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DEVELOPMENT OF INTERNET OF THINGS BASED SMART WAREHOUSE MONITORING WITH EFFICIENT CLOUD ARCHITECTURES

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ABSTRACT--

A warehouse is a mercantile architecture for entry point of stuff. Warehouses are used by producers, dealers, traders, wholesalers, distributors, customs, etc. The use of a smart WMS is the cherry on top of all of new smart technology. This warehouse should be screened at regular intervals to reduce storage cost of food grains due to atmospheric conditions and are documented. With the enlargement of business and the continuous requirements of the food product multiplicity, traditional techniques of granule management prototype will not meet the requirements due to its heavy capacity and low proficiency. To mitigate the manual labor work and to make the work easier, a smart warehouse is implemented which is enabled with several sensors and technologies. This paper intends to develop an Internet of Things (IOT) based smart warehouse monitoring system. The network of sensors includes vibration, humidity, temperature, fire sensors done with the help of current technology (IOT). Arduino adopts IOT technology to convey the messages. Based on the sensor's data the appropriate data is captured and manipulated based on the limit given in the software and send timely information to the concern department officials of Central warehouse corporation (CWC) through SMS for moderation and corrective actions arising due to atmospheric conditions inside the warehouse. The system developed has great advantages compared with the traditional model in terms of cloud storage of the warehouse data.

Keywords: Internet of Things, Smart sensors, Smart warehouse, Embedded Systems, Node MCU, Cloud architectures.

I. INTRODUCTION

Internet of Things (IOT) based integrated management systems for warehouse tools are a cut above traditional ERP (Enterprise Resource Planning) systems. Instead of gathering inventory data manually, staff members can outsource the task to a range of connected sensors or RFID tags. The data is then stored on a cloud-based platform, processed and analysed. Warehouse is a large architecture where raw materials or manufactured goods may be stored prior to their distribution for sale. The main objective of this paper is to monitor the materials and goods in the warehouse by using or through the embedded technology to reduce the man power and losses. Sensors can be installed in various locations within the warehouse, and integrated using IOT technology through which all the shelves, racks, or pallets are connected. These sensors can detect

when an item is removed or added to a location, also track the movement of items around the warehouse remotely.

II. LITERATURE REVIEW

In the existing method they focus only on the fruits and vegetables in the warehouse. Fruits and vegetables are indispensable part of human life. This system comes with different sensors to monitor temperature, humidity, light sensor, gas sensor developed by using PIC Microcontroller 16F877A. Inside the ware house time and quality of the fruits are greatly influenced by the warehousing environment factors which are in need to monitor and analyze multiple parameters 24x7and remote manner data must be collected and then make the regulation and control accordingly. Then optimal storage conditions for fruit and vegetables so as to protect crops against loss of moisture, aging and decay which is very important to maintain. From the literatures M. E. Rana et.al[1] explained about, The IoT is one of the most promising technologies that help in managing, Controlling and improving the performance of the supply chain. It can be used for building a Smart WMS. This paper summarizes the architecture of IoT and impact when implemented in the supply chain. Pane, S. F, Awangga et.al[2] implemented about,The Logic Sector actors need innovation to improve Competitiveness in providing their best Services to Consumers, one of them on Warehouse Management .The System is used to Control the movement the supply chain. RFID Implementation on WMS becomes one of the solutions to handle the goods selection process. M. Budak et.al[3] studied about, The value of RFID technology is critical for the supply chain, especially in the wool yarn industry, due to the high levels of complicated distribution processes and logistics operations in wave house. Tejesh et.al[4] explained warehouse inventory management system is very efficient, it can perform dynamic data update and real time search operation from the data base with the help of web server. In this paper the RFID System of this proposed methodology is implemented. Yerpude et.al[5] gave Impact of data generated from Internet of things (IOT) demand Forecasting. Preliminary data on 80T based demand forecasting including the different types of data collection methods. Richard et.al[6] implemented the information technology system with Stock management. At WMS is essential in today's fast-moving environment. The introduction of a WMS can improve speed, productivity and accuracy is measured. Yan et.al[7] measured about, The internet of Things is one of the efficient ways to solve the problems on information sharing in the supply chain of agricultural products. Sahuriet.al[8] studied about, The warehouse management System (WMS) practices and their effects on operations. This study analyses the relationship between adoption of WMS to its impacts on business performance is studied. Qu et.al[9] explained Cloud manufacturing (CM) and Internet of things (IOT) are inter linked. Systematical CM Supports to respond to the real-time dynamics captured from the IOT Enabled Execution. The dynamic occurring in production logistics process this paper investigates a dynamic PL synchronization (PLS) of a manufactures adopting public PL services. Reaidy et.al [10] explained about, The Industrial deployment of 209 provides development of an ideal platform for decentralized management of warehouse. IOT-infrastructure for collaborative warehouse order fulfill on RFID, ambient intelligence and multi agent system. This approach was selected to improve reaction capabilities of decentralization management of warehouse in a dynamic environment.

