that may be designed to turn the pump on and off at set intervals. This allows the user to control the water flow to the irrigation system, thus guaranteeing plants receive the appropriate quantity of moisture. The pump motor could also be used to monitor the water pressure in the irrigation system, allowing the operator to adjust it as necessary.

3. **IR detector**

Infrared sensors are used increasingly often in agriculture due to their capacity to offer accurate and fast information about crop wellness and soil conditions. In order to help farmers make informed decisions about their crops, these sensors measure temperatures, moisture levels, and other environmental parameters of the soil.

Infrared sensors can pick up the infrared radiation that plants and soil release. Then, this radiation is used to monitor the temperature, moisture, as well as other environmental factors impacting the soil and plants. The data may be used to evaluate the state of the soil and crops as well as identify any potential problems. For instance, infrared sensors can assess if the soil is too dry or too damp and whether the temperature is too high or too low. This information may then be used to modify the timing of watering and fertilization, as well as to identify any problems early on.

4. **Propellers**

a. 6 inches in length.
b. Pitch: 4.5″.
c. 28 g in weight
d. The shaft's diameter is 7.8mm.
e. 7 Inches/150 mm is the total length.
f. Comes with a set of reducers measuring 3, 4, 5, and 6 mm

5. Batteries.

ORANGE 4200/3S-35C, model number. Power: 11.1 volts 35C for Continuous Discharge 50 C maximum discharge (10 sec) The resistance of the Orange LiPo battery matches. Good control over temperature. Minimum class weights.

V. RADIO CONTROLLER

The radio control system consists of two corridor, a handheld transmitter and a receiver that attaches to your drone. Keeping effects simple then, your drone will read your stick input and shoot it through the air to a near receiver. Once the receiver has this information, a drone regulator is transferred, which in turn operates the drone.

VI. SPECIFICATION

In each of the methods mentioned above, the data from sensors is communicated and received using an alternate communication module or a complicated communication protocol. The NodeMCU (ESP8266) can be used in place of the standalone communication module. There's no longer a need for extra transmission channels from the sensors to the microcontroller because this NodeMCU includes an inbuilt Wi-Fi connection module. By using the NodeMCU (ESP8266) as the microcontroller rather than an Arduino board, we are able to save money.

The FS-I6X RC Transmitter's features and specifications are as follows:

TX Channel 6

Fixed wind, glider, or helicopter mode

VII. DESCRIPTION OF THE SYSTEM

1. DESIGN

Microcontrollers like the Arduino Uno are programmed using free software called the Arduino IDE. It is a fantastic tool for creating projects, such as the college research on a "smart irrigation system." The development environment for the Arduino allows users to write C/C++ code and upload it to the microcontroller. The code can operate the water pump, valves, sensors, and other elements of the irrigation system. The code may also be used to read data from the sensors, and the outcomes are shown on an LCD panel. The code may also be used to control the timing of the irrigation system, allowing it to be set up to water the plants at predetermined times. The Arduino IDE allows users to debug their code, making it easier to fix any possible issues. The irrigation system might also have a GUI, or graphical user interface, built using the Arduino IDE, which allows users to operate it from a computer or mobile device.

2. SATCOM

Satellite communications are referred to as SATCOM. Additionally, the lightest and most portable SATCOM equipment on the market is what you need for a drone. Users may download any additional data gathered by the drone and watch streamed footage from its cameras

VIII. WATER PRESSURE PUMP

The water head of the pump should be about1.15 to1.20 times the lift height. For illustration, if the water source is 20 bases above the ground, the lift needed is 23 to 24 bases. It's recommended that you elect a pump with a water head near to the required water head above the pump name. In this case, the pump will have maximum effectiveness and will be more provident. Still, it doesn't have to be the same, because a brushless pump can also be an energy- saving operation if the overall effectiveness doesn't exceed 20.

IX. BENEFITS AND BADNESSES

❖ *BENEFITS*

- Inspections of power lines using drones reduce safety worries
- Power line inspection using drone technology yields effective results
- Make the most of limited human resources by integrating drones
- Modernized power line inspection methods are available in several industries thanks to drone Technology
- Power line inspection frequency is increased via quadcopter integration.

❖ ***BADNESSES***

- High upfront price: Laying out the fields for irrigation is an expensive and labor-intensive procedure.
- If overflowing water gets stagnant, it may encourage the establishment of pathogens like mosquito breeding grounds and other species.
- Because they don't need a continual supply of water, certain crops can't be cultivated and are therefore inappropriate for summer crops.

X. CONCLUSION

The main goal of our project is to design four copters that can be used commercially in the market to learn about the complete design process from engineering requirements to the finished product. With the support of our consultants, we have the resources and technical expertise to successfully complete this project. We chose a quadcopter for our flight design because of its a interesting design elements and potential for market revenue. As the platform seems flexible at this point, the project can go in different directions. This flexibility allows them to change the functions they perform and integrate any technology that may be useful. This project will clearly demonstrate the goal of proving the usefulness of small unmanned aerial vehicles in a variety of applications.

REFERENCES:

1. An annular-ducted fan lift system for VTOL aircraft was studied using CFD in 2015 by Yun Jiang, Bo Zhang, and Tao Huang. ***https://www.researchgate.net/publication/282350303_CFD_study_of_an_aannul arducted_fan_lift_system_for_VTOL_aircraft***
2. Ducted-propeller quadcopter thrust optimizing 2017by Radu Catali Tarca & Endrowednes Kuantama *https://www.researchgate.net/publication/320285199_Quadclr*
3. How ducting for propellers boosts performance trust *https://www.youtube.com/watch?v=Cew5JF8q6eYStandardization*
4. Roadmap for December 2018Published by the ANSI Unmanned Aircraft System Standardisation Collaborative (UASSC), Version 1.0 for Unmanned Aircraft Systems What's the difference between brushless motors and brushed motors? *https://www.thomasnet.com/articles /machinerymotors-vs-brushed motors/*
5. https://www.amazon.com/RSII2206BrushlessSupportCompatibleQuadcopter/product reviews/B07HJ3C 5TR?re

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Advance Manless E-Vehicle Charging Station

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Abstract— Environmental Friendly Automotive technology, such as electric vehicles, have become more accessible and affordable because to public demand for cleaner air. As the number of plug-in hybrids and fully electric vehicles (EVs) on the road grows, so does the need for charging stations [1]. A better understanding of existing EV charging habits is necessary for optimizing the performance and efficiency of the EV charging infrastructure. In order to facilitate real-time authentication of users, this research makes use of RFID (radio frequency identification) technology. In this system, electromagnetic waves are used for both the transmission and reception of data. Radio frequency identification is a feature of modern credit cards that employ RFID technology. By tapping or scanning the card you're using in front of an ATM or card reader, you may quickly and simply access your funds. Tags and readers make up Radio Frequency Identification (RFID), a wireless technology [3]. The reader is a piece of electrical hardware that can receive signals from RFID tags through radio waves, thanks to its one or more transmitting antennas. To adjacent to passive readers, active tags broadcast their identity and other data through radio waves. Batteries are unnecessary for passive RFID tags since they acquire their power from the reader. Batteries are essential to the operation of active RFID tags. In addition to a serial number, RFID tags may also hold a large quantity of text.

Keywords— Electric vehicle, Motor Circuit, Controller Subsystem, Radio Frequency Identification (RFID).

I. INTRODUCTION

A. Objectives

Featuring an Audrino, relays, and an RFID, we built a simple charging station for EVs that can power the user's vehicle. The process of charging at a charging station is simplified and streamlined with the help of this RFID charging station authorization system. The advantages of radio frequency identification (RFID) technology in battery charging stations, include their use in the management of the charging area and the identification of electric vehicles. These advantages make RFID technology a better tool for managing electric car battery charging stations [1]. The installation of charging stations for electric vehicles has begun in several areas, although this process is far from complete. In this method, an RFID system installed at the charging station enables automatic user authorization, drastically cutting down on operational time. Cabinets, rooms, and buildings can be outfitted with reader systems. As the number of EVs on the road grows, charging infrastructure plays an increasingly important role in balancing the demands of EV drivers and the local distribution grid. This article developed an RFID system for user identification and charging authorization as part of a smart charging infrastructure with charge monitoring and management. For efficient EV charging that takes into account grid restrictions and the demands of EV users, the RFID offers a low-cost technique of identifying and permitting cars for charging. The manner in which a vehicle charges is dependent on the voltage. Using IOT, we can check our charging status in this system from anywhere at any time by connecting to the server [2].

