IOT-BASED SMART AGRICULTURE USING SENSORS

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ABSTRACT

This paper explains how to build and integrate several sensors into a single board with minimal decoupling effect. Relays are integrated into the board during construction to minimize noise generation caused by high load consumption. I suggested employing sensor fusion technology because it has many uses.The suggested system is an AVR-based wireless sensor node with the ability to monitor a set of defined parameters continuously, deploy quickly, and extend battery life. The ESP8266 module used in this paper's IOT system facilitates data transmission from a remote farm location to the user. The sensor node is made up of several sensors that measure the soil moisture content, the intensity of the rain, the current used by the motor to calculate its dry-run and overload conditions, and it also assists in delivering information about the motor's current consumption.

1.AIOT INTRODUCTION

Artificial Intelligence is a subfield in technology associted with the development of machine intelligence The IoT is a network of physical objects or "things" embedded with electronics, software, sensors and Internet access. The Internet world is a concept. In this concept, all kinds of physical objects in the world are connected to the Internet. In this cyber world, information is exchanged between all kinds of physical objects and people through which data can be collected and exchanged. Through this, there is an opportunity to create direct integration between the physical world and computer systems. This leads to efficiency improvement, accuracy and economic proof. Each item shall be electronically embedded so that it can be individually identified; These will be aligned with the existing web framework. Scholars estimate that by 2020, 50 billion items will participate in the Internet world. The market value is estimated at 80 billion dollars.

AIoT-*Artificial Intelligence of Things* . The AIoT is the fusion of innovation in Artificial intelligence with the IoT framework to accomplish more effective IoT tasks, further refinement in human-machine interconnection, magnifies information management and problem-solving. The figure.1 shows the differences between IOT with AIOT and IIOT. AIoT can transform the IOT information into valuable data for improvised decision-making for all on-site and remote.

The IOT industry has advanced quickly in recent years. Though IOT has been implemented in agriculture, it has not been able to fully develop as the technology advancement has not been accessible by the farmer in any sector, starting from smart cities to smart villages. A single board has several sensors built into it for this purpose, but it also necessitates using multiple farm applications. Due to their location in rural areas, farms in agriculture are challenging to access and manage at irregular hours. Motor damage is also caused by farm current variations. I suggested designing a current sensor integrated with a relay to control the motor in order to avoid these issues. When compared to other microcontrollers, the AVR microcontroller is employed as it is an idle alternative for low current consumption.

2. Literature Survey

Prof. R. R. Jadhav, Pratmesh P. Pandit, and Shubham P. Pal used GSM technology to control three phase motors, but this has the drawback of not covering all of the three phase motor's utilities. Additionally, they have not made any indication of the GSM module's type.

The key benefit of this study, according to Jaypal J. Ravibhaskar, Afshan Y. Mulla, and Amol J. Baviskar, is that it focuses extensively on the latency involved in carrying out the entire process of control operation. They have hinted that soil moisture detection is necessary for efficient irrigation because their focus is on effective irrigation systems. However, they don't pay attention to the loads produced by the three-phase induction motor.

In particular in South Africa, Mr. AJJ Mouton, Prof. C Smith, and Mr. G.E Smith have suggested that technology is used in large-scale farming. They also suggested using the same GSM, but they used SCADA for communication in big fields and they concentrated on motor protection by focusing on relay loads. This technology is especially helpful in portraying isolated locations with very limited accessibility. Professor and Dr. R. S. Kawitkar, NikeshGondchawar.The project's contains a smart, GPS-based remote-controlled robot that can be used for duties like weeding, spraying, moisture detecting, scaring off birds and other animals, keeping watch, etc. Second, it comprises intelligent decision-making based on precise

real-time field data, intelligent control, and smart irrigation. Thirdly, smart warehouse management that incorporates warehouse theft detection as well as temperature and humidity control

3.PROPOSED METHOD

An efficient IOT based technique is proposed here to make agricultural system mechanized and sophisticated.This automated system built on the Internet of Things is a fairly new technology for smart farming.It is beneficial to keep on monitoring our field from a distance to collect data for later research.

INPUT DEVICES

Different kinds of sensors and transducers are employed as input devices to detect the state of the physical environment, the condition of the soil, and other helpful farm statuses and transmit them to the processor.

OUTPUT DEVICES

Devices that perform actions or deliver information to the user are considered output devices.

for example

Display: It enables the user to view useful information in a visual format.

Buzzer: Aids in alerting.

Relay Circuit: This device is employed as a driver to operate other machines or equipment, such as the water pump.

NETWORK MODULES

Network modules make it possible for a remote device, like a smartphone, to communicate with a processing equipment (like an Aurdino, for example).