Many cons are existed like utilization of micro equipment with complex structure, interfacing issue related to microcontroller to a better power device directly, Analog I/O Interface pins with limited number of executions as shown in figure.(1).

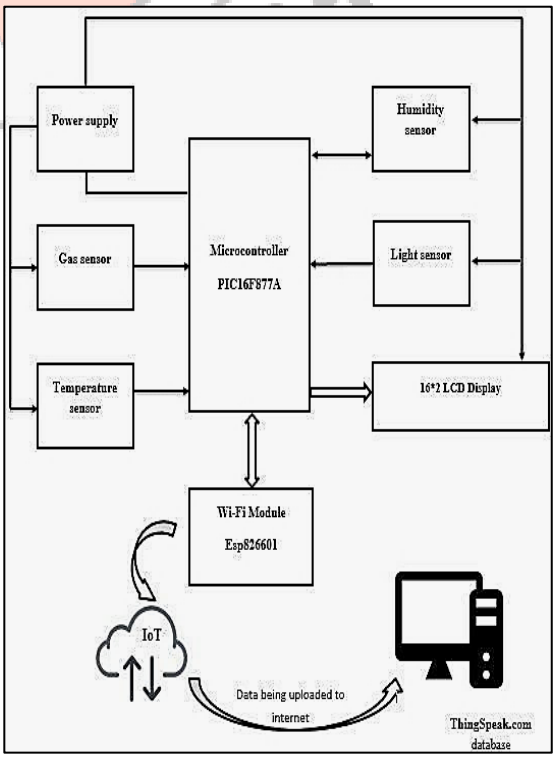


Figure.(1). Warehouse monitoring using PIC microcontroller

III. DESIGN IMPLEMENTATION

The proposed system comes with different sensors to monitor temperature, humidity, light intensity, fire detector, smoke or gas leakage detection and RFID to distinguish between items stored in warehouse. In this proposed design IR sensor is also added to detect unauthorized intruders into the warehouse. The fan, light and different equipment's can be controlled from the mobile app. All the data can be monitored using LCD and also the mobile app. Node MCU is an open source platform based on ESP8266 which can connect objects and data transfer using the wi-fi protocol by adding IR sensor, Vibration sensor, RFID reader to get better performance results.

