Smart Village Innovation

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Abstract - This paper is related to making the village as a smart by providing proper facilities such as electricity, street lights and garbage system and security to farm land for the protection in an efficient manner with the help of IoT. The use of Internet of Things (IoT) is the only one thoughts of innovation, web, and the things around us. It empowers us to convey and communicate with gadgets around us and sensors and to complete the errands on our order. In India the majority of population lives in villages have been made to enhance the smartness of the village. Here IoT could play a role in bringing smartness to the village activities, smart village is a concept developed in rural area that provides solutions to problem occurred and improves the quality of growth. The design makes the village self sufficient in respect of electric power, street lighting, security and cleanliness. The non-conventional energy applications are the key resources here. The electricity produced from the solar panel and the wind mills are captured and stored in the hybrid storage and can be use at night in the absence of sun.

Keywords – Smart Village, IoT, Sensors, LCD, Arduino UNO.

I. INTRODUCTION

As all known our India is becoming a smart India. Honorable prime minister Narendra Modi has introduced a scheme for developing urbanization sector, that is the government has launched Rs 98,000crore smart city and AMRUT (Atal mission rejuvenation and urban transformation) on June 25 2015 in an attempt at transforming the urban infrastructure. So government has selected to develop some of the cities as Smart cities. Considering this, our project is to make a village as a smart village. Why these project means, majority of the population in India resides in villages hence, villages are main criteria for development of a nation. In India there are many problems facing by village peoples and some of the major problems are Irrigation, uncleanliness, electricity, water problems, street light, roads, school, medical facility and available of network etc. Overall, in India there are 6,64,369 villages, in these 2,92,000 villages are not having proper electricity and 43,000 villages without mobile network, 17% are not having proper clean drinking water. Majority of the population in India resides in villages hence, villages are main criteria for development of a nation. In India there are many problems facing by village peoples and some of the major problems are irrigation, electricity, water

problems, street light, roads, school, medical facilities and available of network etc. In recent years, the research community has concentrated on the construction of community-based sustainable settlements, such as smart cities. The establishment of smart villages, in tandem with smart cities, is a pressing requirement of the hour in order to maintain balance in holistic growth. The Internet of Things (IoT) is a crucial technology player in envisioning the smart village. The Internet of Things (IoT) provides interactive platforms for information exchange and control between smart devices. Smart things have smart sensor computing platforms and information exchanges via communication protocols incorporated in them. The Internet of Things is a tried and true solution that improves efficiency and saves time and money.This article tries to close the gap between current smart village difficulties and possible digital solutions via IoT technology..

According to the findings, the majority of cities/districts have restricted access to large-scale topographic maps and land parcel maps that are needed to construct smart cities. This information serves as the foundation for all subsequent data. To learn more about the availability of geospatial data in Indonesian cities.

According to Milind et al (2015) [10], the majority of Indians still live in villages. It will take a lot of effort to clean up the settlements. Engineering students can strengthen their skills by designing and implementing clean and smart village projects. They made proposals at the end of this paper for the effective creation of a clean and smart town. Water supply, sanitation, indoor air quality, solid waste management, renewable energy, and other components of the clean village all have distinct possibilities with varied pros and demerits, and a lot of effort is required to be done.

II. OBJECTIVES

Village by taking smart decisions using smart technologies and services. This project report is on the research and development of a smart community. As described a smart village as a collection of services that are offered in an effective and efficient manner to its residents and businesses. Modern energy access functions as a stimulus for development in education, health, security, productive enterprise, and the environment, which in turn supports future energy access improvement. To establish a happy society, we focus on increased resource efficiency, local self-governance, access to basic amenities, and responsible individual and communal behaviour. We making smart.

The Foundation is also working for inculcating moral values in the society and for improving the standard of living of the development of the village shall be based on the three paths.