GSM Module: It aids in establishing an internet connection for the Arduino. Therefore, we have global access to communicate or keep an eye on our farm.

Wifi Module: It supports cloud storage and wireless communication from nearby locations.

How Does the System Operate?

For instance, we have Internet connectivity for our smartphones. Now, a smartphone application allows us to view every aspect of our farm's state. We could, for instance, see if the water level is alright. For the water level sensor, it is conceivable. The Aurdino will transmit the data to our phone after receiving it from the water level sensor. If the water level is low, we instruct our smartphone to turn on the water pump. As a result, the Aurdino will get the order

and turn on the relay switch to activate the water pump. Once more, the Aurdino will get a signal from the water sensor when the water is full and will then communicate a status to our phone.

Once more, the watersensor will alert the Arduino when the water is full, and the Arduino will notify our phone when the water is full.The water pump can now be stopped with a command. The Aurdino will stop the water pump using the same procedure.All of the sensors and transducers installed on the farm will therefore transmit data via the Arduino. We are able to access and store all the data from anyplace.The system flow is shown in figure 1

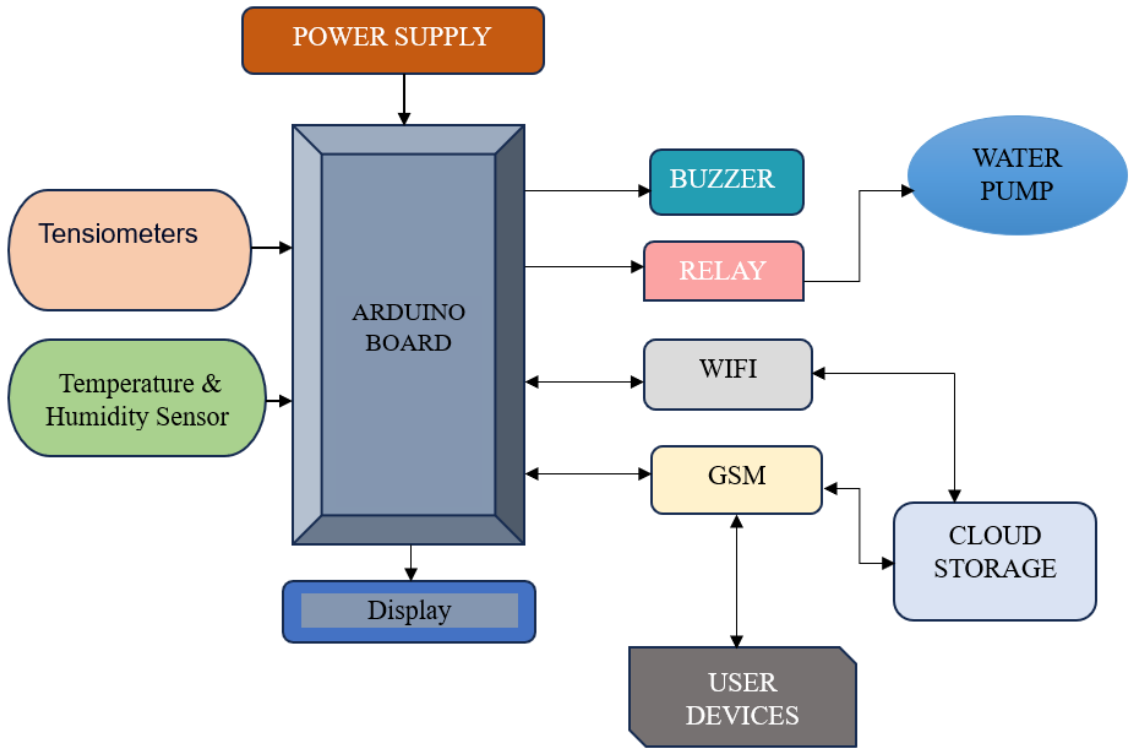

Figure 1 proposed model

4.HARDWARE SYSTEM

ARDUINO

An open-source hardware and software startup called Arduino creates and produces single-board microcontrollers and kits for creating digital devices. The boards they created are known as Arduino boards, and they are able to take inputs like radar-based department information,

light on a sensor, button presses, etc. and convert it into outputs like turning on led lights, motors, buzzers, etc.

The Arduino board comes in a variety of shapes and sizes, such as Nano, Uno, Atmega, etc., and is available in the market. Additionally, it offers a Software IDE for its boards that assists the developer in programming the board in a language. This IDE also gives the user the freedom to input commands straight from the system.Figure 2 shows the Arduino board.