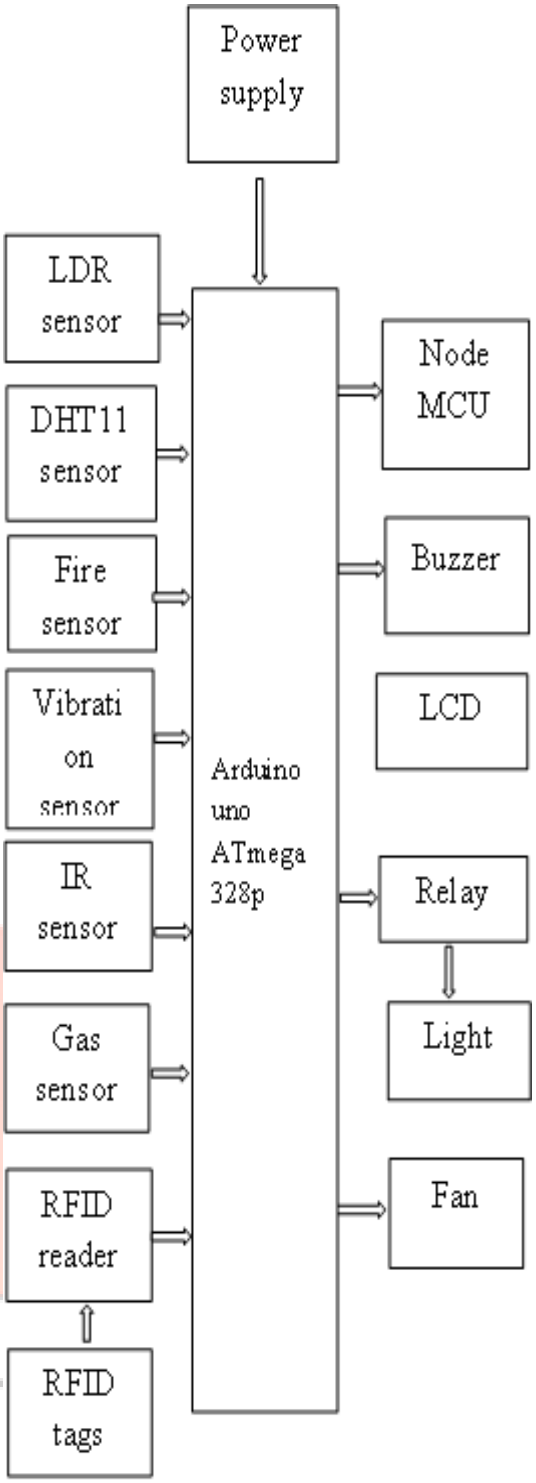


Figure.(2). Block diagram of SMART IOT based Warehouse system

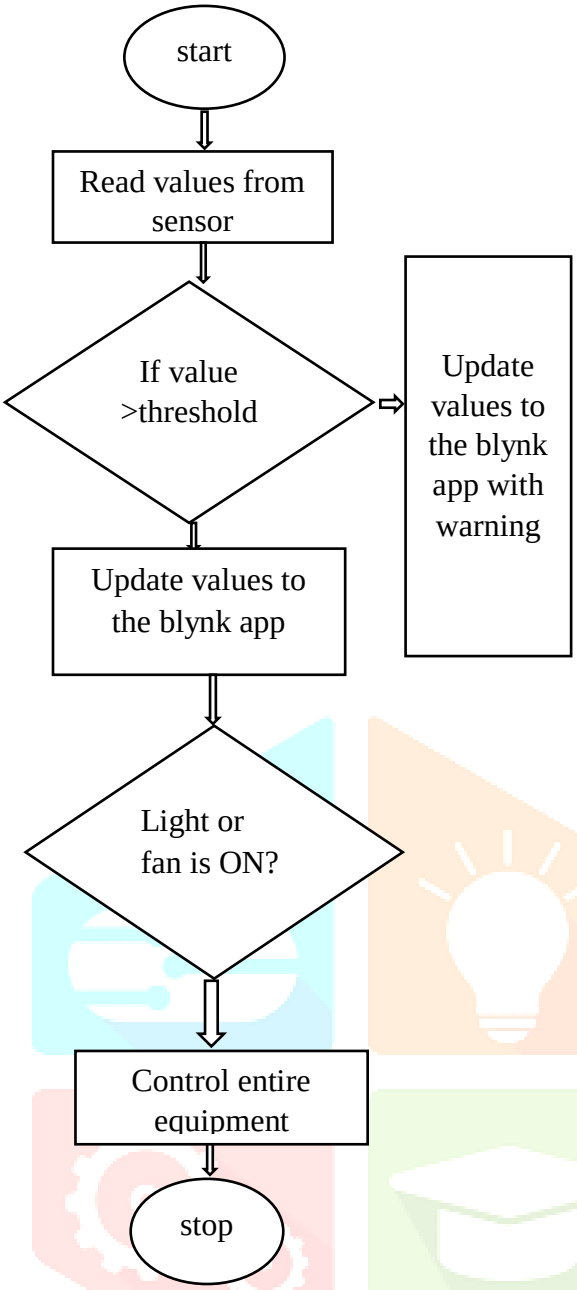
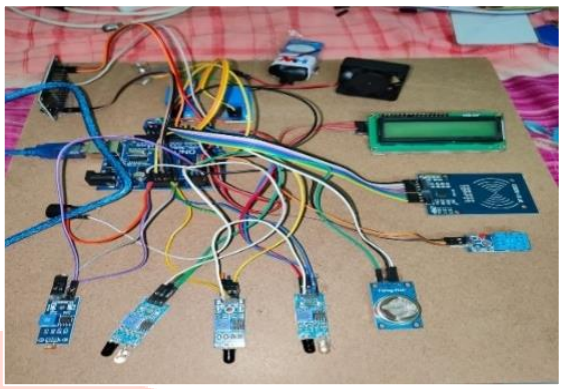