- ➢ Green fields
- ➢ Redevelopement
- ➢ Livelihood

III. MOTIVATION

IoT creates high-quality voluntary International Standards to facilitate international trade, support sustainable and equitable economic growth, encourage innovation, and protect human health, safety, and the environment. a new idea and model for village design, building, management, and smart services that incorporates the latest generation of information technologies, such as the internet of things, cloud computing, big data, and space/geographical information integration. Smart city/village development can benefit synchronised development, industrialisation, information technology, agricultural modernization, and city/village development sustainability. The major goal of smart village development is to achieve convenience of public services, delicacy of village administration, liveability of the living environment, smartness of infrastructures, and long-term network security effectiveness. A smart sustainable village is an innovative village that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of rural operations and services, and competitiveness, while also meeting the economic, social, and environmental needs of current and future generations. Rural development is a national necessity and has considerable importance in India because of the following reasons.

- ➢ About three-fourth of India's population live in rural areas, thus rural development is needed to develop nation as whole.
- ➢ Provision of basic infrastructure in rural areas, such as schools, health facilities, roads, potable water, and electrification, among other things.
- ➢ Provision of social services like health and education for socio-economic development.
- ➢ Increase in industrial population can be justified only in rural population's motivation and increasing the purchasing power to buy industrial goods.
- ➢ The primary goal of the rural development programme is to improve the economic and social conditions of rural people.

IV. LITERATURE SURVEY

Honorable Neman B. Rice (1998) [1] A former mayor of Seattle contributed to this publication. A concise summary of the literature reviewed and stated in this paper. It mostly covers the issues that urban regions face as a result of population increase, transportation, rising property prices, and a lack of open space. In this paper, competence of the street lightning system is improved by sensors. Less energy utilization by the system is done. The smart growth movement aims to find cost-effective and environmentally sustainable solutions to these issues. The separation of middle and upper-income households from the urban poor, low-density residential districts, and reliance on the vehicle are all examples of communal sacrifices needed by the movement. It aims to do this through enhanced community participation in development decisions and a healthy conversation about neighbourhood development.

Pallavi et al (2012) [2] Cities in emerging nations are the engines of growth in this article, because if villages support agriculture, cities serve industry and service sectors. The emerging economies have particular policies in place because they recognise and understand the function and relevance of these townships in the development of sustainable cities. Four states in India, Karnataka, Gujarat, Rajasthan, and Maharashtra, each have their unique township strategies. The goals are to develop smart cities with smarter plans, a better built environment, and happier residents. The challenges and implications of this unplanned growth become more apparent and serious as cities expand without sufficient planning and preparation.

Fan et al (2013) [3] in this study, they concern the issues arises in agriculture, countryside The only solution these three problems is agricultural modernization, they introduced the cloud computing technique and internet of things into agricultural modernization to solve the problem. China's agricultural development gave attention in the development of the agricultural information which trend development for world agriculture and achieve the remarkable result in the projects like "every village" "golden agricultural project" "three dian project". They concluded by use of cloud computing and IoT convert agriculture as smart agriculture to develop the agriculture infrastructure in China. The purpose of this study was to look into the Malaysian smart village project in a rural community in Malaysia known as kg besting.

Norizan et al (2013) [4] The purpose of this study was to look into the Malaysian smart village project in a rural community in Malaysia known as kg besting. Limited human capital involvement in agricultural activities is one of the biggest difficulties faced by farmers in this community, according to data research. Finally, by adding the notion of smart village, it regards smart village as a potentially novel means of improving the lives of rural people and introduces a strategic implementation in three phases: creating the village ecosystem, social empowerment, and economic empowerment.

Yann et al (2013) [5] in this paper, they propose a smart bin application based on information self-contained in tags associated with each waste item. With associating a physical waste with digital information by the smart waste approach.

As a final, they provide a new solution to enhance waste collection efficiency using the RFID technology. The SAGY will keep rural India's soul alive while also providing tangible amenities that will allow people to shape their own destiny. Because it takes a holistic approach to rural development, the project is distinctive and transformative.