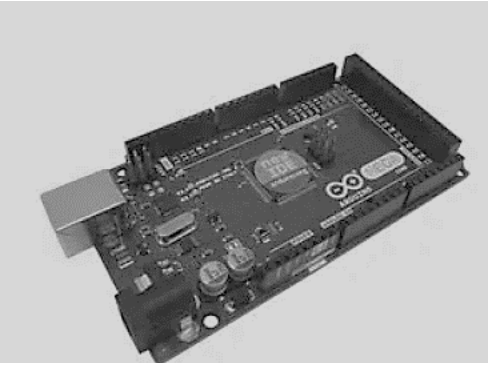

Figure 2: Arduino board(from internet)

Oled:

The Oled has been utilized to display the motor's current state and current consumption, making it easier for farmers to understand and obtain the information because we are employing a separate keypad panel.

keypad panel:

The motor's HP was chosen using the panel, and the current calculation will be made in accordance with that choice. The specifics of the current calculation will be discussed later.

Soil Moisture Sensor:

The farm's moisture content was determined using the soil moisture sensor, which also provided the user with updated information.

Rain Drop sensor:

The motor has been controlled in accordance with the rain's strength using the rain drop sensor.

Current sensor:

To determine and regulate the motor's current consumption, the current sensor was created utilizing a hall effect sensor.

Relay:

The motor's activity is being controlled by a 30A DOAT relay. 30 Peak current can be tolerated in the early phases by a relay.

Altium Designer:

The PCB was designed using Altium software, and sensor fusion technology was used to address noise issues.

ESP8266:

It functions as a WiFi module to collect sensor data, send it to the user, and regulate the motor automatically. It also enables farmers to reach their farms from distant locations.The proposal's working has been explained using the generic block diagram, which covers all of the hardware components shown in figure.3.

Figure 3.ESP826(INTERNET SOURCE)

5.INTEGRATION OF SYSTEMS

Altium software has been utilized to build the schematic and pcb layout for effective system integration. There are two sections to the system integration. One is a farm board, the other is a motor board.

Integration of the motor board:

The current used by the motor has been measured using the current sensor. Calculate the current used depending on the motor's horsepower before turning the motor off. Most agricultural fields employ motors with 3 to 5 HP.

Case1.

Ac power used=3*746=2238w

We should determine the current consumption based on the watts as stated below.

Motor current consumption at 100% efficiency=(2238/230)=9.7A

By examining the data sheet, we should be able to determine the motor's efficiency, which is likely to range between 60% and 80%.

Motor current consumption at 60% efficiency= (9.7A/0.6) =16.6A

Motor current consumption at 80% efficiency =(9.7A/0.8)=12.1A

A 3 HP motor is regarded to be overloaded if its current consumption is greater than 16.6 A, and it is considered to be dry-loaded if it is less than 9. 7 A.

Cloud:

The Thing Speak cloud has been utilized to continuously monitor the data from the hardware, such as the motor. It designs a graph using the calibrated data, and the values based on the graph are shown in the image below.

