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# Multiple Tasks of IOT based Smart Security and Monitoring Devices for Agriculture

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ABSTRACT:The project is embedded based IOT system for security and monitoring system for agriculture. It offers a cheaper and simple operation to perform by a farmer. In agriculture contains several problems in indoor and outdoor can be classified is resolved in the project. The information of indoor and outdoor are obtained by using Bluetooth module and gsm.in indoor section we used an IR sensor, PIR sensor, ultra sonic sound repeller and temperature sensor. Those sensors are to give multiple information's like intruder or animal detection, room temperature and human counting. In outdoor section we used moisture sensor, LDR sensor, and level controller. On the outdoor section we obtain information's like soil moisture plant growth and water irrigation. Both section of information's we can monitor and secure the agriculture field. Both sections are connected with an interface of Bluetooth, controlled and monitor by a computer using IOT.Those can resolve some major problems.

**KEYWORDS**: IOT, Arduino, Sensors, Soil moisture, Bluetooth, Thermal detection.

## I. INTRODUCTION

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But where ever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. Most of the papers signifies the use of wireless sensor network which collects the data from different types of sensors and then send it to main server using wireless protocol. The collected data provides the information about different environmental factors which in turns helps to monitor the system. Monitoring environmental factors is not enough and complete solution to improve the yield of the crops. There are number of other factors that affect the productivity to great extent. These factors include attack of insects and pests which can be controlled by spraying the crop with proper insecticide and pesticides. Secondly, attack of wild animals and birds when the crop growsup. This paper therefore proposes a system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. The paper aims at making agriculture smart using automation and IOT technologies. Secondly, it includes smart Irrigation with smart control based on real time field data. Thirdly, advancewarehouse management which includes; temperature maintenance, person counting and theft detection in the warehouse. It provides an alternative to a primitive method of irrigation in which an alarm intimates a farmer when water reaches a certain level of the tank. The farmer then shuts off the alarm manually and closes the water inlet to stop the supply. Leakage of water from the tank or a damaged alarm can result in wastage of a valuable resource. The proposed system will allow farmers to continuously monitor the water levels inside the water tank and the moisture level in the field, controlling the supply remotely over the internet. When moisture goes below a certain level, sprinklers would be turned on automatically, thus achieving optimal irrigation using Internet of Things.

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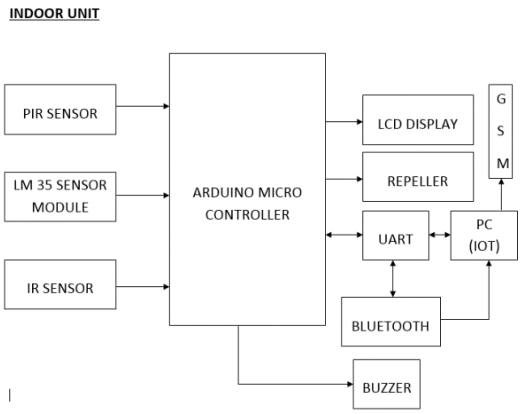
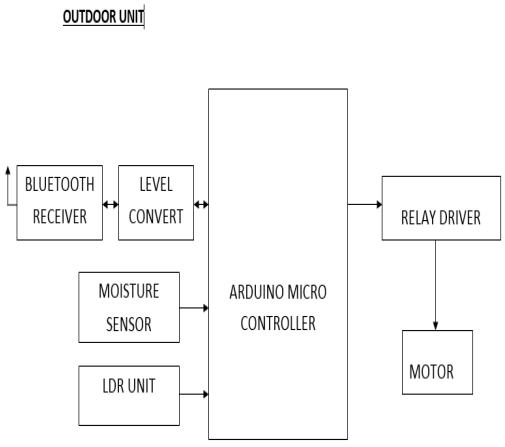
## II. SYSTEM OVERVIEW

The PC or mobile app to control system. In the present system, there are two units is integration with different sensors and devices and they are interconnected to one central server via wireless communication modules. The server sends and receives information from user end using internet connectivity. There are two units of operation of the system; in indoor unit that aims for securing a warehouse from insects or animals, theft detection and temperature maintanence.in outdoor unit it maintains water level management, plant growth and moisteninglevel. Both indoor and outdoor unit are Bluetooth interfacing with microcontroller to the PC and connected with IOT and GSM module.it control with PC itself.

## III. ARCHITECTURE OF THE SYSTEM




The above block diagram is Indoor unit will be present on the warehouse. It consists ofmotion detector, light sensor, temperature sensor, ultrasonic sound repelleraltogether interfaced with arduino micro controller.Motion detector will detect the motion in the room when security mode will be ON and on detection of motion, it will send the alert signal to user via ardunio microcontroller and thus providing theft detection.Temperature sensor a senses the temperature respectively and if the value crosses the threshold then room heater or cooling fan will be switched ON/OFF automatically providing temperature.