Saansad et al (2014) [6] on 11th October, we plan to bring the notion of gramme swaraj into reality through Saansad Adarsh Gram Yojana on the birth anniversary of Loknayak Jaya Prakash Narayan Ji, following in Gandhi's footsteps. Because it takes a holistic approach to rural development, the project is distinctive and transformative. It envisions the village's growth in several sectors, including health, sanitation, the environment, education, livelihoods, agriculture, and so on. It aims to raise the level of living, enrich social capital, and foster community spirit in addition to providing physical infrastructure and basic services.

Milind et al (2014) [7] This study discusses the transfer of ideas from smart cities to smart villages. The user can use WIFI, 3G, or 4G lite to access the app on their smartphone. They created a new technique that can eliminate all hard effort and produce a nice outcome. They create an Android application to provide all information directly to farmers, such as recruiting processes and government scheme notifications.

Ramachandra et al (2015) [8] in this research paper, the term of Smart village is selfreliant manpower appropriate rural technologies. In this village implement the smart village framework as department wise to improve the quality of people in that village. The vision of SAGY to make at least one gram panchayat as an ideal panchayat from each Member of Parliament constituency every year. In this paper they elaborate about Ragihalli village which is Ragihalli gram panchayat of Bengaluru urban district is adopt under Sansad Adarsh Gram Yojana (SAGY) program by Shri Ananth Kumar, Member of Parliament.

Heri et al (2015) [9] Developing smart cities necessitates a wide range of data, including geospatial data. According to the findings, the majority of cities/districts have restricted access to large-scale topographic maps and land parcel maps that are needed to construct smart cities. This information serves as the foundation for all subsequent data. To learn more about the availability of geospatial data in Indonesian cities.

Milind et al (2015) [10] in India, the major populations still live in villages. It will take a lot of effort to clean up the settlements. Engineering students can strengthen their skills by designing and implementing clean and smart village projects. They made proposals at the end of this paper for the effective creation of a clean and smart town. Water supply, sanitation, indoor air quality, solid waste management, renewable energy, and other components of the clean village all have distinct possibilities with varied pros and demerits, and a lot of effort is required to be done.

Tejas Bangera et al (2016) [11] The study and execution of an IoT-based smart village are described in this paper. It was built with the goal of allowing paths to connect at any time, anywhere, with anything and everyone. Wearing linkitone devices are all-in-one prototyping boards for IoT wearing devices, combining GSM/GPRS capabilities into a basic arc to produce a substantial development unit. In terms of the form factor. A seed studio and mediate collaborated on the design of this device. It creates a substantial development by combining two-way duplexing techniques into open hardware and industrial leading reference designs for iot/wearable.

Pritesh Y Shukla (2016) [12] To develop a lively and joyful society in the village, they emphasise on enhanced resource-use efficiency, empowered local self-governance, access to basic facilities, and individual responsibility for behaviour. They talked about the government's Saansad Adarsh Grama Yojana, which aims to make villages smarter by implementing relevant technologies and providing internet access. They also suggested that the hamlet implement awareness campaigns to increase agricultural, employment, and nutrition security. Finally, the whole growth of the country can be achieved alone through the development of communities.

Nayan Kakadiya et al (2017) [13] As part of this research, the Gujarat government has started a project called "Vishwakarma yojana" - a method to rurbanization led by Gujarat technological university. Rurbanisation is the process of bringing urban aspects to rural areas. In this project, Chansad village will be used to update urban components. Primary and secondary survey data were gathered in accordance with UDPFI principles and the GAP analysis for the community and appropriate designs. There are some suggestions and guidelines for creating a sustainable village. To summarise, this programme is primarily undertaken to preserve the "spirit of villages" by offering all civic and infrastructure facilities accessible in large towns and cities in order to halt migration.

