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Lora Based Renewable Energy Monitoring System

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Abstract: *The world economy is growing rapidly, and global energy demands are predicted to increase even more in the future. Energy is expected to get more expensive, in turn affecting the economic development. Energy demand can be reduced by employing efficient Energy Management Systems (EMS). The development of wireless communication technology in the last decade has made wireless communication protocols exclusive in the domain of sensor networks. Existing trends have encouraged the use and implementation of many radio-based protocols due to fact that short-range the radio transmission is inexpensive, secure and easily available. Therefore, the objective of this project is to design and implement a LoRa based Wireless Sensor Network for conventional energy monitoring system capable of intelligently monitoring parameters such as wind and solar.*

Keywords: Component, Formatting, Style, Styling, Insert

I. INTRODUCTION

Present world rapidly moves towards the Renewable energy due to the quantitative and quality impact of fossil fuels on the environment. But using these natural resources as a clean energy requires lot of in between processes. Solar and wind are the most popular energy sources at present scenario due to the tremendous improvements in the area of power electronics and transmission systems. The space or land occupied by solar panels is more compared to wind turbine generator system. Since the wind energy system has upper hand over the solar system, monitoring of wind turbine system is important. Wind power plants are one of the top rising sources of power generation in the world today. So the need of proper operation and monitoring is mandatory for providing reliable and cost effective green energy.

In this system, we propose implementation methods to effectively construct energy monitoring system which is based on open IoT hardware and software platforms for economical system construction. And LoRa supporting low power long distance network is applied through low cost solution without base station of Telco's. The monitoring system proposed in this paper can be applied to the future energy IoT system because of the ease of implementation, reduced development cost and variety of applications. The IoT industry is bringing lots of technology and solutions to the market with chip manufacturers investing heavily in the market growing the industry exponentially. It isn't however without its challenges. One of the key challenges in building out the internet of things is ensuring that those "things" or end nodes are in fact able to communicate with the internet. The sheer number of current internet devices is massive and is expected to hit 25 billion by 2020. Any network that supports such an infrastructure needs to have the ability to handle the traffic. These issues don't include the fact that nodes need to run on some sort of battery power, have weak radios and also are limited in memory and processing power.

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II. MOTIVATION

The world economy is growing rapidly, and global energy demands are predicted to increase even more in the future. Energy is expected to get more expensive, in turn affecting the economic development. Energy demand can be reduced by employing efficient Energy Management Systems (EMS).

The development of wireless communication technology in the last decade has made wireless communication protocols exclusive in the domain of sensor networks. Existing trends have encouraged the use and implementation of many radio-based protocols due to fact that short-range the radio transmission is inexpensive, secure and easily available.

Therefore, the objective of this project is to design and implement a LoRa based Wireless Sensor Network for conventional energy monitoring system capable of intelligently monitoring parameters such as wind and solar.

III. LITERATURE SURVEY

Development of an online monitoring and control system for distributed Renewable Energy Sources (RES) based on Android platform. This method utilizes the Bluetooth interface of Android Tablet of Mobile phone, as a communication link for data exchange with digital hardware of power Conditioning Unit

This work[2] proposes a low-cost Wind turbine monitoring and control system with data logging facility. By the use of this proposed system, Parameters of the particular wind plant like amount of Power generation, Magnitude of instantaneous voltage and currents, level of vibration, Turbine speed, Humidity and Temperature can be monitored and used anywhere. In the proposed system Turbine control is adopted based on the turbine vibration level and IoT is implemented by using Raspberry Pi and Arduino microcontrollers.

This paper[3] presents a review of the challenges and the obstacles of IoT concept with emphasis on the LoRa technology. A LoRaWAN network (Long Range Network Protocol) is of the Low Power Wide Area Network (LPWAN) type and encompasses battery powered devices that ensure bidirectional communication. The main contribution of the paper is the evaluation of the LoRa technology considering the requirements of IoT.

In[4] paper, The Internet of Things (IoT) concept entails the connection of various devices to the Internet, thus providing remote monitoring and control services. This definition only refers to M2M (Machine-to-Machine) communications. The main contribution of the paper is the evaluation of the LoRa technology considering the requirements of IoT.