B. Necessity

As Charging amenities in public parking lots and private garages are becoming more common as the number of electric vehicles on the road rises. The needs of the distribution grid, EV owners, and parking garage managers will be the responsibility of these stations. These charging stations will perform a wide variety of functions, including authorization from users, verification, and invoicing. A short-range RFID card serves the same purpose at other commercial charging stations, such as Coulomb and Blink. In both cases, the customer must take more active actions to give their consent to be charged. The authors of propose using middleware and a unified charging controller in conjunction with standard RFID tags installed inside EVs and RFID readers installed on parking garage entry gates to authorize, allocate, and allow charging. However, this tool still requires user input and isn't as adaptable as some might hope [4].The suggested enhancements make it possible for simultaneous charging authorization at many charging stations within a single geographical region. VMMs are installed in EVs and serve as RFID tags for tracking and identifying purposes. Useful both for identifying vehicles and authorizing charges. The "internet of things," also known as the "matters related net," is a network that uses radio-frequency identification tags to establish connections between everyday objects and the internet for the purpose of sharing and transferring data. This study aims to discuss the implementation of radio frequency identification (RFID) technology inside battery charging stations, and to assess the technological benefits of RFID technology within the identification of electric vehicles and their charging compartments. The output power supply in this case is a switching mode power supply (SMPS) [1]

II. LITERATURE SURVEY

A. History of EV Charging Technology

The biggest issue was many households didn't have electricity until the early 20th century, making it impossible to charge a car inside. Home electrification made EVs more widely

available to the general public. As a result, an increasing number of people would purchase and use EVs. 38% of American cars at the turn of the 20th century were electrically propelled. These cars either had batteries within the car to charge or the battery was taken out, charged elsewhere, and then put back on the car [3]. General Electric introduced the first Electrify charging stations in the early days of electric vehicles. Around the major US cities, similar to phone boxes, these were placed so that EV owners could use them to recharge their vehicles. Due to the automobile industry's development in the 1920s and increased road quantity and quality, EVs with their restricted range were not more prevalent suitable for journeys, and this meant that their purpose was limited. Cheaper gasoline price during this period surely had even more influence on usage of internal combustion engine vehicles. This meant that EVs were only a novelty in the automotive business up until the late 20th century. As the public's awareness of airpollution grew in the latter half of the 20th century, the idea of manufacturing EVs once more began to gain traction. After automakers began producing EV cars, the issue of charging infrastructure arose. The first versions of these EVs could be charged at home using a standard outlet. Hybrid automobiles were once thought of as a compromise between ICE and EVs, and home charging was sufficient to refuel them. A suitable public charging infrastructure was urgently needed as soon as manufacturers began producing plug-in electric vehicles [4]. Now we are in the twenty-first century, the era of electric vehicles and charging technology. In a parking lot next to Los Angeles International Airport, there are public charging outlets. Two outdated 6 kW AC chargers are displayed. The usage of Level 2 (single-phase AC) EVSE, as defined by NEC-1999, was favored by many of the EVs that were originally introduced in the United States in the late 1990s and early 2000s, including the GM EV1 and Ford Ranger EV. These EVSEs were equipped with conductive connectors (often AVCON) or inductive connectors (Magnet Charge). GM, Nissan, and Toyota supported the inductive system whereas DaimlerChrysler, Ford, and Honda supported the conductive system. There were two sizes of magnet charge paddles: an older, bigger paddle (used for the EV1 and S-10 EV) and a smaller, more modern paddle [1]. The more compact paddle (first in 2000) interfaced with an air-cooled intake while the larger paddle (first produced in 1994) was necessary for accommodating a liquid-cooled vehicle inlet charge port. The initial version of SAE J1773, which outlined the technical specifications for inductive paddle coupling, was published in January 1995 [5]. A subsequent revision was published in November 1999.The Magnet Charge paddle wasphased out by the following March when the important California Air Resources Board embraced the conductive connector as its standard on June 28, 2001, citing cheaper costs and durability. Avcon (also known as butt-and-pin, employed by Ford, Solectron, and Honda), Yazaki (also known as pin-and-sleeve, on the RAV4 EV), and ODU (which is utilized by DaimlerChrysler) were the three conductive connectors in use at the time [6].

Avcon butt and pin connectors support both Class 2 and Level 3 (DC) charging and are defined in the appendix of SAE J1772 Recommended Practice Primary Model (1996). In the 2001 model, the connector notation was transferred to the substance, and it became a de facto trend in the United States. IWC approves Avcon butt connectors for North America based on environmental and durability testing. As mentioned earlier, Avcon connectors have four contacts on Level 2 (L1, L2, Pilot, Ground) and Level 3 (L1, L2, Pilot, Com1, Com2, Ground, Clean Information Plane, DC+, DC-) use By 2009, J1772 had replaced the spherical pin and sleeve connector (Yazaki) as a common implementation, replacing his square Avcon butt connector. The idea of a removable battery service was proposed in 1896 [7]. It was first introduced from 1910 to 1924 by the Hartford Electric Light Company through the Electric Vehicle Battery Service (GeVeCo). The car owner purchased the car without a battery from Standard Vehicle Organization (GeVeCo), which owns electric vehicles. Power was supplied by Hartford Electric in the form of removable batteries. All motors and batteries are designed for quick replacement. The owner paid a variable mileage fee and a monthly provider fee to cover truck maintenance and storage. He has driven these vehicles over his 6 million miles. At a higher level, Tesla and Mitsubishi Heavy Industries were considering battery relocation approaches. A complicating factor was that this approach required changes to the car's design. In 2012, Tesla began building its own Tesla Supercharger fast charging network. In 2013, Tesla announced it would also support battery pack replacement, but that program was discontinued. With the development of electric vehicles, a lot of research has started on the layout and technology of public charging stations [1]. C. Panatalaniye et al. (2016) developed a charging station with microcontroller ATMEGA8535 and RFID as controller or identifier for EV users. It has desirable properties for electric vehicles from a network of renewable energy sources connected to solar panels. Harilet at (2018) developed a wireless charging station for electric vehicles controlled by RFID tags. Charging was very easy because the power supply method is wireless. N.KALYANI et al. (2014) used 8051 microcontroller to develop his RFID-based secure access system, which is very widely used in offices, laboratories, homes, etc. By referring to this paper, I understood the interface between RFID and 8051. (2013) proposed a mesh network RFID system for user identification and charging authorization for intelligent charging network connectivity. Provides a cost-effective solution for vehicle identification and authentication. Jin Wentao and others (2017) investigated the impact of location of BEV public charging facilities on mixed conventional gasoline vehicle (GV) and BEV networks [3].

B. Existing System

In this work, the solar panel controller and power optimization are done to solve this shortcoming. Here the panel rotates according to the readings read from the LDR. Therefore, working in full sunlight and using LDR also optimizes performance. This work is mainly designed to automatically control the solar panel, keep it facing the sun. This is done by controlling the mechanical movement of the solar panel. The sun rises in the east and sets in the west. If you're facing east in a normal star system, you can't turn toward the sun at sunset [3]. Because of this, solar panels may not receive enough sunlight to function. These problems are overcome by using this work. In this work, we also build a very nice microcontroller-based solar charger. The coin-based mobile battery charger developed in this work will provide a unique service to people in rural areas where commercial power is partially or full-time unavailable and will be a

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revenue generator for location he providers. Install outside the office. The mobile phone market is a major industry, and it is spreading as an indispensable means of communication in rural areas. Urban people use more sophisticated mobile phones with powerful batteries for several days, while rural people buy second-hand mobile phones that need to be charged frequently. Battery often runs out during calls, especially at inconvenient times when standard chargers are not accessible. Coin base mobile battery charger aims to solve this problem. The user has to insert the mobile phone into her one of the adapters and insert a coin. The phone will then receive micro pulses to charge. You can't bring your phone from 'dead' to fully charged Mobile phone charging power is designed using predefined values [3]. The system provide three levels of output. While normal EV charging stations only have one output port available, this system provides up to three output ports, including 60V, 48V and 12V output ports. When you input the RFID tag into the RFID reader, the reader will read the specific value of the tag, and after the signal has passed through the Arduino controller, the controller will switch the respective relay coil. Finally, the EV system is charged for a given period of time. Connect the Wi-Fi module to the Arduino controller while tapping the RFID tag that sent the information to the owner and save the total charging time in cloud storage [4].

III. PROPOSED METHODOLOGY

The illustration 3.1 depicts the components of an, which include a microprocessor, RFID, power supply circuit, and relays. The 328 microcontroller manages the relay switching. The microcontroller is programmed to charge the electric vehicle for a set length of time when the user presses a button, then to cut off the power and deduct that amount from the user's account. When a user clicks a button, Rs 10–20, etc., are deducted from their balance. The starting balance on the user's card is $100.Technologies Central to RFID "RFID" is shorthand for "radio frequency identification," which is what "electronic tags" mean. RFID requires only two simple elements to function as a wireless technology [6]. Several tags with transponders. Mostly made up of chips and joint pieces. Every label has a specific electronic code connected to it for the purpose of identification. Tag reader/writer: Read/write to the device's tag. Portable and fixed readers are both available.

The antenna is responsible for relaying a high-frequency signal from the tag to the reader. RFID kinds and categorizations for choosing. An RFID system's reader may read and write information from an electronic tag or tags. Electrical tags provide a framework for categorizing RFID technology. According to their charging mechanism, electric tags may be broken down into three categories: passive, semi-passive, and active. Low-band high-frequency tags, medium- and high-frequency high-frequency tags, ultra-high-frequency (UHF), and microwave tags are the several types of electric tags that may be classified by their working frequency. UHF and microwave passive electronic tags are used in this paper [5].

Powered by their own operations, passive electronic tags use the radio frequency energy sent by the reader to generate a small amount of direct current. The tags require little upkeep, are cheap, and last a long time. Also, the reader feels more involved. This label is commonly used in systems that keep track of battery packs RF and microwave identification: Frequencies of 433.92MHz, 862-928MHz, 2.45GHz, and 5.8GHz are often used. Tags and readers communicate with one another through electromagnetic coupling. Both active and passive tags can receive radio frequency energy from the reader's emitted radiation. Typically, the read range of an RFID system is between 4 and 6 meters, with a maximum of 10 meters. This tag is used for tracking and identifying vehicles. The concept of RFID. Fundamentals of Operation [1].