Roshini Pandey (2017) [14] MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) is a job-guarantee programme implemented by law on August 25, 2005. It is a social security employment statute that ensures employment for India's disadvantaged rural population. The major goals are to alleviate extreme poverty and to make villages in the country self-sufficient through the construction of economic assets. The plan is to give all adults in each hamlet 100 days of work doing unskilled manual labour. The MGNREGA Act's function and effects on rural India's job creation, economic development, and infrastructural development. They determined that this act supervises the scheme's implementation in a vast number of states and that it has reduced overall poverty.

A. Singh and M. Patel (2019) [15] With the deployment of smart education methods at a model "smart village" Punsari, India, the smart education idea successfully reduced school dropout to zero.
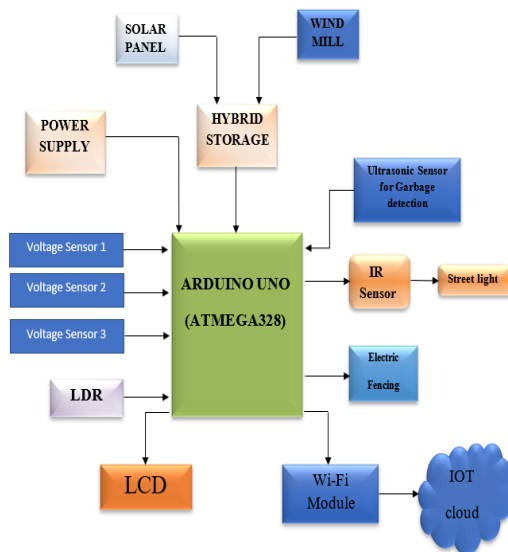
V. METHODOLOGY

Fig 1: Block diagram

The Non-Conventional energy based smart village innovation system using IoT technology mainly works on Arduino UNO board. This unit is placed at villages to make the village as a smart village. The above figure shows the block diagram of smart village innovation which consists of sensors, solar panel, LCD, and the heart of project that is Arduino UNO. The sensed values are absorbed using Arduino UNO and it is stored to the cloud through Wi-Fi module. If the parameters increased beyond the threshold level an alert message is sent to the control unit. Here the electricity is produced alternatively by using solar panel and windmill and it will be stored in Hybrid storage so that it will be used in villages when there is a cut off in the village and it can also be used to run the motors in the farming. This system consists of voltage sensor consists of stepdown transformer and it has bridge rectifier that converts the AC to the pulsating DC, Ultrasonic sensor, LDR sensor, and relay to monitor the parameters which is difficult to predict for human beings and those are displayed in LCD.

3 phase System - As per this project an idea was to implement 3-phase current that will be used to run the motors in the farming but as we can't implement the 3-phase so we are assuming as the single phase to 3 single phase current. As the villages faces many problems in day today life, these can help in leading the life in easy way. 3 phase lines makes the error detection of current in which phase line the current is not flowing and sends the message via Wi-Fi Module and that is for the 3 single phase current we are using 3 stepdown 6-0-6 transformer and it will convert the 230V to the 6V AC and then we are using the bridge rectifier that converts the 6V Ac to the pulsating 5V DC which is required for the Arduino UNO and then we are going to connect the rectifier to 100Mhz capacitor filters to get the perfect signal strength and next lastly to the potentiometer that is called as voltage sensor which will tuning the value of the voltage for displaying the sensed value in the LCD.

Smart Street light – As all know in so many villages smart street lights has been implemented and in some village they haven't, So here implementing a new concept to the existing street light and that is here used a LDR sensor in only 1 street light and that will be interconnect to all other street lights and this sensor depends on sun UV rays and depending on the threshold value the light will get on automatically when it will be night and turns off when it will be morning and we are placing a IR sensor at the 1st street light and when it will the night the 50% intensity of the street light will be on and when a person passes through the IR Sensor the intensity of will 100% till some time and then again the intensity of the light decreases to 50% so that we are saving the energy.