This work[5] presents the design and implementation of a wireless sensor network based on the LoRa protocol. Sensor nodes with embedded temperature, humidity, luminance, carbon monoxide, methane, alcohol and smoke detection sensors transmit the collected data to a base station (gateway) using LoRa. The base station collects all the data and uploads them to the cloud using GPRS, where data gathered is stored and processed in order to be accessible to users

This paper[6] provides an overview of LORA used in analyzing the air pollutants data from different sensors (CO2, NO, CO, Temperature and Humidity) and locations of those areas by GPS module. Using an ARM7 microcontroller as an intermediate device of controlling and converting the analog data to digital data, thereby the controller is connected to LORA device and finally there is a LORA transceiver (receiver section) which is connected to the LORA configured PC to store and analyzes the real time data for further use

IV. SYSTEM ARCHITECTURE

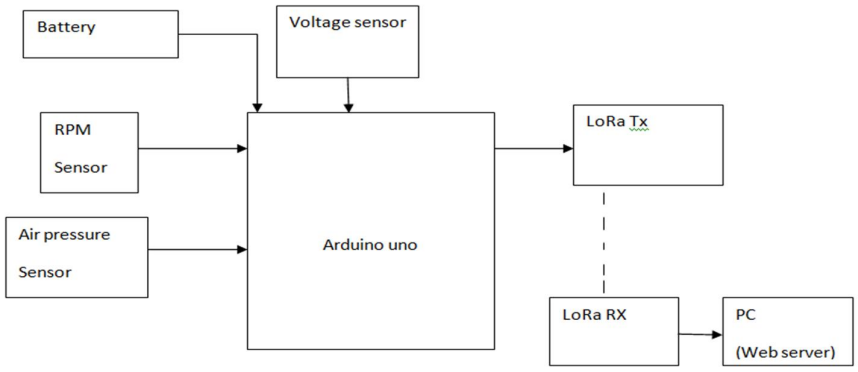

Figure 1: System Architecture

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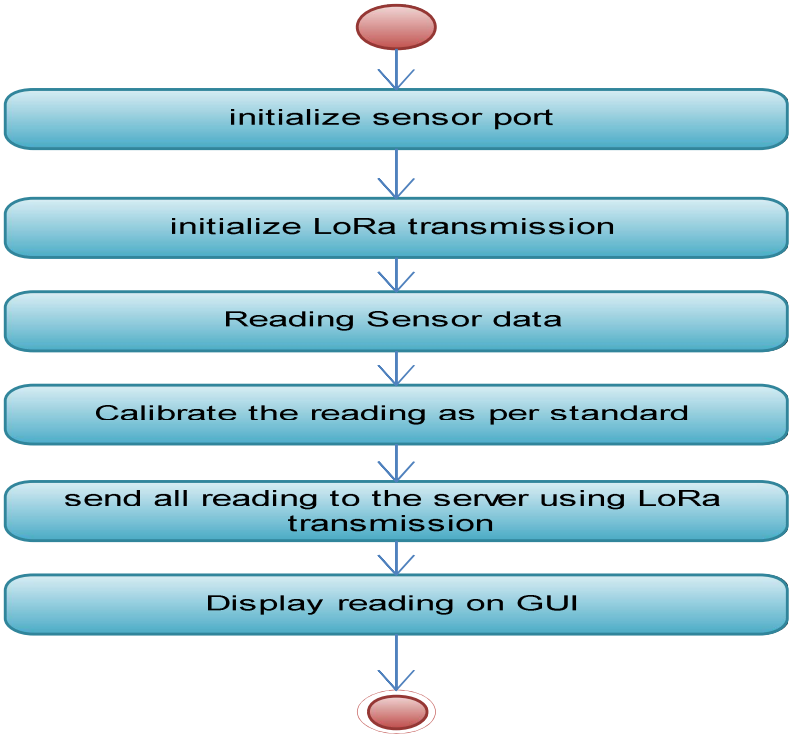

