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RESEARCH ARTICLE

INTELLIGENT FIELD AUTOMATION SYSTEM

Mr. Antony P. James[1] and Dr. V. Sidharthan[2]

1. Research Scholar, Department of Electronics, Sri Ramakrishna College of Arts and Science (Autonomous), Coimbatore, Tamilnadu, India.
2. Asso Prof & Head, Department of Electronics, Sri Ramakrishna College of Arts and Science (Autonomous), Coimbatore, Tamilnadu, India.

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Abstract

The economy of India is a developing diverse economy. Nowadays, India grades second worldwide in farm production. Farming and connected areas like forestry and fisheries accounted for 13.7% of the GDP (gross domestic product) in 2013, about 50% of the workforce. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Agriculture is the broadest economic sector and it has an importantplace in the overall socio-economic fabric of India.The prime concern being played is that deficiency of water, not just any water, but potable water. Agriculture automation [1] is the procedure of using several technical apparatuses to improve and automate agricultural dealings. This toolis essentially proposed to improve the labor-intensive and time-consuming agricultural procedures that farmers all over the world face. Farmers may gain more time and resources to devote in their properties with the support of farm automation and agriculture technology growths.This system is used to provide water to the field according to the need of soil by measuring the soil moisture level and atmospheric humidity level [2]. This systemavoids the wastage of water and electricity. The power consumption and water consumption can be controlled by a single motor, water tanks and some valves. Pump water to various water tanks by using single motor, valves and from multiple wells. The unauthorized person's intervention to the field, current atmospheric temperature level and moisture level of soil and animal attack can be remotely monitored and can be take necessary actions[3].

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Introduction:-

Agriculture is one of the very old human profession. The aim for emerging agricultural automation system is to droplabours and the associated socio-economic circumstances prevailing. In India 70% personsfully depend on agriculture. Smart agriculturedenotes to runningagriculture by means ofcurrent information and communication technologies to upturn the measure and worth of products while enhancing the human labours required.

Here we can pour water to plants without giving special instructions to it. This system can control the pouring of water [4] to plants by measuring the level of water contents in the soil and atmospheric temperature. The level of

Corresponding Author:- Mr. Antony P. James
Address:- Research Scholar, Department of Electronics, Sri Ramakrishna College of Arts and Science (Autonomous), Coimbatore, Tamilnadu, India.

water contents in the soil can be measured by using soil moisture sensor and the level of atmospheric humidity can be sensed by the help of humidity sensors. The system takes necessary actions according to these readings. Through this way we can avoid water wastage.

This system also provides the tank water level controlling and water pumping from multiple wells to multiple water tanks with the help of a single motor and different valves. This valves can be controlled by the status of the various float switches located inside the water tanks. Hence we can avoid wastage of power and water [5].

Remote monitoring of field and controlling can be done with the help of this system. Recognition of unauthorized intervention of human beings and prevention of animal attack are the main feature of this system. By using this system, we have to know the current status of the field from any place by sending a text message to the GSM [6],[7]module as "STATUS" and it replies the current status of the field.Smart irrigation technology may support to decrease water wastage, moreover it given that a healthy, attractive landscape.