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The above block diagram is for outdoor unit. It is a smart system with features like;control of water pump based on real time field data i.e. automatically turning ON/OFF the pump or gave an alert or message to the user after attaining the required soil moisture level in auto mode, switching water pump on/off remotely via mobile or computer in manual mode, and continuous monitoring of soil moisture. Moisture sensor transmits the data using bluetooth transmitter. The transmitted data is received by data and there it is processed by microcontroller in order to control the operation of water pump. Also the Plant growth monitoring system has been present, the plants growth can be measured and monitored constantly with regular updates to user monitoring system, here the LDR sensor measures the light reflections on leafs and colour of leafs can be classified as plants growing rate.

Hardware used:

a) AVR Microcontroller Atmega 16/32:

The microcontroller used is, Low-power AVR® 8-bit Microcontroller, having 8K Bytes of In-System Self programmable Flash program memory, Programmable Serial USART, 8-channel, 10-bit ADC, 23 Programmable I/O Lines.

b) Temperature Sensor LM35:

The LM35 is precision IC temperature sensor. Output voltage of LM35 is directly proportional to the Centigrade/Celsius of temperature. The LM35 does not need external calibration or trimming to provide accurate temperature range. It is very low cost sensor. It has low output impedance and linear output. The operating temperature range for LM35 is −55˚ to +150˚C. With rise in temperature, the output voltage of the sensor increases linearly and the value of voltage is given to the microcontroller which is multiplied by the conversion factor in order to give the value of actual temperature.

c) Moisture sensor:

Soil moisture sensor measures the water content in soil. It uses the property of the electrical resistance of the soil. The relationship among the measured property and soil moisture is calibrated and it may vary depending on environmental factors such as temperature, soil type, or electric conductivity. Here, it is used to sense the moisture in field and transfer it to microcontroller in order to take controlling action of switching water pump ON/OFF.

d) IR sensor:

**Infraredradiation** (IR) is electromagnetic radiation with a wavelength between 0.7 and 300 micrometres, which equates to a frequency range between approximately 1 and 430 THz. Its wavelength is longer (and the frequency lower) than that of visible light, but the wavelength is shorter (and the frequency higher) than that of terahertz radiationmicrowaves. Bright sunlight provides an Irradiance of about 1 kilowatt per square meter at sea level. Of this energy, 527 watts is infrared light, 445 watts is visible light, and 32 watts is ultravioletlight. Infrared imaging is used extensively for military and civilian purposes. Military applications include target acquisition, surveillance, and night vision, homing and tracking. Non-military uses include thermal efficiency analysis, remote temperature sensing, short-ranged wireless communication, spectroscopy, and weather forecasting. Infrared astronomy uses sensor-equipped telescopes to penetrate dusty regions of space, such as molecular clouds; detect cool objects such as planets, and to view highly red-shifted objects from the early days of the universe.

e)PIR sensor:

A **Passive Infrared sensor(**PIR sensor**)** is an electronic device that measures infrared (IR) light radiating from objects in its field of view. PIR sensors are often used in the construction of PIR-based motion detectors (see below). Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall. All objects emit what is known as black body radiation. It is usually infrared radiation that is invisible to the human eye but can be detected by electronic devices designed for such a purpose. The term passive in this instance means that the PIR device does not emit an infrared beam but merely passively accepts incoming infrared radiation. “Infra” meaning below our ability to detect it visually, and

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"Red" because this color represents the lowest energy level that our eyes can sense before it becomes invisible. Thus, infrared means below the energy level of the color red, and applies to many sources of invisible energy.

f) LDR sensor:

A**Light Depended Resistor** or photo resistor is made any semiconductor material with a high resistance. It has a high resistance because there are very few electrons that are free and able to move - the vast majority of the electrons are locked into the crystal lattice and unable to move. Therefore in this state there is a high LDRresistance. As light falls on the semiconductor, the light photons are absorbed by the semiconductor lattice and some of their energy is transferred to the electrons. This gives some of them sufficient energy to break free from the crystal lattice so that they can then conduct electricity. This results in a lowering of the resistance of the semiconductor and hence the overall LDRresistance. The process is progressive, and as more light shines on the LDR semiconductor, so more electrons are released to conduct electricity and the resistance falls further.LDRs are very useful components that can be used for a variety of light sensing applications. As the LDR resistance varies over such a wide range, they are particularly useful, and there are many LDRcircuits available beyond any shown here. In order to utilize these components, it is necessary to know something of how an LDR works.

g)LCD:

A **Liquid Crystal Display** (LCD) is an electronically-modulated optical device shaped into a thin, flat panel made up of any number of colour or monochrome pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power. LCD has material, which continues the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered from similar to a crystal. LCD consists of two glass panels, with the liquid crystal materials sandwiched in between them. The inner surface of the glass plates is coated with transparent electrodes which define in between the electrodes and the crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. When a potential is applied across the cell, charge carriers flowing through the liquid will disrupt the molecular alignment and produce turbulence. When the liquid is not activated, it is transparent. When the liquid is activated the molecular turbulence causes light to be scattered in all directions and the cell appears to be bright. Thus the required message is displayed. When the LCD is in the off state, the two polarizer's and the liquid crystal rotate the light rays, such that they come out of the LCD without any orientation, and hence the LCD appears transparent.