Figure 2: Flowchart

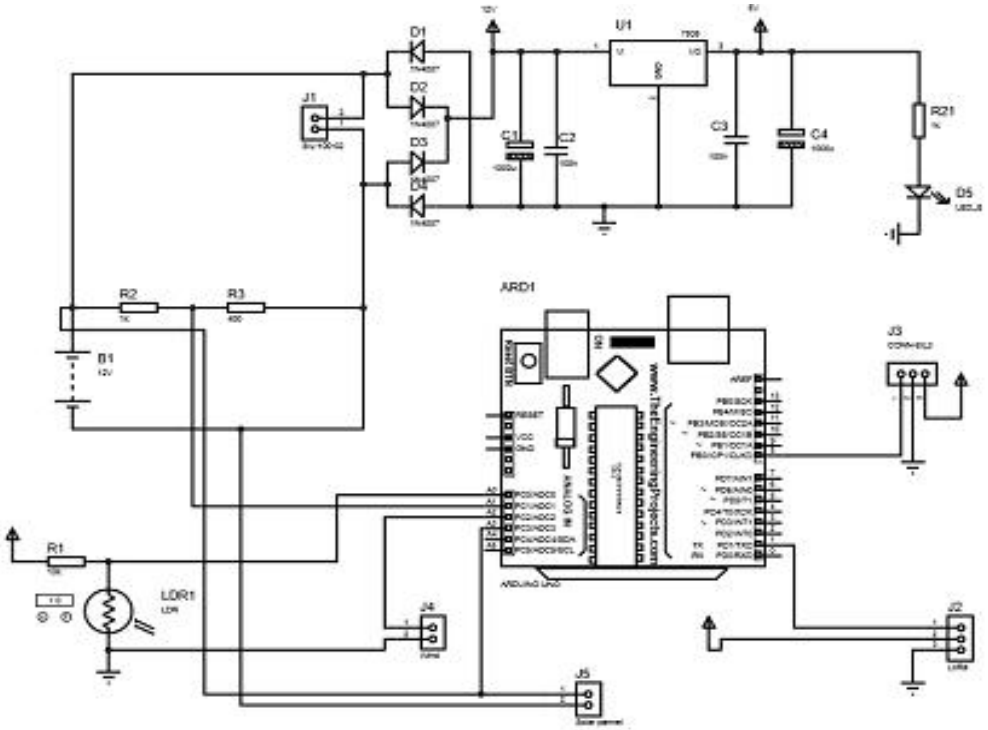

Figure 3: Circuit Diagram

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V. RESULT

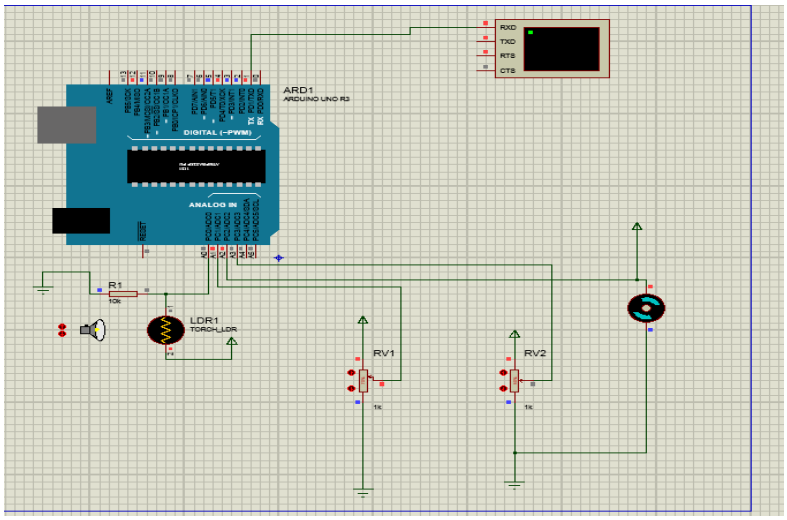

Figure 4: Simulation Result

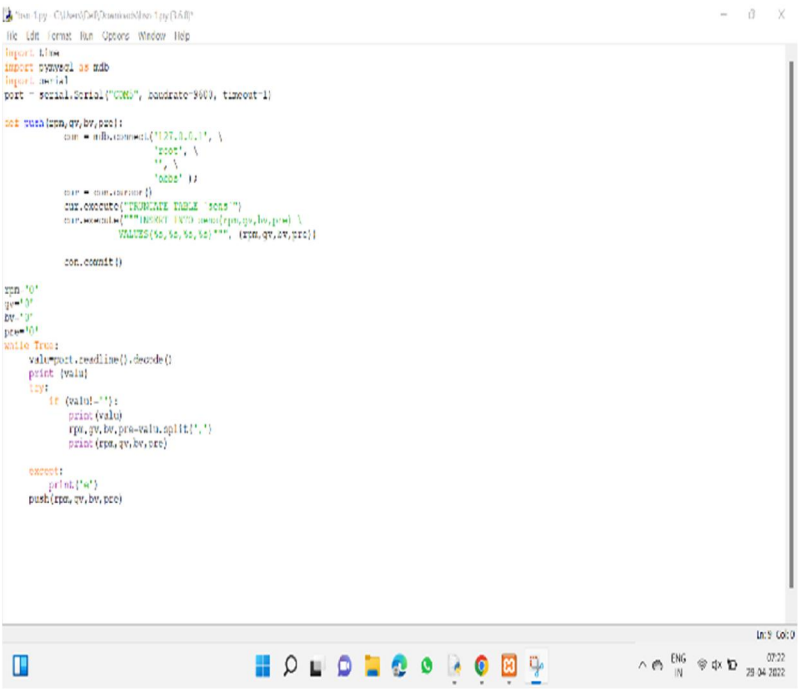

Figure 5: Backend Code GUI

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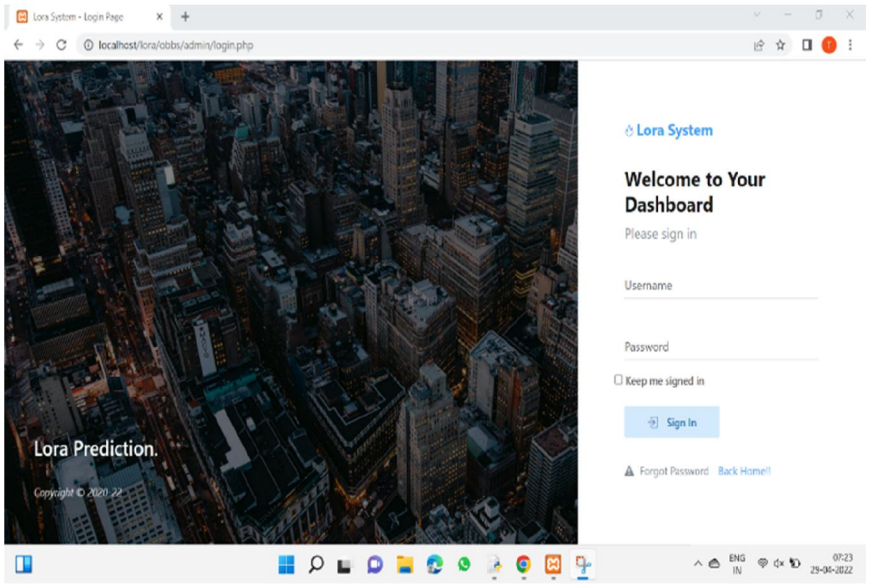

Figure 6: Login Page

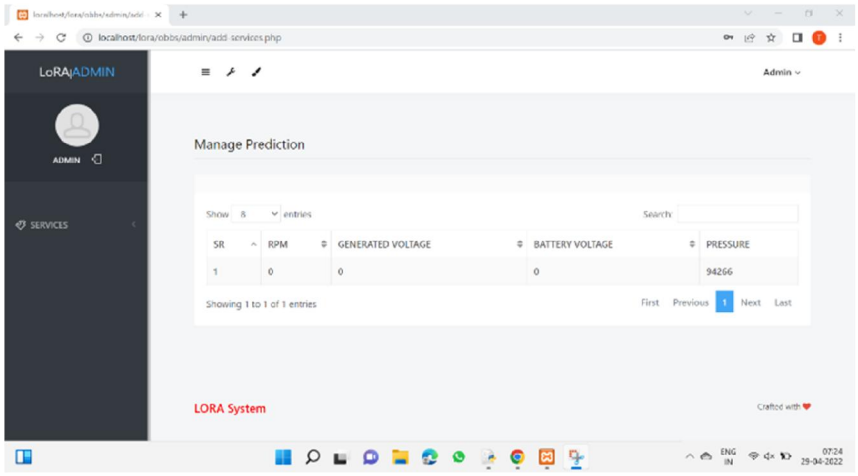

Figure 7: Parameter Reading Page

VI. Conclusion

In this work, we introduce a low-cost and efficient renewable energy monitoring system using open IoT platform such as Arduino. And our system implements the low-powered low-cost LoRa network without base station. We collect energy status data of wind power generation facilities and solar power generation facilities, and various analysis services are provided with web-based protocols. We are detecting the faults occurred in the system which in sense increase the efficiency of the whole system.

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