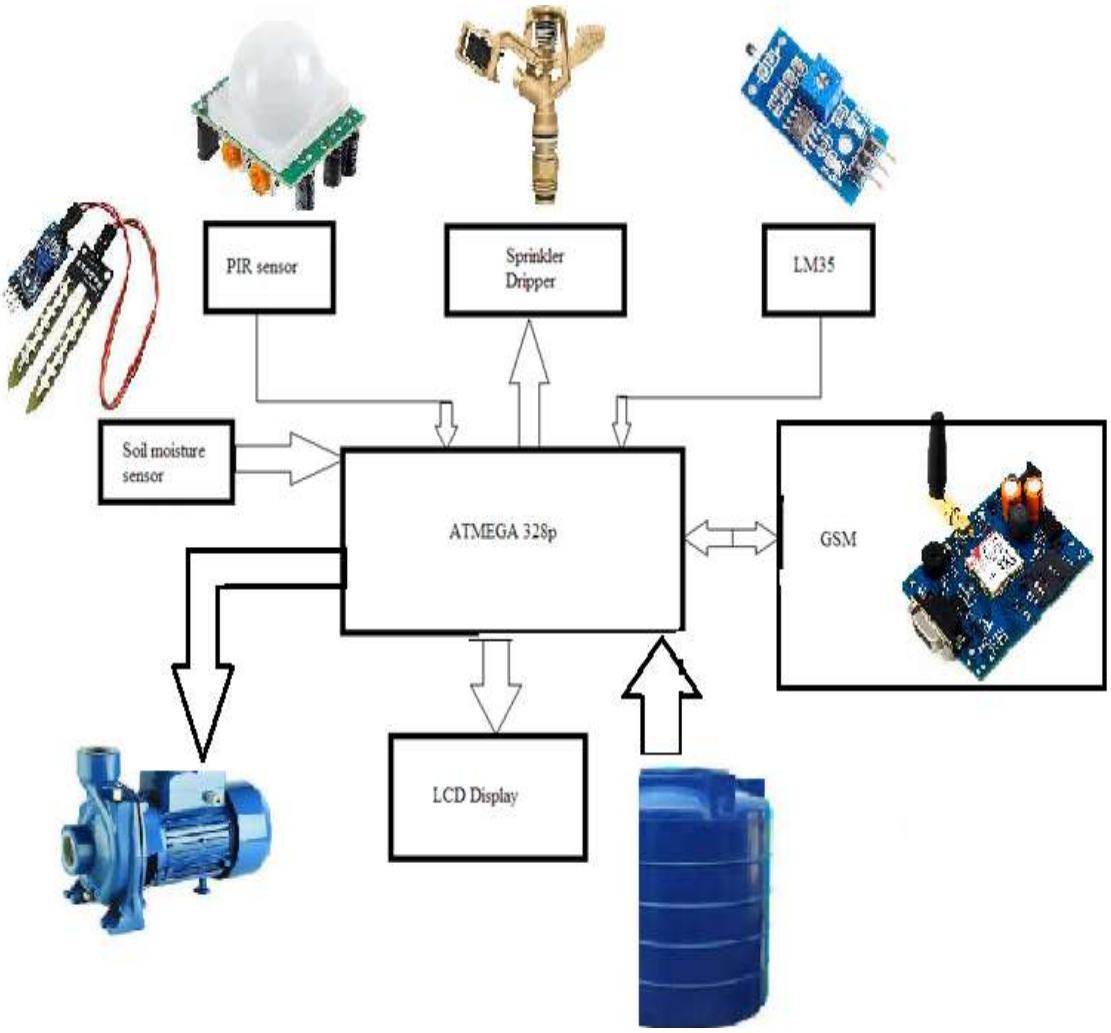

Figure 1:- Block Diagram of Intelligent Field Automation System.

The heart of this system is ATMEGA328P microcontroller [8]. A microcontroller is a compacted integrated circuit aimed to manage a particular operation in an embedded system. A typical microcontroller contains a processor, memory and input/output (I/O) peripherals on a single chip. All the operations are controlled by this microcontroller. The source code is keep in this microcontroller and this source code will take care of the operations of this system.

Main features of ATMEGA328 P:
ATMEGA328P[9] is an 8-bit AVR RISC-based microcontroller with a maximum clock frequency of 20MHz, associates 32 KB ISP flash memory with read-while-write abilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose operational registers, 3 timer/counters with compare modes, interrupts (both internal and external), serial programmable USART, a byte-oriented 2-wire serial interface, Serial Peripheral Interface serial port, 6-channel 10-bit Analog to Digital converter, programmable watchdog timer with internal oscillator, and 5 software selectable power saving modes. The operating voltage of ATMEGA 328 P is in between 1.8 V to 5.5V. The device achieves throughput approaching 1 MIPS per MHz.