h) Bluetooth:

This version of the Bluetooth Core Specification was released in 2004 and is backward compatible with the previous version 1.2. The main difference is the introduction of an Enhanced Data Rate (EDR) for faster data transfer. The nominal rate of EDR is about 3megabits per second, although the practical data transfer rate is 2.1 megabits per second. EDR uses a combination of GFSK and Phase Shift Keying modulation (PSK) with two variants, π/4-DQPSK and 8DPSK. EDR can provide a lower power consumption through a reduced duty cycle. The specification is published as "Bluetooth v2.0 + EDR" which implies that EDR is an optional feature. Aside from EDR, there are other minor improvements to the 2.0 specification, and products may claim compliance to "Bluetooth v2.0" without supporting the higher data rate. At least one commercial device states "Bluetooth v2.0 without EDR" on its data sheet.

i) Internet of Things:

The term "Internet of Things" to refer inter connected devices[3]. It's a major tech revolution in information and communication technology with updated infrastructure and networks where all the connected devices are able to identify and communicate with each other [4]. According to Gartner, in near future, about 25b identifiable devices are expected to be a part of this computable network by year 2020 [5]. Thus, agriculture can be a vast area to integrate Internet of Things with distributed autonomous sensors to monitor environmental condition of grain stores and to analyse data and pass theinformation to remote user.

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Software used:

a) AVR Studio Version 4:

It is used to write, build, compile and debug the embedded c program codes which are needed to be burned in the microcontroller in order to perform desired operations. This software directly provides .hex file which can be easily burned into the microcontroller.

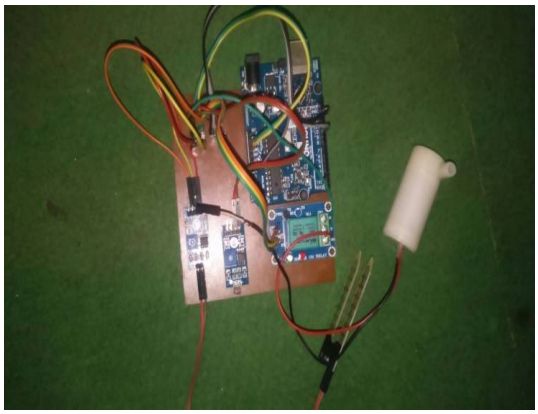
b) Proteus 8 Simulator:

Proteus 8 is one of the best simulation software for various circuit designs of microcontroller. It has almost all microcontrollers and electronic components readily available in it and hence it is widely used simulator. It can be used to test programs and embedded designs for electronics before actual hardware testing. The simulation of programming of microcontroller can also be done in Proteus. Simulation avoids the risk of damaging hardware due to wrong design.

c)Labview:

Labview is a laboratory virtual instrumentation engineering workbench. It is an integrated development environment designed specifically for engineers and scientists building measurement and control systems. Withan instrumentation a native graphical programming language, built-in IP for data analysis and signal processing, and an open architecture that enables integration of any hardware device and any software approach, Labviewis the software you need to build the optimal solution that can meet your custom requirements and solve the challenges at hand.

## IV. EXPERIMENTATION AND RESULTS



As shown in above figure, it is an outdoor unit it consists of motion detector, temperature sensor, humidity sensor,water pump, etc. connected to the microcontroller board.The sensors gives input to the controller and according to that microcontroller controls the devices in auto mode and also sends the value of sensors to Test results shows that when temperature level increases above preset threshold level then cooling fan is started automatically in auto mode.The water pump also gets turned ON if moisture level goes below fixed threshold value. As shown in above figure, consists of a moisture sensor connected to HT12E. Moisture sensor transmits the data using HT12E Encoder IC and a RF transmitter to the Node2 where it is processed by microcontroller and accordingly water pump is switched ON/OFF.

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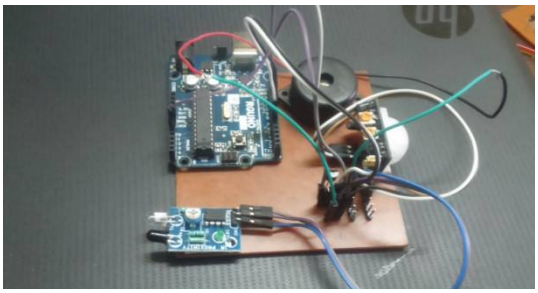

As shown in above figure, it is an indoor unit it consists of PIR sensor, IR sensor it counts the number of intruders enter into room or stores, it consists ultrasonic sound repller itgives sound to avoid the animals and it consists temperature sensor it maintains the room temperature this outdoor unit focuses on secure the warehouse management from thief and animal detection, monitor of the room temperature.

## V. CONCLUSION

The sensors and microcontrollers of two units are successfully interfaced to PC and IOT is achieved between various units. All observations and experimental tests proves that project is a complete solution to field activities, irrigation problems, and storage problems , smart irrigation system and a smart warehouse management system respectively. Implementation of such a system in the field can definitely help to improve the yield of the crops and securing the warehouse.

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