A. Control Circuit

1) Relay

- *Normally Operates at 5V DC*
- *Current at rest is 70mA;*
- *Maximum AC load current is 10A at 250VAC or 125V AC.*
- *Operating time is 10msec,*
- *Release time is 5msec, maximum switching is 300 operations per minute,*
- *DC load current Max is 10A at 30V DC or 28V DC,*
- *5-pins included, resilient design.*

2) Microcontroller ATmega328P:

The Atmel's AVR® upgraded RISC technology is showcased in the ATmega328/P, an 8-cycle CMOS microcontroller. By executing highly efficient instructions in a single clock cycle, the ATmega328/P reaches performance near 1 MIPS per MHz This paves the way for infrastructures that value efficiency over raw processing power. The UNO Microcontroller from Arduino. Keep in mind that the Arduino board's microcontroller actually executes the software. This realisation means we can finally retire the absurd "Arduino is a microcontroller" benchmark. The Arduino UNO R3 relies on the ATmega328 microprocessor for its primary control. The AVR 8-bit MCU is known as ATmega328. It can transport data and has eight internal registers to store data simultaneously [4]. The ATmega328 can access three distinct memories. The programme can be saved in the 32 KB of non-volatile memory (streak memory), saving you time and effort. Unsecure random access memory (SRAM) amounts to 2 KB. During runtime, the application stores its variables here. EEPROM Memory: 1 KB of non-volatile memory can be used to store information that must be accessible regardless of whether or not power is being supplied to the card. Atmel's AVR® upgraded RISC technology is showcased in the ATmega328/P, an 8-cycle CMOS microcontroller. By executing highly efficient instructions in a single clock cycle, the ATmega328/P reaches performance near 1 MIPS per MHz this paves the way for infrastructures that value efficiency over raw processing power [2]. The UNO Microcontroller from Arduino. Keep in mind that the Arduino board's microcontroller actually executes the software. This realisation means we can finally retire the absurd "Arduino is a microcontroller" benchmark. The Arduino UNO R3 relies on the ATmega328 microprocessor for its primary control. The AVR 8-bit MCU is known as ATmega328. It can transport data and has eight internal registers to store data simultaneously. The ATmega328 can access three distinct memories. The programme can be saved in the 32 KB of non-volatile memory (streak memory), saving you time and effort. Unsecure random access memory (SRAM) amounts to 2 KB. During runtime, the application stores its variables here. EEPROM Memory: 1 KB of non-volatile memory can be used to store information that must be accessible regardless of whether or not power is being supplied to the card [3].

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3) LCD

LCD screen, short for liquid crystal display, is a versatile electronic display module used for a variety of purposes. A 16x2 LCD display is a common component because of its low cost and ease of integration. There are two lines in a 16x2 LCD, each of which can display 16 characters. Each character on this LCD is shown in his own individual 5x7 pixel matrix. The 224 distinct letters and symbols are all supported by the 16x2 intelligent alphanumeric dot-matrix display. This LCD features separate command and data registers [1]. The display's command register keeps track of the user's input for the screen. The display data is saved in the data register. The data that makes up the picture to be shown should be placed in the data register, while the instructions should be placed in the instruction register. The LCD library streamlines this process so that you may focus on your Arduino project without worrying about the nitty-gritty details. A potentiometer hooked up to the VEE pin may be used to modify the display's contrast.

• Power used when powered down: 10uA (minimum)

B. POWER TRANSMISSION KIT

1. *MFRC522 RFID Module*

Fig. 3.3: RFID Transceiver Module

The RC522 is an NXP semiconductors-based 13.56MHz RFID module that uses the MFRC522 controller. The module is often an I2C-, SPI-, or UART-compatible packaged with a keychain RFID reader and card. It finds widespread usage in attendance tracking and other forms of biometric identification.

- Range of usable power supplies: 2.5V to 3.3V
- Top Data Transfer Rate: 10 Mbps
- Range of Reading: 5cm Power Required: 13-26ma

2. *Wireless Power Transfer*

Fig. 3.4: Wireless power Transmission Kit

The primary main components of WPT, or wireless are the transmitter and the receiver. A coil in each half serves as an antenna for sending and receiving signals. If you adjust the distance between the transmitter and reception coils, you'll see a corresponding change in the amount of current flowing out of the transmitter.

Input voltage: 9-12 Volts, Transmitter Module Features of Wireless Power Transfer Module. The following are the prerequisites for a norm transmitter and receiver:

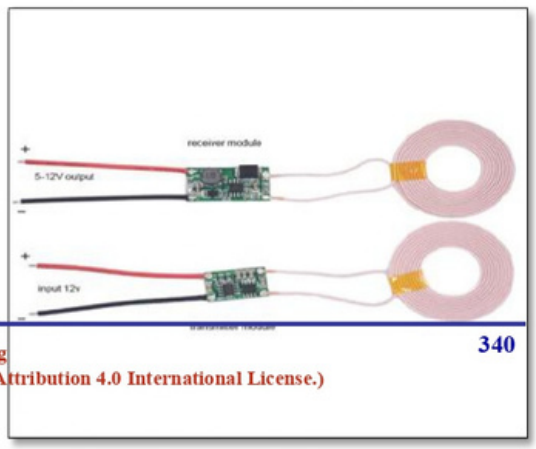
- Transmitter module dimensions: 22 mm x 12 mm x 2 mm
- No-load current: 40 mA or so
- Transmitting coil size: 30 mm x 1 mm
- Receiving coil size: 30 mm x 1 mm
- Receive regulator board dimensions: 27 mm x 5 mm x 2.5 mm • Receives the output voltage: 5 V
- Receives the output current: 350 mA

IV. SYSTEM RESULTS

Fig. 4.1: Results for Different Inputs

CONCLUSION

A stable communication field from the RFID reader and transponder works best when the license plate is 60 cm above the ground and the angle between the plane of the license plate and the plane of the RFID reader is 0°. As the transponder position (height, angle) changes, the size of the stable communication field decreases. Communication will be unstable if the RFID antenna plane is perpendicular to the transducer plane. For industrial installations, the optimal angle for the RFID reader is 30° to the plane of the charging



station. This allows better communication between RFID readers and transponders at different electric vehicle license positions, alleviating the need for high precision when parking.[8] Designers of RFID systems for EV services must consider the potential impact of other RFID devices already deployed in modern vehicle systems, as well as RFID devices that may be nearby. Reducing interference between different RFID transponders could become a very important issue in the future [5].

Electric vehicles (EVs) are growing in popularity. Thanks to constantly modernized technology, they are becoming more efficient and expanding their operational range. However, like all vehicles (scooters, cars), they need charging stations and there is growing interest in user-friendly locations such as shopping malls, parking lots, or specially prepared "e-Charge" charging networks Increase As well as the availability of a charging station, the speed of charging and the convenience of settling payments for each kWh unit charged are also important. This is where RFID comes up to the challenge again, enabling the "e-Charge" network of chargers to build their own customer management system and payment settlement, including subscription payments, fleet payments, etc. Each customer of the "e-Charge" service provider receives its own card, on the basis of which the system, thanks to an RFID reader installed in the application, uniquely identifies the user and grants (or denies) access to the charger, counting the downloaded kWh units on his customer account[6]. As examples from real life show, vehicle charging systems are used not only by individual customers, but more and more often entire fleets, including public / public transport vehicles, fleets of small and medium-range delivery vehicles (courier companies decide to use electric vehicles in large agglomerations), use their own charging stations. In conjunction with extensive GPS-based fleet applications, it is possible to significantly optimize the available resources by mapping the optimal routes for electric fleet vehicles, locating the vehicle and its safety (by switching off the ignition without having the appropriate card). Here you can use a turbocharger or fast charger for efficient and fast operation. This saves time on charging. By connecting this charging station system to a computer network, it can provide electronic billing instead of manual billing and store data on how long users have used this charging service [4].

REFERENCES

[1] "Development of a Wireless Power Transfer Circuit Based on Inductive Coupling," by Edi Rakhman Supriyadi, Suyanto, Arif Rahman, and Noor Cholis Basjaruddin, published in TELKOMNIKA, Vol.16, No.3, June 2018, pp.1013–1018.

[2] "Wireless Power Transfer in Electric Vehicle by Using Solar Energy," by N. uthaya Banu, U. Arun Kumar, A. Gokula Kannan, M.K. Hari Prasad, and A.B. Shathish Sharma, published in the January-June 2018 issue of the Asian Journal of Electrical Sciences.

[3] "Survey on Wireless Charging and Placement of Stations for Electric Vehicles," by Govind Yatnalkar and Husnu Narman, presented at the 2018 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT) in December 2018.

[4] "RFID BASED SMALL TRANSACTION SYSTEM," Balamurugan S, Aman Bhattad, Vishnu R, and Marimuthu R.Vol. 14, No. 4 (February 2019) ARPN Journal of Engineering and Applied Sciences ISSN: 1819-6608

[5] Norsuzila Ya'acob, AzitaLaily Yusoff, Suzi Seroja Sarnin, Darmawaty Mohd Ali, Nani Fadzlina Naim, Murizah Kassim, and Nur Amirah Binti Mohd Azni, " A cashless payment transaction (CPaT) using RFID technology," Indonesian Journal of Electrical Engineering and Computer Science, Vol. 16, No. 1, October 2019, pp. 191199.