PIR Sensor:
The presence of human being or animals can be detected with the help of PIR sensor[10]. The presence can be detected and the required signal is transmitted to the microcontroller, the microcontroller takes necessary action according to the needs. PIR sensor is an electronic sensor, it detecting and valuating the infrared (IR) light radiating from things in its arena of view. All things with a temperature above absolute zero release heat energy in the radiation form. Generally, this emission invisible to the human eye because it emits at infrared wavelengths, but it can be identified by electronic devices aimed for such a purpose. PIR sensor can distinguish animal/human movement in a particular range. PIR is prepared of a pyroelectric sensor, which is capable to sense diverse intensities of infrared radiation. The detector itself does not produce any energy but passively receives it. It senses infrared radiation from the atmosphere. Once there is infrared emission from the human body unit with temperature, directing on the optical system origins the pyroelectric device to produce a quick electrical signal.

Soil Moisture Sensor:
We can apply water to the plants according to the moisture level of soil. If the soil is dry then the soil moisture sensor [11] will detect the value and the value is transferred to micro controller. If the value is not up to the required level, then micro controller takes the necessary actions. Soil moisture sensors measures the volumetric water content in soil [12]. Thesoil mopisture sensor must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Farmers can use the portable probe instruments.

Calculating soil moisture is significant for agricultural applications to support farmers accomplish their irrigation systems more powerfully. Knowing the precise soil moisture environments on their fields, not only are farmers capable to normally practice less water to nurture a yield, they are also capable to rise harvests and the quality of the crop by enhanced supervision of soil moisture during acute plant growing steps.

LM 35:
Watering of plants also depends up on the temperature level of atmosphere. The atmospheric temperature can be measured with the help of temperature sensor LM 35 and send the information to the microcontroller. The microcontroller takes necessary steps according to the value received from the LM 35 sensor[13].

The LM35 series are precise value generated integrated-circuit. LM 35 generates an output voltage linearly and proportional to the temperature in Centigrade. The LM35 device has benefit above linear temperature sensors calibrated in Kelvin, as the operator is not required to subtract a large constant voltage from the output to obtain appropriate Centigrade scaling. The LM35 device does not need any external calibration to deliver typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. It is a low cost device.

GSM Module:
Global System for Mobile Communications is a standard established by the European Telecommunications Standards Institute to explain the rules and regulations for second-generation digital cellular networks. The data transfer between this system and the mobile communication device of the field owner can be held through the GSM communication standards. The owner of the field can be send a SMS to the GSM module which is placed in the field and the current status of the field can be replied to the owner, this communication between the System and the owner mobile can be done with the help of the GSM standard modem.

LCD Display:
LCD (Liquid Crystal Display) [14] display is an electronic display component. Here a 16x2 LCD display is used to display the messages. The aims being: LCDs are cost-effective; simply programmable; have no restriction of

presenting special & even custom characters, animations and so on. A 16x2 LCD can display 16 characters per line and there are 2 such lines.