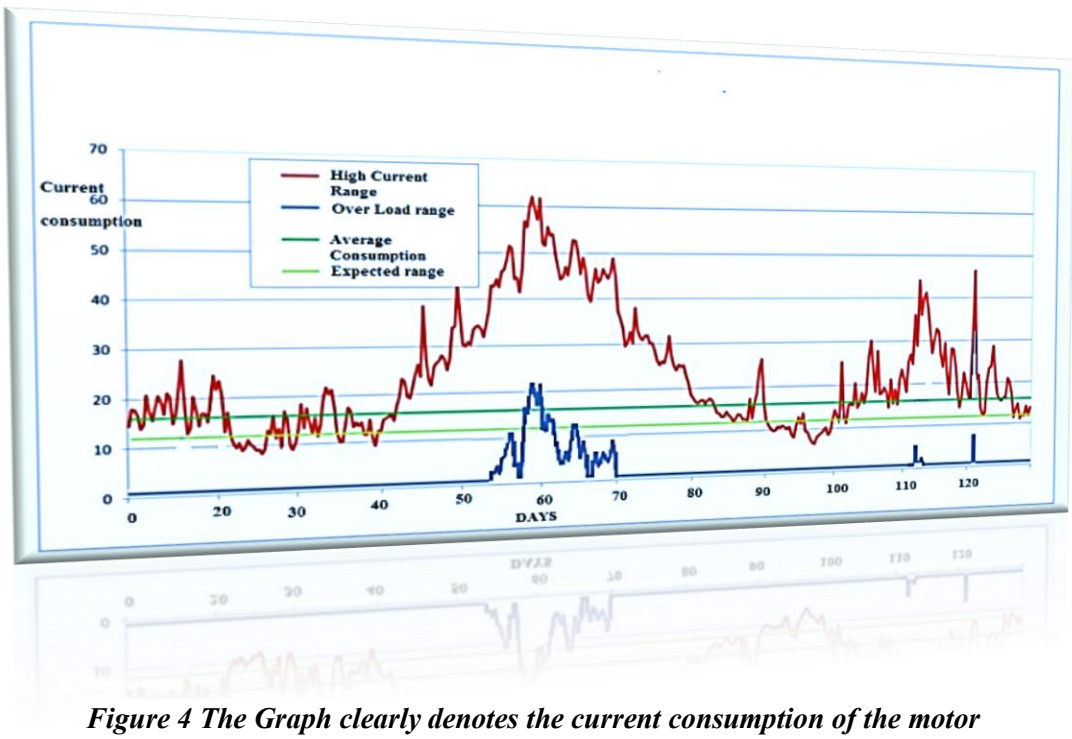

Figure 4 The Graph clearly denotes the current consumption of the motor

The graph clearly indicates the motor's current consumption as well as the precise moment that the range exceeds, or when it is overloaded shown in figure 4.

Results:

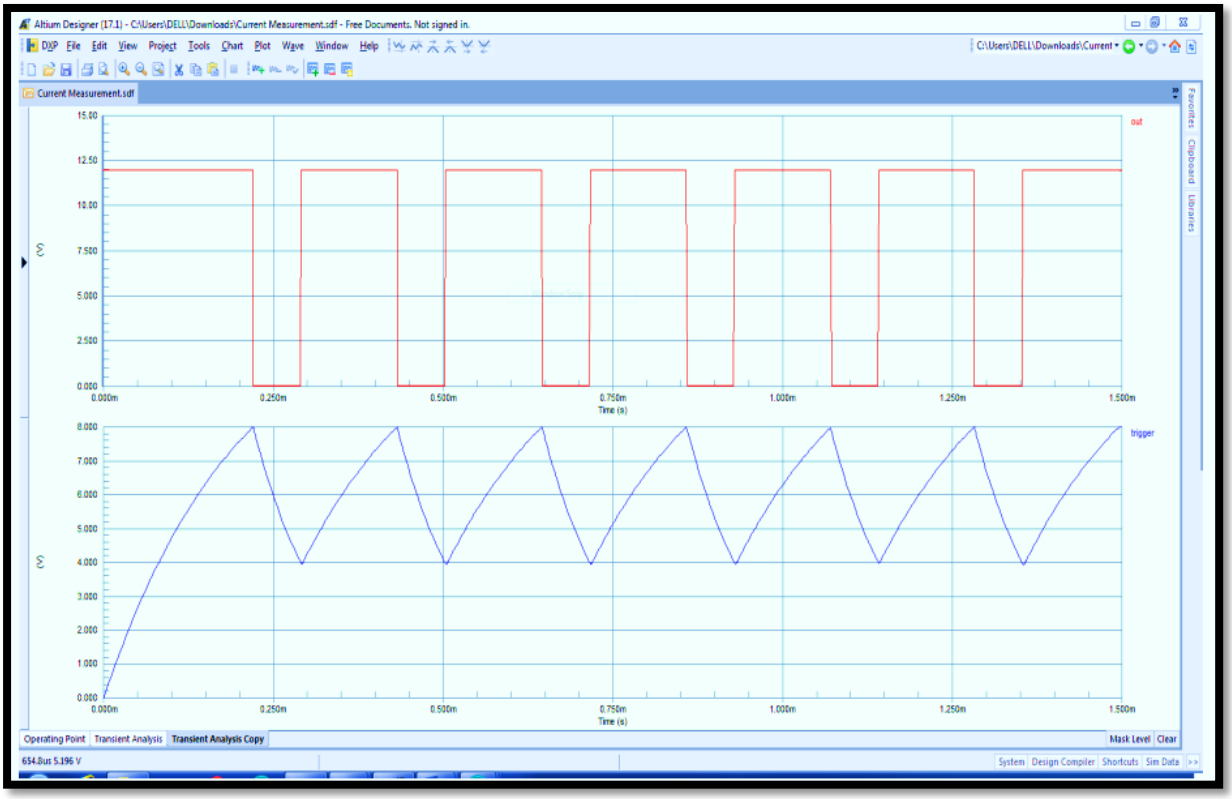

Figure 5 Results of the proposed system

6.CONCLUSION

Agriculture is being replaced and improved over time by more advanced and precise digital and electronic devices. A significant portion of agricultural earnings is lost due to improper practices and power outages. Smart sensors are used to lessen this.The suggestion is to carry out agriculture in a smarter, more effective manner. This approach also promotes the adoption of the Internet of Things. The board's power usage and all other information will be given to the farmers as feedback. for instance, energy use, temperature, and soil moisture content.

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