Smart Garbage level detection - The height of the dustbin is 4m and are placing the ultrasonic sensor at top of the dustbin and it senses the garbage bin when it is full and sends the message to empty the garbage bin. The Smart Garbage Management System would give a solution for the increasing waste management problems in a village. And if the garbage is full it will send to the cloud through Wi-Fi module and through the Thing Speak app and through this app co-operation to empty the dustbin and send the location of the bin.

Electric fencing - In this system, the electricity produced by using solar panel and windmill. The produced electricity is stored in battery which uses Hybrid storage. The mains or battery power is converted into a high voltage pulse by an electric fence energizer. About once every second, the energizer sends a pulse to an insulated fence line. The pulse lasts around 150 microseconds. This pulse, known as the "shock," is felt by every animal that comes into contact with an electric fence. The circuit is complete when the animal makes contact with the fence. The animal receives a shock at this stage. Because an electric fence is a psychological rather than a physical barrier, the animal must be taught to respect it. The pain that an animal feels is very temporary and does not affect the animal physically.
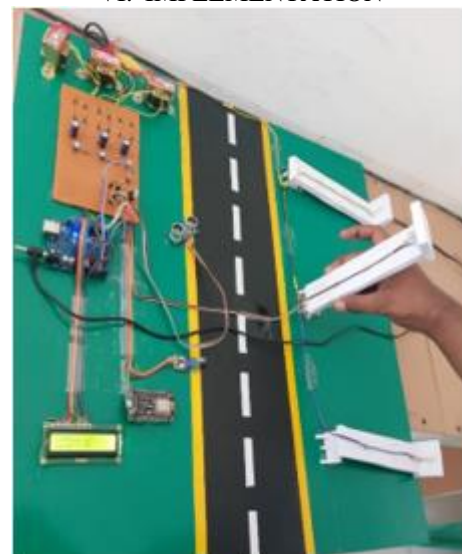
VI. IMPLEMENTATION

Fig 2: Implementation of the project

The above figure shows the proposed system of our project, here we are going to explain the pin configuration of our project. So we are using Arduino UNO(ATMEGA328) and our 1st application is 3 single phase system which is connected to the bridge rectifier and then to the capacitor that amplifies the signal strength and it is then connected to the potentiometer which is connected to the analog pins that is A0,A1,A2 in the arduino UNO board and then in Ultrasonic sensor the echo pin is connected to pin number 3 and trigger pin is connected to pin number 2 and three Led's are shorted together and connected to pin number 5 and LDR is connected to the analog pin A3 and LCD to the pin number 12,13,8,9,10,11 and we are using 4bit LCD and IR sensor is connected to the pin number 6 and ESP8266 is connected to pin number 1 and 2 that is transmitter and Receiver pins.
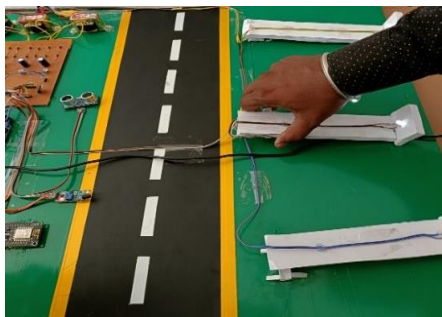
VII. RESULTS

Fig 3: Smart Street light

As implemented above the smart street light is very helpful and by this, we can also save electricity. As all know in so many villages smart street lights has been implemented and in some village they haven't, So here implementing a new concept to the existing street light and that is we are using a LDR sensor in only 1 street light and that will be interconnect to all other street lights and this sensor depends on sun UV rays and depending on the threshold value the light will get on automatically when it will be night and turns off when it will be morning and we are placing a IR sensor at the 1st street light and when it will the night the 50% intensity of the street light will be on and when a person passes through the IR Sensor the intensity of will 100% till some time and then again the intensity of the light decreases to 50% so that we are saving the energy.