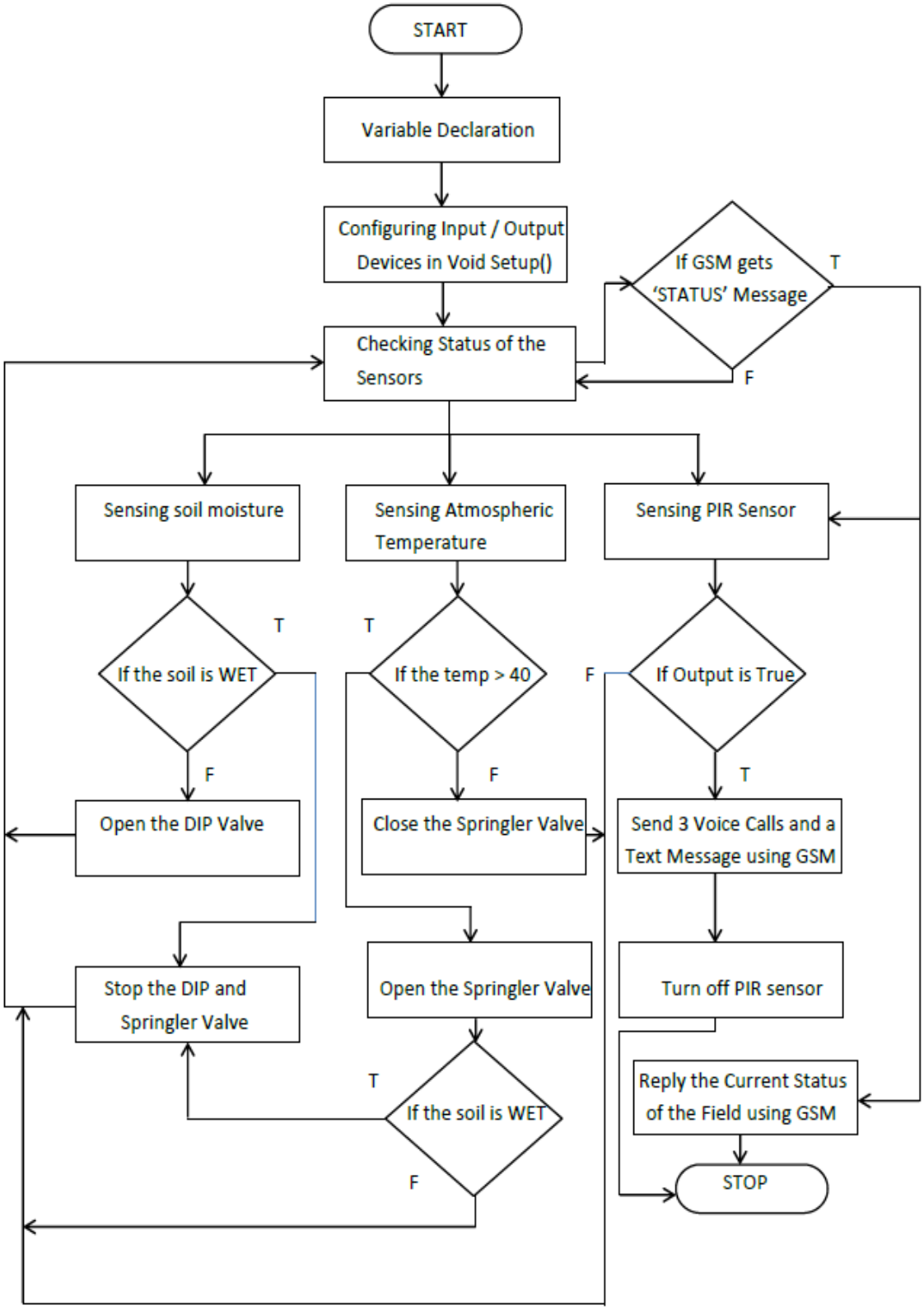

Figure 2:- Flowchart.

Solenoid valves:
A solenoid valve [15] is an electromechanically functioned valve. The valve is controlled by an electrical current through a solenoid. Solenoid valves are the supreme commonly used control elements in fluidics. The water level of tanks can be controlled by solenoid valves. These solenoid valves can be controlled by the instructions given by the microcontroller.

Water Pump:
A pump is a device that transfers fluids by mechanical action. Water pumps are used to fill the water tanks from the various water sources. The controlling of water pumps lead by the solenoid valves.

Float Switch:
A float switch is a level sensor used to sense the level of liquid within a tank. The switch may be used to control a pump, as an indicator, an alarm, or to control added devices. Float switches have a two-stage switch. In this system as liquid increases to the trigger point of the first stage, the related pump is triggered. If the liquid continues to rise, the second stage will be activated. This stage may switch off the motor.

Applications:
1. We can use it in Paddy Fields.
2. We can use it in Home Garden
3. Automatic pumping systems can be used inHouses & Offices.

Conclusion:-
We have created and implemented an Intelligent Field Automation System. The system is created based on the projected design. Various smart sensors are placed in the field for monitoring. According to the signals received from the sensors the system will take necessary actions.We have discussed the advantages, disadvantages, and opportunities of this system in the agricultural field. Continuous monitoring is required for the correct working and system will give an option for the continues monitoring or random monitoring. This research also differentiated the early agricultural system to newfield monitoring system. The graft will take change in agricultural field and be a blessing for agricultural extents. This study work has verified its profits already.

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