Figure.3 Flowchart of IOT architecture for warehouse system

By using Arduino Uno R3 ATmega328P processors are simpler to use more complex set of instructions can be handled. Lower cost implementation with built in power supply is possible, in which fully automation, precise location tracking, optimized warehouse operations with improved safety is designed as shown in the figure .3.

IV. Hardware RESULTS

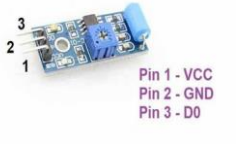
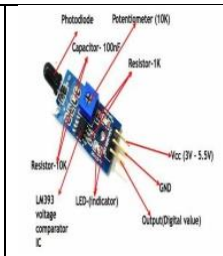
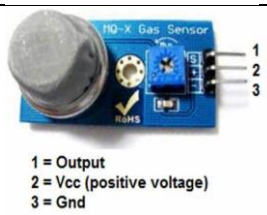
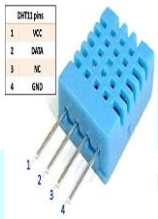
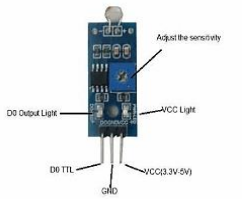
The hardware IOT architecture for warehouse system designed is as shown in figure 4.1 in which all the above shown sensors as shown in table (1) are embedded and programmed with suitable instruction sets in Embedded C.



Figure(4.1). Design of Hardware IOT architecture for warehouse system

Figure(4.2). Implementation of Vibration detection u sing Blynk app

Table.1 Components Used for the Design of smart warehouse IOT architecture

	Arduino Uno R3 ATmega328P		Vibration sensor		Fire Sensor
	Node MCU ESP8266		IR sensor		Buzzer
	RFID RC22		GAS sensor		CPU Fan
	DHT11 sensor		LDR sensor		LED bulb