[6] "Electronic Toll Collection (ETC) of Transportations System with active RFID," by Vaishali Pande1, Nivedita Hasti2, Anjali Rahate2, Kunal Tagade2, and Anup Telrandhe2, was published in the International Journal of Scientific Research in Science, Engineering, and Technology (Volume 4, Issue 4, 2018).

[7] "DYNAMIC WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM," by P. Magudeswaran, G. Pradeeba, S. Priyadarshini, and M. Sherline Flora, appears in the March 2019 issue of the International Research Journal of Engineering and Technology.

[8] An Overview of Matlab/Simulink Dynamic Model of an Electric Vehicle's Performance, Yogesh K Kirange, International Journal of Engineering Research & Technology, Vol.12 issue no 04, April 2023, pp. 177-183

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ARDUINO BASED SMART DUSTBIN

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***Abstract*- Overflowing waste dumps and the resulting unhygienic conditions and offensive odours lead to the development of potentially fatal illnesses in today's society. The primary aim is to generate a clever garbage tin that will help in upholding a hygienic and sustainable environment. The Swaach Bharat Mission serves as a motivating factor. By adding a sensor and a GSM module, the conventional trash can is transformed into a "smart dustbin". Ultrasonic sensors are used to measure distance for intelligent garbage cans. The waste level may be monitored with a GSM module in a smart trash can, which then notifies the user via text message. Because of the waste that gets dumped into the smart trash can and the antibacterial spray used to try to keep germs at bay, the environment around the trash can is unsanitary. Unkempt garbage cans contribute to air pollution, which has negative effects on human health. Using an Arduino UNO, an ultrasonic sensor, a servo motor, and a battery jumper wire, we built a smart garbage can. Instead of waiting for the user to place trash in the can and close the lid, the dustbin will open as soon as they get within range. Business-wise, we aim to make it accessible to as many people as possible by keeping prices low. So, that everyone, from the poor to the wealthy, can profit.**

***Index Terms*- Arduino, microcontroller, garbage disposal, ultrasonic sensor, smart dustbin, waste management.**

I. INTRODUCTION

According to a Worldometer study of the most recent United Nations data, there are 1,418,237,140 people living in India as of 2023. In addition, if everyone did their part and cleaned up their area, we'd have a cleaner and healthier nation in less than two minutes. The issue of waste management affects people emotionally as well as ecologically. As a consequence of this study, a new benchmark has been set in this area. The Swachh Bharat Unnat Bharat Abhiyan was supported by the introduction of waste materials control, plastic rubbish control, and electronic waste management rules in 2016. In addition to fostering honesty and helpful regulatory frameworks with cutting-edge gear like a robotic waste sorting system, technological innovation is a factor that might assist the nation's ideal trash control. The primary objective is to promote the concept of a smart city while making smaller demands on human resources and labour. The persistent issue of trash cans spilling onto the roadway needs quick attention. Based on the proverb, "A clean city is like a temple dedicated to the Almighty," our paper's focus is on the need to keep urban spaces clean.A garbage can, or dustbin, is a container for trash that can't be recycled or composted. People are always close by to pick them up if there happens to be an overabundance, despite their pervasiveness in homes, workplaces, and communities. Trash cans frequently overflow, attracting a wide variety of unwanted visitors, such as dogs, rats, and cats. In addition, certain animals are known to rummage into garbage cans, but this innovative bin will put an end to that practise. The municipal administration can deliver the notification directly to the cleaning van.Being close to a garbage can also causes increased pollution. Air pollution from a garbage can may be conducive to the growth of germs and viruses, which might be fatal to humans. As a result, we designed a can with an Arduino UNO ultrasonic sensor that detects the can's latch and automatically deposits trash inside. The general public is more likely to adopt technologies that help consumers save time and energy. Green and smart cities benefit from the use of smart garbage cans.

II. LITERATURE REVIEW

Author	Year	Workdone
Gaikwad Prajakta and Jadhav Snehal	July 2021	Each trash can has a camera attached along with an accumulation cell sensor. Next, the camera readings and load sensor data are compared to the predetermined limit.
Abhishek Ayush et.al.	November 2021	Automatic trash can that listens for your voice commands
Abeesh A. I.,et.al.	June 2019	An Arduino Mega board is used to build a "smart bin," as described in the paper "SMART BIN: Internet of Things-Based Waste Management, Evaluation, and Surveillance."
Ms. Nisha Bhagchandani et.al.	May, 2018	A smart waste management system for urban areas that makes use of the internet of things (IOT)
L.J.N. Sree Lakshmi et.al.	February 2018	With the use of GPS and the Internet of Things, we have developed a sophisticated warning system to keep tabs on garbage authorization by sounding an alarm through the municipal computer network.
Chaitanya Jambotkar et.al.	December, 2017	IoT Based Smart Trash Bins – A Step To-ward Smart City.
K.Harika, Muneerunnisa et.al.	February, 2017	IOT Based Smart Garbage Monitoring and Alert System Using Arduino UNO.
K. Vidyasagar et.al.	November, 2016	Eco - friendly Environment with RFID Communication Imparted Waste CollectingRobot.

Narayan Sharma et.al.	October, 2015	Smart Bin Implementation for Smart Cities.

III. System Development

Flowchart

The sensor will detect a human approaching the trash can. When motion is detected, the servo motor unlocks the lid of the trash can, and the GSM connection notifies the user that the trash can is full. In a garbage can in public, people toss trash into it, and a sensor goes on top of the can to detect when it's full. The process of the intelligent trash can is shown in the flowchart below

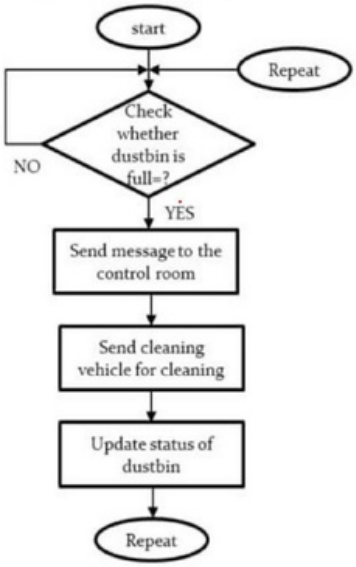

Figure 1.Flowchart

Components

1. Ultrasonic sensor
2. Arduino UNO
3. GSM Module
4. Connecting wires
5. Servo Motor
6. Battery
7. Adapter

1. Ultrasonic Sensor: This sensor is used to determine how far away a hand or other item is from the intelligent trash can. Sonar waves are the basis for determining the distance to an obstacle. The trigger pin only works to detect obstructions when it receives a strong pulse for more than 10 seconds. This sensor starts sending a 40 KHz ultrasonic burst of eight cycles when it detects a hand (an obstruction), and then it waits for the reflected ultrasonic signal.

Technical Specifications:

- Control supply : +5v dc
- Operating current : <15 mA
- Working current :15 mA
- Effectual angle : <15◦
- Ranging distance : 2cm – 400cm/1" – 13 ft
- Resolution : 0.3 cm
- Measuring angle : 30◦
- Operating frequency : 40Hz

Table 1: Pin Number and Function of Ultrasonic sensor

Pin Number	Pin Name	Description
1	VCC	The VCC pin controls the sensor, typically with +5 V
2	Trigger	An input pin is Trigger pin, which has top keep high for 10 microsecond to initialize measurement by sending micro wave
3	ECHO	An output pin is echo pin which goes great for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	GND	This pin is connected to the Ground of the system.

Working of Ultrasonic Sensor: The HC-SR04 US sensor is a 4-pin module with Vcc, trigger echo, and ground pins labeled accordingly for use with ultrasonic detection. This ubiquitous sensor is employed in a plethora of contexts requiring either distance measuring or object detection. Distance = Velocity x Time is the formula on which the sensor relies.The sensor works by sending out an ultrasonic pulse, which then travels through the air and is reflected back to the sensor by whatever it comes into contact with. The echo pin on the module will be set high for however long it predicts the US wave will take to return, allowing us to keep tabs on it.

2. Arduino UNO: An Integrated Development Environment (IDE) is a computer program used to write and upload programs to the Arduino board, which is a programmable circuit board based on a microcontroller. The Arduino is a microcontroller board that uses the ATmega8. It has 14 digital I/O pins (six of which can be used as PWM outputs), a USB connector, a power jack, an ICSP header, a reset button, and a power jack. The Arduino Uno is an open-source microcontroller board that is based on the ATmega328P. Including the reset button, power connector, ICSP header, and USB port, the board features a total of 14 input/output pins (8 of which can be utilized as PWM outputs). The microcontroller now has all of its components in place. You may power it on by connecting it to a wall outlet or a computer's USB port. The AVR board, which operates at 5V, and the Arduino Due, which operates at 3.3V, will eventually share compatible shields. The second is a sleeping pin with potential future usage.

3. GSM Module: A GSM modem or GSM module uses GSM mobile telephone technology to create a wireless data connection to a network. GSM modems are used in mobile phones and other devices that communicate with cellular networks. Users are identified on the network via their SIM card. Your computer can communicate with a GSM/GPRS network through the GSM/GPRS module. The components of a GSM/GPRS module include the modem itself, a power supply circuit, and a number of different types of computer interfaces (RS-232, USB, etc.). A GSM/GPRS MODEM is capable of the following tasks:

You may use a SIM to receive, send, and delete SMS messages.