Fig 4: Initial stage of garbage
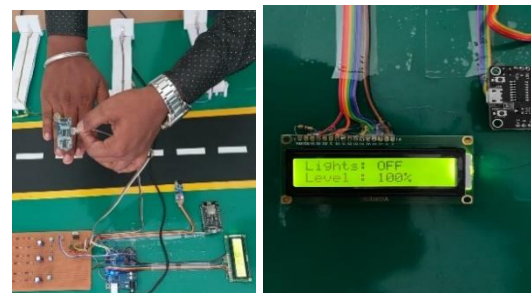

Fig 5: 50% Of Garbage Bin

Fig 6: Garbage Bin is Filled

As implemented above figure the smart garbage bin helps in keeping the village hygiene and cleanliness. The height of the dustbin is 4m and we are placing the ultrasonic sensor at top of the dustbin and it senses the garbage bin when it is full and sends the message to empty the garbage bin. The Smart Garbage Management System would give a solution for the increasing waste management problems in a village. And if the garbage is full it will send to the cloud through Wi-Fi module and through the Thing Speak app and through this app co-operation to empty the dustbin and send the location of the bin.
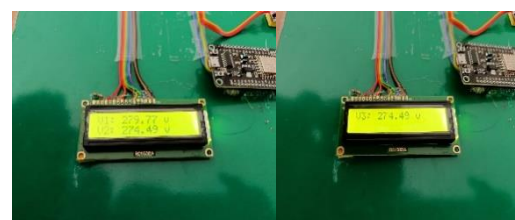

Fig 7:3 phase power avaliable

Fig 8:3rd phase cut off

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As implemented above the 3 single phase system is used for agriculture and village peoples for their needs. The villages face many problems in day today life, these can help in leading the life in easy way. 3 phase lines makes the error detection of current in which phase line the current is not flowing and sends the message via Wi-Fi Module and that is for the 3 single phase current we are using 3 stepdown 6-0-6 transformer and it will convert the 230V to the 6V AC and then we are using the bridge rectifier that converts the 6V Ac to the pulsating 5V DC which is required for the Arduino UNO and then we are going to connect the rectifier to 100Mhz capacitor filters to get the perfect signal strength and next lastly to the potentiometer that is called as voltage sensor which will tuning the value of the voltage for displaying the sensed value in the LCD.

VIII. CONCLUSION

The smart village concept has the ability to boost the country's grass roots level, hence contributing to India's overall growth. The smart village concept has a lot of promise for replication in other developing countries. Each hamlet has its own set of issues and circumstances. The proposed design is executed with IoT, which can be used to construct the digital transformation ecosystem's backbone. This digital transition necessitates IoT connectivity technology that covers a wide region, takes little setup time, and runs on low power. Non-Conventional energy based smart village innovation system using IoT technology that is done for developing the village with help of solar panels, windmills and sensors and Wi-Fi module. This proposed system is implemented with Arduino platform for monitoring the 3-phase current system, smart street light, electric fencing and garbage monitoring system with help of web server using IoT. The people can monitor the system from anywhere.

FUTURE ENHANCEMENT

Electricity can be stored in a hybrid storage system that collects energy from solar panels and wind turbines. This is beneficial in emergency and peak conditions. Electric fencing can be used to protect the farm field from cattle and other animals. The mains or battery power is converted into a high voltage pulse by an electric fence energizer. About once every second, the energizer sends a pulse to an insulated fence line. The pulse lasts around 150 microseconds. This pulse, known as the "shock," is felt by every animal that comes into contact with an electric fence. The circuit is complete when the animal makes contact with the fence. The animal receives a shock at this stage. Because an electric fence is a psychological rather than a physical barrier, the animal must be taught to respect it. The pain that an animal feels is very temporary and does not affect the animal physically.

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