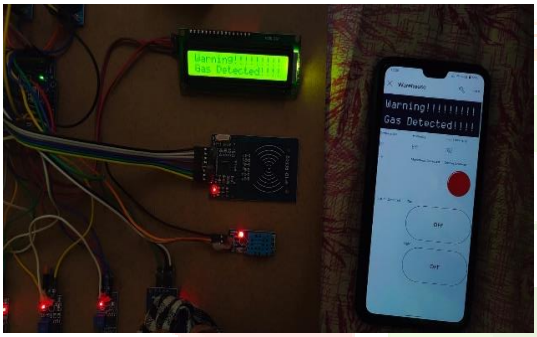


Figure (4.3) Implementation of Gas detection (ethyl alcohol) by using Blynk

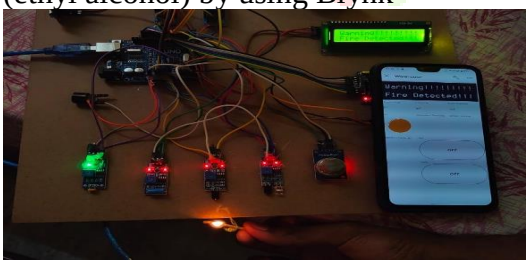


Figure (4.4)Implementation of Fire detection using Blynk app

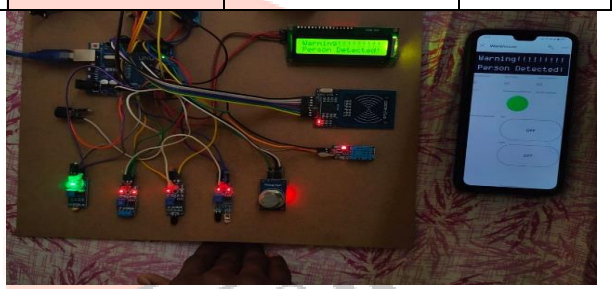


Figure (4.5) Implementation of Person detection using Blynk app

B. Implementation of RFID tags detection using Blynk app

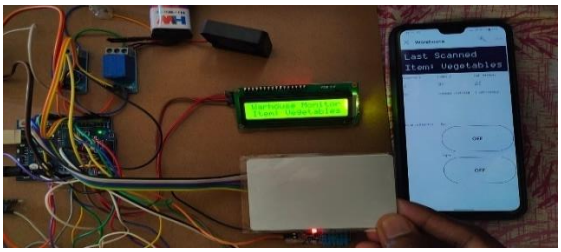


Figure (4.6.1). Implementation of Vegetable detection using Blynk app

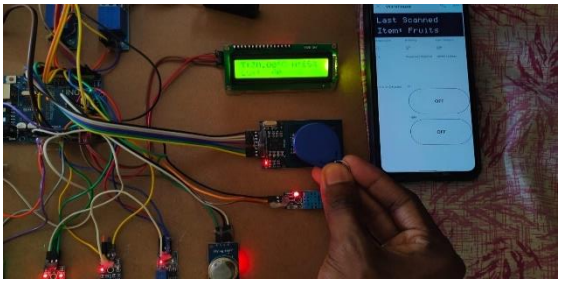


Figure (4.6.2). Implementation of Fruits detection using Blynk app

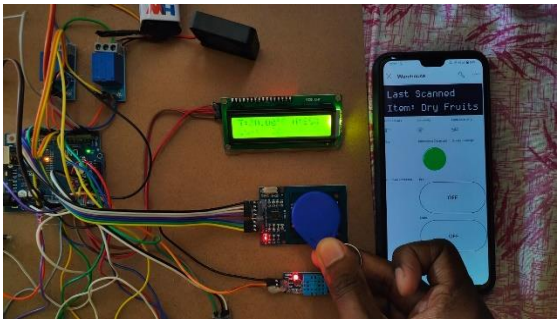


Figure (4.7). Implementation of Temperature and Humidity detection using Blynk app

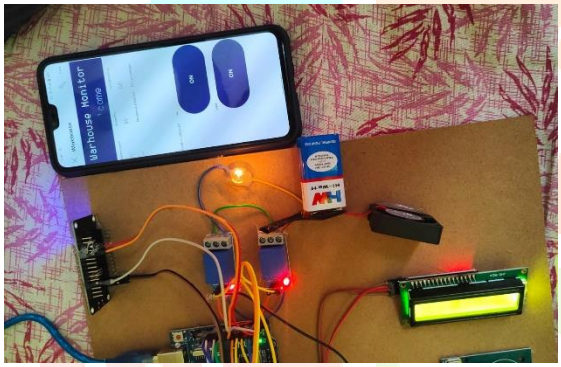


Figure (4.8). Implementation of Light and Fan using Blynk app

V.CONCLUSION

The real time monitoring on fruits warehousing environment promotes the upgrading of warehouse management system, leading to optimization guaranteed the safe storage of fruits and avoiding wastage of fruits may it be over a short term or a long term thereby avoiding unnecessary economic losses by considering the safe storage of fruits and vegetables which is needed to one's daily life and health aspects. Different sensors used in this project like fire sensor to detect the fire, gas sensor to detect the air quality and gas leakage, vibration sensor as shown in the results and figures[4.1-4.8] respectively. A specially designed blyink app is used to monitor all the data from sensor using IOT and also the user can control the appliances like light, fan in order to adjust the room temperature and humidity environment remotely.

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