Ability to access, edit, and search the SIM's phonebook.

Manage your incoming and outgoing voice calls.

4. Servo Motor: One example of a tiny device with an output shaft is a servo motor. Sending a coded signal to the servo allows for precise angular positioning of this shaft. As long as the encoded signal is present on the input line, the servo will keep the shaft at the programmed angle. If the encoded signal changes, so does the shaft's angular location. The Futaba S-148 is an example of a conventional servo, and its 42 oz/in of torque makes it rather powerful. It uses energy in accordance with the mechanical stress applied to it. Therefore, the power needed to run a servo that is not heavily loaded is minimal. A servo motor consists of a control circuit, the motor itself, a gear set, and a housing. Additionally, it includes three cables that go to the exterior. One is the control wire (white), another is the power (+5 volts), and the third is ground.

5. Software Arduino IDE: The Arduino IDE is the necessary software for this. With the free and open-source Arduino Software (IDE), creating and transferring code to the board is a breeze. Windows, Mac OS X, and Linux are all supported. The environment is built in Java, with Processing and other free tools serving as its foundation. The programme is compatible with all Arduino boards. The Arduino IDE has a code editor, a chat window, a text console, a toolbar with frequently used buttons, and a menu system. It communicates with Arduino boards so that code can be uploaded and run. Arduino software is referred to as sketches. These draughts are created using the text editor. Files containing sketches have the ".ino" extension. It allows you to copy and paste, search and replace text, and more. While exporting or saving, you may check for updates or issues in the message box. The Arduino environment's text output, such as error warnings and other data, is shown via the console. The active board and serial port are shown in the lower-right corner of the window. The buttons on the toolbar provide access to the serial monitor, programme verification, programme uploading, sketch creation, and sketch saving.

6.

IV. Results

Incorporating garbage bins with indication lights is one way to improve sanitation in urban areas. This system utilises a garbage can, an infrared sensor, and a Raspberry Pi to collect garbage remotely. When the trash cans are overflowing, the system will send an email and update the bins' dashboard to let you know. If the trash can isn't emptied within a certain time frame, a report is sent up the chain of command so that action can be taken against the responsible contractor. Additionally, this approach aids in keeping an eye on phoney reports, which helps to cut down on managerial corruption. As a result, the cost of waste collection as a whole is reduced as fewer rubbish collection truck trips are required. Cleanliness in public places is aided as a result. This means that the inclusion of solar panels in a smart waste management system might help cut down on the system's overall energy usage while also making rubbish pickup more efficient. Such systems require improvement since they are susceptible to component theft in a variety of ways. Any of the world's smart cities can use this dustbin model. A waste collecting and monitoring crew sent into the city can be effectively directed in their collection efforts.

Table 2: Testing Results

Testcase Notation	Input	Remarks	Testcase Validation
T-1	Null	No trash can contents present.	Pass
T-2	Garbage filling	The rubbish can is almost overflowing.	Pass
T-3	Garbage filling	There's more trash than fit in the rubbish can.	Pass
T-4	Filled	The trash can is overflowing with trash.	Pass
T-5	Spillover	Overflowing waste has caused the bin to reach its maximum capacity.	Pass

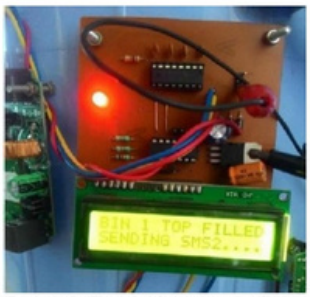

Figure 2: Result 1 showing Garbage level is Top filled

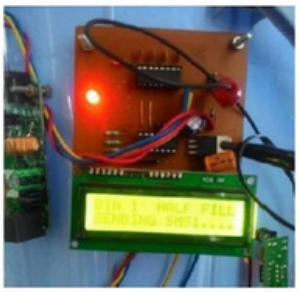
Figure 3: Result 2 showing Garbage level is Half filled

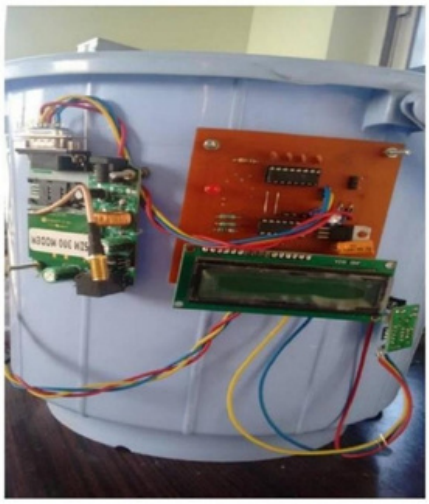
Figure 4: Final Model

V. Conclusion

Intelligent trash cans are better than regular garbage cans since they are compactible and can be monitored in real time using this cutting-edge system. The Arduino sensor and other high-tech gadgets are already built in. The trash can will open when something comes close to it and close when a set amount of time has passed.

Increasing the number of individuals who can afford it will stimulate the economy. And improve people's health and sanitation an afford it will stimulate the economy and improve people's health and sanitation. So that both the wealthy and the needy might share in its benefits. We predict that this will lead to improvements in sanitation and technology.

REFERENCES:

1. Mr. Kunal Dalvi et.al. "Solar Powered Dustbin for Efficient Waste Management", International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), Volume 4, Issue 2, April 2021, ISSN (Online) 2581-9429, pp 124-128
2. N.S. Kumar, B. Vuayalakshmi, R.J. Prarthana, and A. Shankar, "An Internet of Things (IoT) and Arduino UNO-powered garbage can alert" 2016 IEEE Region 10 Conference (TENCON). IEEE, pp 1028–1034.
3. PS Reddy, R.N. Naik, A.A. Kumar, and S.N. Kishor, "An Arduino-based wireless trash can surveillance and alarm system" (2017), the Electrical, Computer, and Communication Technologies 2017 (ICECCT) conference, IEEE, pp. 1-5.
4. Thirdly, CJ Baby, H Singh, A Srivastava, R Dhawan, and P Mahalakshmi, "An intelligent trash can with alert and foresight capabilities based on machine learning", 2017 WiSPNET (International Conference on Wireless Communications, Signal Processing, and Networking), pp. 771-774 IEEE
5. R. Manikandan, S. Jamunadevi, A. Ajeyanthi, M. Divya, D. Keerthana, "An Analysis of the Grabage Mechanism for Smart Cities", International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 01, 2019, pp 1709-1713
6. Zade, R.; Khadgi, N.; Kasbe, M.; and Mujawar, T, "Online Garbage Monitoring System Using Arduino and LabVIEW", International Journal of Scientific Research in Network Security and Communication 2018;6(6):5-9.
7. L. Wang, Y. Ali, S. Nazir, and M. Niazi, "Isa evaluation framework for security of Internet of health things system using the-topics methods," IEEE Access, volume 8, pages 152316-1523322, 2020
8. Public Space Hands-Free Garbage Compactor by Ramji DR, Shinde J.R., and Venkateswarlu R.2019;1(2):52-8 International Journal of Digital Electronics.

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Smart Energy Meter Using Lora Protocols & IOT Applications

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Abstract- **The world regularly uses old technology to measure power consumption. In today's technological and digital world, no system or device works without electricity. Therefore, everyone needs energy to work on a system or device. So, we are delivering such a system to know or to measure the power consumed by the system to do work. People are moving towards digitalisation and modernization, and energy requirements are increasing. It is an electrical era where the electrical sector is emerging. There are many misunderstandings between consumers and the electricity board. Vehicles are dependent on electricity. Due to the increment in EVs, electrical requirements and electricity optimization is also required. To power EVs, there is a need for charging stations. So, these are the main reasons behind load shedding. To continue the electricity dispatch, we must manage and control the electricity on the consumer side. Considering the above, we are designing a model/system that can measure the accurate meter reading without human involvement and generate bills. i.e., Smart Energy Meter Using LORA Protocols & IOT Applications [1].**

I.INTRODUCTION

In today's world, everything depends on electricity, even though vehicles also depend on electricity, i.e., Electric Vehicles. There are no devices or any machine which works without electricity. So due to modernization and digitalization, electricity is an essential requirement of society or human beings to survive and meet their daily needs. Hence due to the enormous requirement and need for electricity, there is a need for proper management and optimization of electricity. The system of electric meter reading currently used has many drawbacks, such as being more time-consuming, requiring manpower and electricity theft, and misunderstandings between the electricity board and consumer because of third-party participation in meter reading. There is no fixed date for taking meter readings because the current reading is taken manually with the help of employees. The bill will be generated after taking it home by home, and it is a more time-consuming process. Then after a few days, the generated bills will be distributed along with the meter numbers. It is a more time-consuming process due to which the electricity board gets losses. So, by considering this, the proposed system is much more helpful to consumers and the electricity board, i.e., the Smart Electric meter [1].

The system consists of an inbuilt WIFI module and PZEM-004T module, which senses the active variable voltage, current, frequency and power consumed by the load.

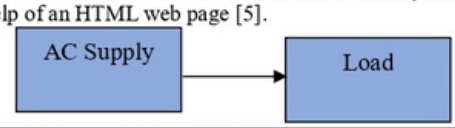
The PZEM-004T module is interfaced with NODEMCU ESP8266. The proposed system is using Wi-Fi which acts as a heart for IoT. In proposed system, the Wi-Fi module is connected to mobile. Through this Wi-Fi module, the reading will reach the users mobile. The data sensed by the PZEM-004T module will be sent to the Wi-Fi module NODEMCU ESP8266, and it will show on a web page with the help of coding and programming. The system will show the active voltage, active frequency, active current, and the power consumed by the consumer. So, there are no theft chances in meter readings. So, there is no chance of misunderstanding between the electricity board and the consumer. The smart meter system provides the user with real-time voltage, current, frequency and power. We can implement this system efficiently and at a low cost with higher efficiency. Once the system is installed, there is no need for Manpower to take meter readings. This system requires minimal installation space because it has minimum components; only one PZEM-004T module will give several readings, i.e., variable voltage, variable frequency, variable current and power consumed by the user [2].

II.LITERATURE REVIEW

This paper proposed that the energy consumption in household and industrial sectors, mainly in the developing areas gaining more and more losses due to Electricity theft and improper management of electricity. This paper proposes an intelligent energy metering system using IoT. This smart energy meter is not only designed to measure power consumption, but it can show the live voltage, current, and frequency so that we can manage the devices. No damage to the devices due to high voltage. It is designed with the help of an intelligent PZEM-004T sensor with inbuilt voltage, current, and frequency sensors to give accurate readings. This paper proposed an auto meter reading with perfection; it removes the manual help to get meter readings to minimize consumer fraud and misunderstandings. It reduces the cost of a meter reading person so that the charges can be minimized. It has the ability to optimize the use of electricity. This system can reduce the financial losses of electricity board and energy savings. Meter readings will be taken on date accurately so there is no chance of misunderstanding between an electricity provider and consumer [4].

III.PROPOSED SYSTEM

This system is designed with the help of PZEM-004T module and WIFI module NodeMCU ESP8266. The PZEM-004T sensor is interfaced with the WIFI module. The data sensed by the sensor will be passed to the ESP8266 module. We can see the output with the help of an HTML web page [5].



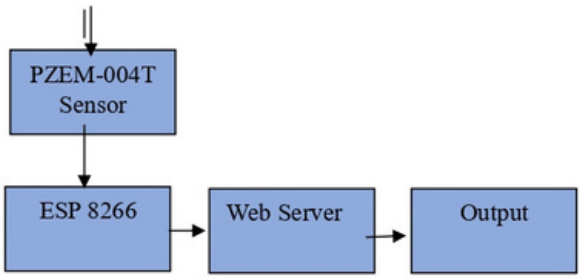


Fig.1: Proposed System Block Diagram

To assemble the system following components are required: -

1. PZEM – 004T Sensor
2. NodeMCU ESP8266
3. Load
4. Electrical Wires
5. Jumpers

PZEM – 004T Sensor

By using individual measuring elements, the complexity of the system increases. So, we have used the Electrical Variable Meter is named PZEM-004T sensor. (Ningbo Peace Fair Electronic Technology, Zhejiang, China). PZEM-004T Voltage, current, active power, power factor (PF), and system energy are measured and calculated by the sensor.

Fig.2: PZEM-004T sensor

Sensor has the Voltage measurement range from 80 to 260 VAC; current measurement ranges from 0 to 100 amps; active power measurements range from 0 to 23 KW; Power factor measurements range from 0 to 1; and frequency measurements range from 45 to 65 Hz, and 5V D.C. is the module working voltage.

NodeMCU ESP8266

System is using Wi-Fi which acts as a heart for IoT. The Wi-Fi module (ESP8266) is a circuit generally used to establish the connection for any internet-enabled devices. In our system, we connect the Wi-Fi module to our mobile. Through this Wi-Fi module, the reading will reach the users mobile. The Wi-Fi module has a range of 2.4GHz. It is also known as ESP32-DevKitC [5].

Fig.3: NodeMCU ESP8266 Wi-Fi module

This board has a 2.4GHz dual mode WIFI and wireless connection. The board has 21 pins for interface connection. Features: - Flash Memory is about 4MB Frequency – 2.4 GHz & Operating voltage is 3.7V or 5V.

IV. WORKING OF SYSTEM

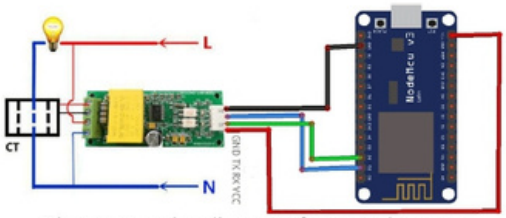


Fig.4: connection diagram of proposed system

A 230V passes through the ELCB and is divided by the MCB. The proposed system transfers energy from the ELCB to the MCB and then, via a relay, from the MCB to the load. Here, two PIR sensors are used to look for people inside the room. NodeMCU will receive Pzem-004T real-time data. The serial port and LCD can be used to display the extracted data. In the proposed system, closed relays are typically used. The HTTP protocol is used to push data from NodeMCU to the server [5].

The suggested approach makes use of Firebase as the desired server. The relay is controlled and configured by the user through Firebase. The web/Android application allows users to access real-time data from anywhere. As a result, users may monitor and control loads more effectively, lowering the cost of the bill. The Django framework for Python is used for web development. A third-party program, MIT app inventor, is a user interface between mobile and control devices. It is an open-source platform for developing applications. A visual programming language based on building blocks will piece together application behavior [5].

The design of the suggested system is built on components like the PZEM004T energy meter, NodeMCU, PIR sensor, Firebase server. A microcontroller, and the PZEM004T sensor are installed near the building's MCB. It has a Wi-Fi connection to the Firebase server. Comparing the electrical parameter data, such as voltage, current, and frequency, allows the user to determine the accuracy of the proposed system. The connected load may cause changes in power factor readings. Since the readings are acceptable and reliable, the proposed system is reliable [5].

V.RESULT

The primary motivation behind creating an IOT-based E-meter is to lower internal power usage. It forgoes human involvement, lowers expenses, and conserves human power. Both automatically and manually, it functions. Before the due date, this meter automatically sends billing to a mobile device without requiring human involvement [6]. The job costs are reduced by computerization, which also improves the framework's effectiveness and accuracy.

The system's primary target audience is public Wi-Fi hotspots in smart cities. The Internet of Things is the foundation of the project. It aims to replace the outdated implementation of energy meters with a more modern one. It can be used for automatic power reading, which reduces power waste by optimizing power usage. The meter readings are posted to Thingspeak.com, where the customer and service end can examine a channel with the energy usage for a specific energy meter [6].

VI.CONCLUSION

This research focuses on the networking aspect of IoT connectivity in the era of smart city development. This project uses an embedded system PIC16F*A MCU to create and perform an energy consumption computation based on counting calibration pulses. The proposed work uses an IoT and PLC-based meter reading system to track the readings. Whenever a client fails to pay the monthly fee, the service provider has the right to permanently cut off the power supply. Additionally, it does away with human intervention, provides persuasive meter readings, and guards against billing errors. The following goals of the project have been met.

- Consumers can easily access data from energy meters via IoT.
- Real-time theft detection at the consumer end.
- Service being cut off from a distant server. Future improvement: Wi-Fi access to IoT energy meters in the current system will assist consumers in preventing unauthorized electricity use.
- By integrating all electrical home appliances with IoT, the system's performance can be improved.

REFERENCES:

1. Dhande Sharayu.et.al, "Smart Electricity Consumption Meter Using LoRa Module" *International Journal of Advance Research, Ideas & Innovations in Technology*, Vol:5, 2019.
2. Kewal Kokate.et.al "IoT BASED SMART METER" *International Research Journal of Engineering and Technology*, Vol:05, Apr 2018.
3. V. Vijayrama Raju.et.al "Remote Monitoring of Energy Using LoRA", *Turkish Journal of Computer & Mathematics Education*, Vol:11, 2020.
4. Gopika B & Dr. Sabu George, "IoT Based Smart Energy Management System Using PZEM-004T Sensor & NodeMCU" *IJERT*, Vol:09, 2021.
5. A. Anit Dayana.et.al, "Smart Electric Meter Using LoRA Protocols" *International Journal of Engineering Research and Technology*, Vol:07, 2019.
6. Kishore Kumar Pc et.al "IOT Based Energy Meter Reading System with Automatic Billing", *International Journal of Engineering Technology*- Vol:07(3), 431-434,

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Development of a Hybrid System Combining Solar and Vertical Axis Power

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***Abstract*- People have been looking at alternatives to conventional energy sources because of the modulation and utilization of energy resulting from needs based on the post-industrial revolution. Using natural renewable energy sources is advisable because fossil fuels and energy sources like coal, radioactive materials, and petroleum are becoming increasingly scarce. Primarily, due to the paradigm shift, humans have made an impressive transition to solar and wind power development. The energy needs are satisfied through generation and distribution based on those demands, even though new alternative resources and recently growing technology have helped us. The dependability and efficiency of the output are decreased since the technologies depend on a safe, suitable environment for the generation. The scalability of these technologies is still limited since, even if the sources have enough capacity and the limitations have been removed, only a tiny generation has been made to date. For people right now in these situations of constrained operation, the combined operation of two or more models that depend on various energy sources can be beneficial. A hybrid wind turbine is an illustration of it, constructed using a multi-blade wind turbine and another generative model. Scaling up machine production and operation aids in increasing the efficiency coefficient. The torque coefficient and the static torque coefficient are crucial operational and geometrical elements that affect the power coefficient. When coupled with a size of operation that is practical, such as a small-scale operation for residential purposes, the integrated solar panel and turbine in this sort of machine will enhance the machine's operability. Before mass commercialization, there should be additional optimization and adjustment in addition to the application.**

***Keywords*- Photovoltaics (PV), Pulse width modulation (PWM), Horizontal axis wind turbine (HAWT), Vertical Axis wind turbine (VAWT).**

INTRODUCTION

Global warming is a severe problem that the world is currently facing. As more people rely on fossil fuels to meet their everyday energy needs, their limited supply is running out. A sustainable solution must be discovered to preserve the world's wealth for future generations. Utilizing renewable energy sources can help reduce carbon emissions and promote the adoption of green energy as a result. Growing renewable energy options have enabled us to replace our current carbon-intensive sources and reduce pollution. [1]

Large amounts of wind energy may be used to meet a sizable fraction of the current global demand for electrical energy. The availability of solar energy is limited by the amount of sunlight that is available during the day [2]. Other uncontrollable factors include shadows from nearby solid objects, like trees or birds that are likely to fall on the panel and cause dark interference. Despite their effectiveness, it may be argued that the fact that the technologies are not self-sufficient in generation is a drawback. Using innovative turbine blade designs, we can improve the self-starting capabilities of vertical-axis wind turbines. Axis wind turbine, or HAWT. For scientists and engineers, however, simulating the wake is challenging, particularly in the case of VAWTs, where the aerodynamics are very unpredictable and have significant 3D implications [3].

Wind turbines come in two basic varieties: rotating horizontal axis wind turbines (HAWT) and vertical axis wind turbines (VAWT). [4] The rotor axis of a wind turbine and a HAWT are parallel to the ground when rotating. [5] The vertical axis wind turbine, as opposed to the HAWT, is more suitable for this application since it can simultaneously capture wind from various directions without the need for a YAW mechanism or piloting. [6]. A solar panel needs lots of sunlight to properly use solar energy. So for solar panels to produce power, they must face the sun. In order to achieve this, we must have the best possible angle for capturing sunlight that lasts a long time. This strategy requires less energy. This system helps create the output more effectively. In order to establish a plant in the proper location and position and create the most electricity, the wind turbine's production depends on how fast the air is moving. The secondary is a crucial element of the system that helps produce torque.

Utilizing solar and wind energy PV cells in solar panels are utilized to generate electricity. Since solar energy is easily accessible and the sun provides an unending energy source, its popularity has increased over the past several decades. We use photovoltaic solar cells to transform solar energy into electricity, which we must position correctly to catch the most energy. Electricity is produced based on the position of the sun and the amount of sunlight that reaches the cells. [7]

In contrast to other types of solar panels, the polycrystalline PV panels utilized in this model have an efficiency of more than 13–16%. The requirements of each used panel are 0.64 A, 10 W, and 18 V. Two panels are positioned and turned beneath a pole in this model. This charge controller's electrical circuitry constantly monitors the input voltage from the producing systems and the battery-based voltage. This device controls how the battery unit charges.

We are using a battery, and the battery has a built-in BMS controller to avoid overcharging. The battery's lifespan may be extended using this system. If not, the battery may be harmed, or the required battery backup may not be provided.
In order to charge batteries and prevent overcharging, solar charge controllers generally function as voltage or current controllers. Its ranges vary depending on its intended usage. The appropriate level of battery charge is maintained while charging times are shortened. We can employ a reverse flow controller for each type of fault scenario. These days, a charge controller has several uses.
A hybrid wind turbine and solar energy generating system are suggested in this project, along with a model of the system's prototype. It might be posted along the sides of the roads. Air moves because of the motion of cars, which is used to generate power. A similar concept can be applied to supplying areas with insufficient on-grid connectivity, rough geography, and challenging roadways. A wind turbine is a device that converts mechanical energy into electrical energy. When a turbine rotates with the airflow produced by a DC motor, the power is DC voltage, which can be used in a variety of applications.

I. CURRENT TECHNOLOGIES

Wind power generation has increased rapidly and steadily during the last few decades, claims N.C. Batista et al. [8]. Because fewer natural resources are available and we installed more plants in 2010 than other energy sources (renewable) in Europe, we need a smart grid system that can handle both the rising demand for energy in urban areas and the integration of thriving decentralized renewable energy sources. Otherwise, we will not be able to power the grid. Because of the straightforward schematic, many are drawn to vertical wind turbines; nonetheless, this design has significant drawbacks, including the fact that it does not self-stare at low airflow. Therefore, we need to work on the black construction to rotate in low air flow and start the wind turbine on its own. The method utilizes a vertical axis and wind turbine blade (VAWT). It is thus more trustworthy and self-staring. Here, a method is also provided that provides an essential means of creating and comparing blade profiles using various airfoils.

Mitchell, S briefly summarize the wind turbine.[10] et al. When the wind turbine blade is positioned at an angle of 0 to 31 degrees, the lift-driven system rotates at high tip speed ratios (TSR), producing the full output power. It also demonstrates the self-starting ability that depends on the wind turbine's angle that we specified. The blade angle and airflow speed affect wind turbine efficiency. The best position to install a wind turbine is at a right angle. Low angle results (less than 90 degrees) are to blame for poor outcomes and results that are up to 30% less powerful, claim simulation studies.

Joaquin Alberto Moleon. He installed a test wind turbine for better results. The two distinct hemispheres of this machine are joined rather intimately by a system of duct valves that modify the airflow to the blades. The findings imply that wind power generation options may be easily sustained in high wind circumstances in topographic locations prone to severe weather. Experimental testing was carried out using the existing model, under demanding circumstances to examine the motion and behavior of the blades.

The initial investigation of the various approaches to judging the viability of energy was done by Elena V. [11]. Platono v and his companions fastened the solar panel before separating. As a result, it will be easier to calculate how much energy the solar panels and other affecting factors will absorb. They aid in our acquisition of a comparative modelling viewpoint as well as the development of useful tools in this area. Here, a solar-powered power system might be created, and the best power systems would optimize the energy produced. The ideal angle for a solar panel can be calculated by placing it at various angles and recording the measurements. The loss of incoming energy is then estimated if the data differ from the ideal value. These evaluations could also include a graphic analysis.

II. RENEWABLE ENERGY SOURCES

Renewable energy sources can be copied or filled up at a rate equal to their use rate. Although fossil fuels will likely be the main sources of thermal energy for the foreseeable future, there is concern that they will exhaust themselves. As a result, many countries are testing new systems that rely on renewable and non-traditional resources. These include geothermal, wind, sun, ocean, and biomass energy. Although the term "renewable" has gained the most attention, these are also referred to as alternative, natural, or new energy sources. Nonrenewable energy resources are running out day by day. These resources are all renewable and can be used to meet all requirements.

III. PROBLEM DEFINITION

Every day, there is a greater need for energy, but the supply cannot keep up with this demand at a reasonable price. We must use energy in the modern world to suit our demands. We have clean energy options, with solar and wind power having the most potential. Each country must use resources to produce the energy required to meet its needs.
Installing a solar farm or a windmill is very expensive. Solar energy is not usable on days with minimal sunlight or at night. It discourages the typical person from putting up solar farms. The windmill cannot continuously produce power due to seasonal winds, requiring a continual flow of wind breeze. It thus produces sporadic outputs. It makes people less likely to put up wind turbines.

IV.OBJECTIVES

The goals of this project are:
1. The project's main objective is to enhance the usage of renewable energy sources.
2. To consume less fossil fuel.

3. To improve the standard of living for people.
4. To avoid environmental contamination.
5. To use resources and land as efficiently as possible.

V. THE PURPOSE OF DEVELOPING A HYBRID SYSTEM COMBINING SOLAR AND VERTICAL POWER.

The block diagram of the system, which is seen in Figure 1, briefly describes how it functions. Electrical energy is first created from solar energy, according to Figure 2. As shown in the block diagram, energy is produced using both solar and wind turbines. Solar energy is produced using sunlight, while wind turbines produce energy from airflow. Thus, a wind turbine converts mechanical energy into electrical energy as it rotates. The output from the solar panel and the wind turbine is then fed via a DC-DC converter so that the supply may charge the battery. In order to control voltage regulation and prevent overcharging, batteries also require a BMS or battery management system. We use batteries to store energy, which we may use for various purposes. We must maintain solar at the right angle and location for optimal results. A graphical analysis may also be included in these evaluations.

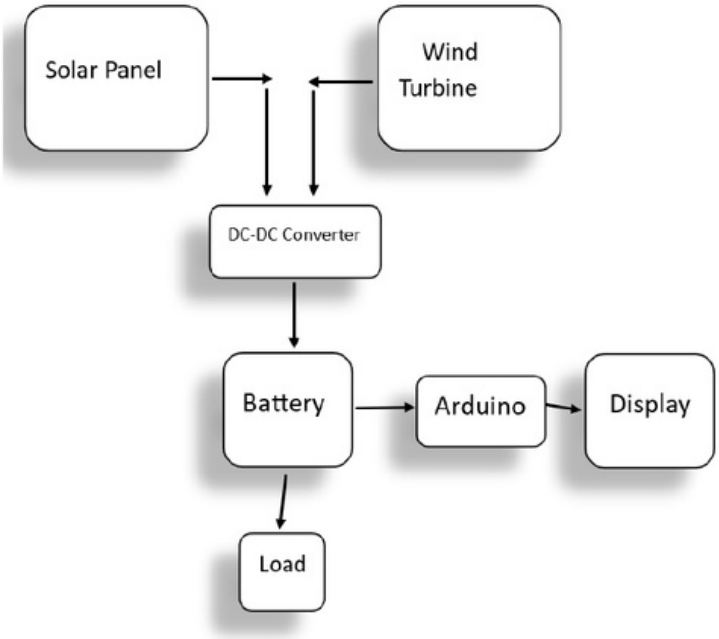


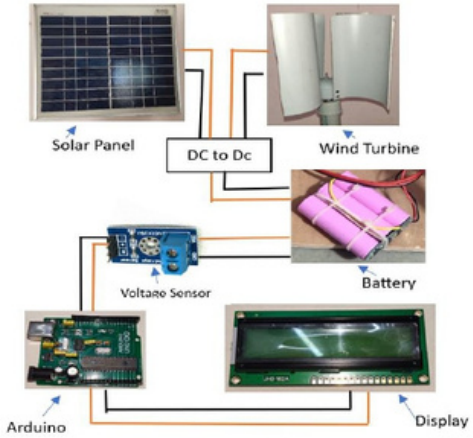
Fig1. A proposed hybrid system diagram using a vertical wind turbine

Fig2. Vertical Wind Turbine and Solar Hybrid System Experimental Setup

A. *Principal Elements in Use*

Sr	Components	Ratings
1	Solar Panel	18V, 10W
2	Arduino	-
3	Voltage Sensor	-
4	Wind Turbine	12V
5	Display	-
6	Battery	12V

B. *Circuit Diagram*



C. *Experimental Result*

I. Solar Output

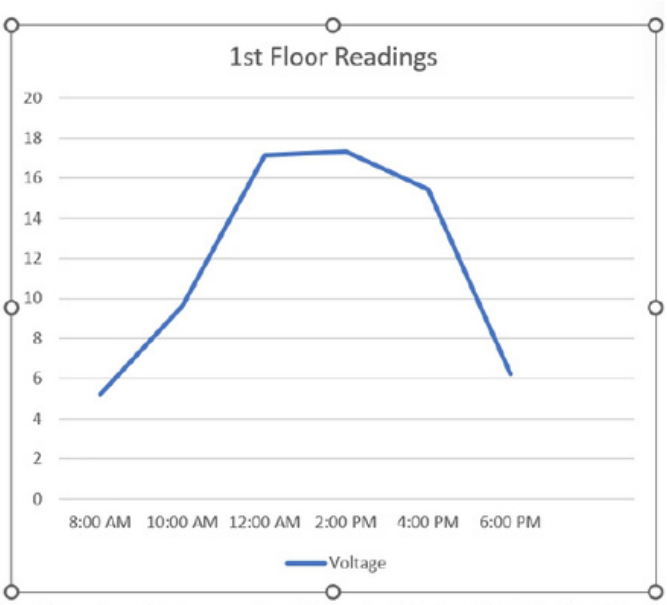


Fig3. It is the output for solar voltage generation. This output starts at 8 AM and updates every two hours.

II. Wind Turbine

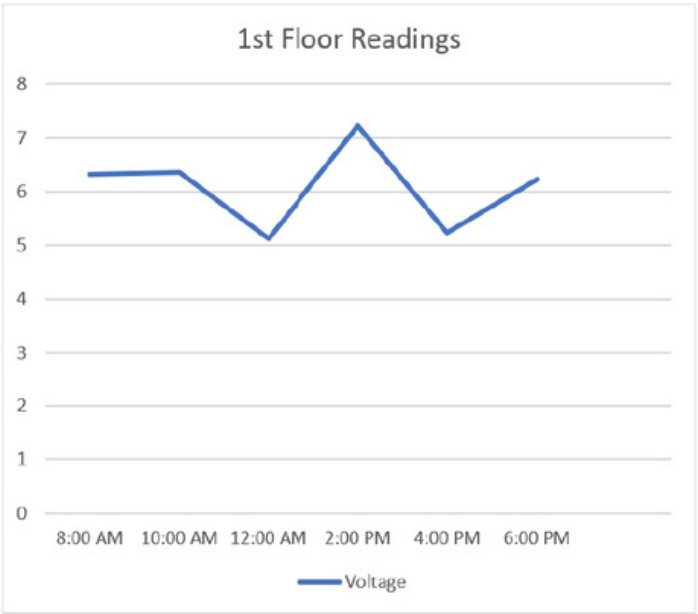


Fig4. This graph depicts the voltage generated by a wind turbine. As a result, the average air flow rate is 25 km/h (based on online data). According to this figure, the wind turbine produces 5 to 7 volts at a moderate airflow of 25 km/h.

III. Both Wind and Solar voltage Generated Chart

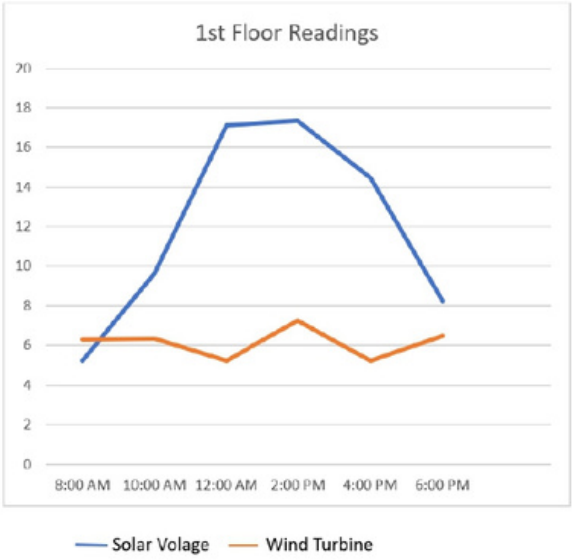


Fig5. Overall comparison of wind turbine and solar power generated. With modest air movement, this is the overall result.

VI. CONCLUSION

This technology is used in the basic hardware prototype of the hybrid vertical axis wind turbine concept. It is the underlying notion of combining wind and solar electricity. We have created a model in which we have built a system incorporating inputs from several energy-harvesting sources. Some of the project's primary uses are in areas where electricity is still unavailable; with the help of this project, we can power up the fundamental needs of the home. It can be useful in locations where "motor roads" have not yet been constructed but where the population still requires basic electricity that can be supplied on a minimal scale. If we need extra supply for other reasons, the size of this system can still be optimized. It might also be used for highway illumination or in tiny residences, businesses, and filling stations with enough small-scale electricity, and off-grid connectivity is feasible.

REFERENCES:

1. Mitchell, S.; Ogbonna, I. Volkov, K. Improvement of Self-Starting Capabilities of Vertical Axis Wind Turbines with New Design of Turbine Blades. Sustainability 2021.
2. Avinashn Bavchakar, Chougale N, Priyanka Sargam, Prajakta Survase, Prof. Dr Sachin Sawant, "A Hybrid Model of Vertical Axis Wind Turbine – Solar Power Generation for Highway and Domestic Application, 2018
3. Scheurich, Frank. Modelling the aerodynamics of vertical-axis wind turbines. Diss. University of Glasgow, 2011.
4. Avinashn Bavchakar, Chougale N, Priyanka Sargam, Prajakta Survase, Prof. Dr Sachin Sawant, "A Hybrid Model of Vertical Axis Wind Turbine – Solar Power Generation for Highway and Domestic Application, 2018
5. N Raghu, K Murthy, K Nagendra, VN Trupti, "Measurement and study of radiation levels and its effects on living beings near electrical substations", The Journal of CPRI, Volume-11, 2015.
6. IhorShchur and Volodymyr Klymko, "Comparison of Different Types of Electromechanical Systems for Creating the Counter-Rotating VAWT", IEEE First Ukraine Conference on Electrical and Computer Engineering (UKRCON), 2017.
7. M Balamurugan, N Raghu, N Kamala, Trupti V Nandikolmath, Sarat Kumar Sahoo, "Solar Powered Electric Vehicle Through Wireless Power Transfer", Electric Vehicles and the Future of Energy Efficient Transportation, IGI Global Publishers, 2021.
8. Mitchell, S.; Ogbonna, I. Volkov, K. Improvement of Self-Starting Capabilities of Vertical Axis Wind Turbines with New Design of Turbine Blades. Sustainability 2021
9. Jose Alberto Moleón Baca , Antonio Jesús Expósito González and Candido Gutiérrez Montes. (2020). Analysis of the Patent of a Protective Cover for Vertical-Axis Wind Turbines (VAWTs): Simulations of Wind Flow. Sustainability, 2020.
10. N.C. Batista, R. Melício, J.C.O. Matias, J.P.S. Catalão, "NEW BLADE PROFILE FOR DARRIEUS WIND TURBINES CAPABLE TO SELF-START", International Journal of Computer Science and Communication (IJCSC), 2020.
11. Elena V. Platonov, Andrey S. Toropov and Alexander N. Tulikov, "Simulation of Energy Input to Solar Panels", International Ural Conference on Electrical Power Engineering (UralCon), 2019.