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SELF-REGULATING AGROLOGY APPROACH VIA SOIL DAMPNESS

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Abstract: India is a developing country where there are a greater number of farmers living. In India we have different ways of Irrigation systems mainly like overhead irrigation, drip irrigation, surface irrigation and so on. Here we are using mankind power and without knowing about the moisture content in the soil the farmers the watering the plants which makes the usage of more water for the field where it is not necessary. So, in this paper we are dealing about an automatic irrigation system where it collects data of water moisture present in the soil and sends it to Arduino. This Arduino has an AtMega328 microcontroller which is programed to receive moisture content of soil for every certain amount of time. Here whenever the Arduino receives the information about moisture present in soil less than the minimum value the motor will be in on condition until the moisture content will reaches higher than the predefined value. It also uses the GSM modem is used to send the information to concern farmer about condition of moisture and motor where he does not need to worry about the watering of plants daily.

Index Terms **- Irrigation, soil moisture sensor, GSM, Arduino IDE.**

I. INTRODUCTION

In India nearly 70% of peoples are depending upon agriculture sector. In past the farmers were using irrigation methods like drip irrigation, surface irrigation, manual irrigation, overhead irrigation and so on. With these types of irrigation there are many causes occurred mainly over watering, soil erosion, wet foliage, not equally water distribution [1]. With these causes the food production is decreasing and while the demand for food has been increasing from day-to-day life. There are many places in India where the scarcity of water is very low and also the farmers are wasting more water than required.

Automatic Irrigation system using the soil moisture content is a way of watering for the growth of plants without any kind man power. We can use it for mainly in dry areas where the scarcity of water is very high. With manual irrigation system we cannot predict the amount of water that is to be required for the plants but with automatic irrigation system we can count the amount of water we are using for irrigation from day to day.

So, to prevent all these draw backs an irrigation system which works by its self is developed. It works by sensing the moisture content of the soil and will checks weather pumps needs to be in either on or off conditions. It can supply the water for irrigation from ponds, wells, canals, stream, etc. This is very less cost than other system, more efficient, and also time saving as it works automatically without manpower and we also receive the condition of field like moisture content, temperature, water used for irrigation, etc., for each quantity of time.

II.PROBLEM STATEMENT

Many farmers are using excess of water for irrigation purpose without knowing the condition of moisture present in soil. The current methods using by them are having causes like irregularity of water distribution, more weed growth, soil erosion, and so on which leads to less growth in plants [2].

III. PROPOSED WORK

3.1 FOW CHART OF THE WORK:

So, in order to reduce all the usage of heavy water and soil erosion and so on this Automatic Irrigation system will use only required amount of water only. It is also an artificial machine where it does not require man power and the farmers also can receive the messages via GSM module for checking the condition of field manually. With less usage of water, the soil erosion also reduced, Fig 1.

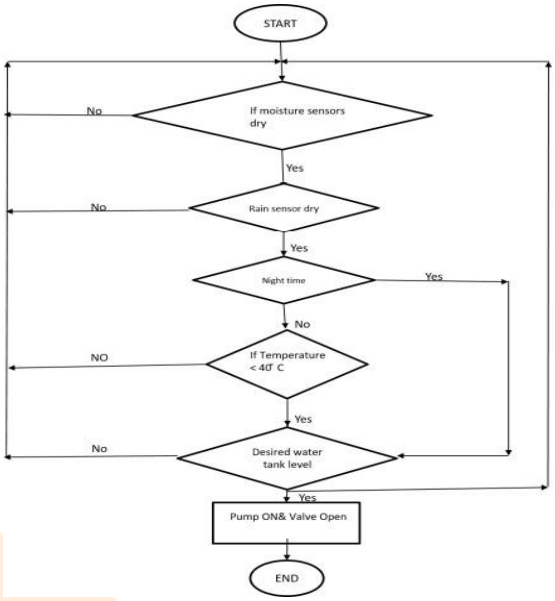

FIG 1: FLOW CHART

3.2. BLOCK DIAGRAM:

From Fig 2. The Arduino is the main part in the block diagram where all the external requirements are connected to it. The soil moisture sensor which measures the moisture content in the soil has three probes which will be dig into the soil. These values are sent to the Arduino. Based on the values the Arduino will give condition to the relay switch where to send the water from the pump. Here the GSM module has a SIM which will send a message to the farmer about the condition of the field for every certain amount of time [3].

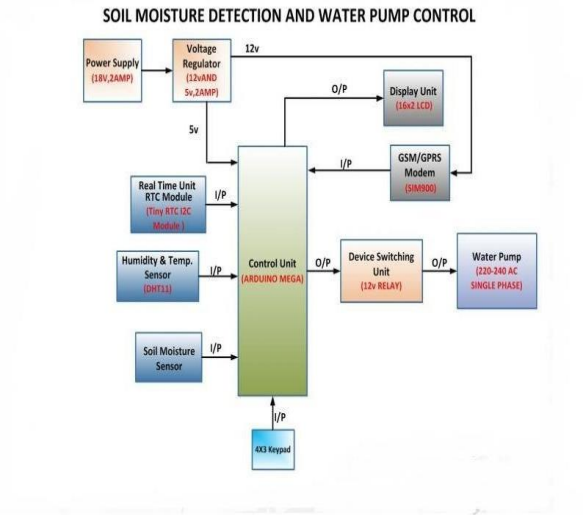

FIG 2: BLOCK DIAGRAM

3.3 SCHEMATIC DIAGRAM OF THE WORK:

From Fig 3. The work has been divided into several segments and each segment we are going to keep the soil moisture sensor which are connected to the Arduino. The pump is connected to the relay switch. Based on the different values read by the Arduino the relay switch turns the water coming from the pump to the segments where the moisture is low. When all the soil moisture sensors read the value greater than the required then it water pump will becomesin off condition [4].

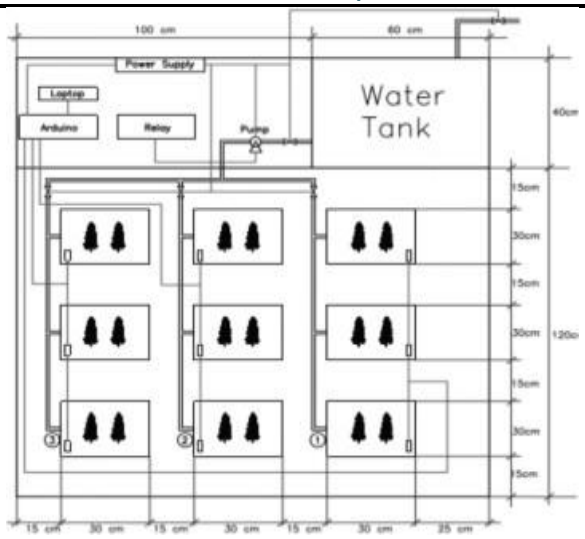

Fig 3: Schematic Diagram

3.4 HARDWARE REQUIREMENTS

- Arduino
- GSM
- Temperature sensor
- Soil moisture sensor
- Water pump
- Voltage regulator
- Power supply

3.4.1 ARDUINO

Fig 4: Arduino UNO

AURDINO is a digital device for making surely cool things. It is a micro controller which is based on electronic prototyping board that is done with programming model which can we use very easily. It is a tool for making computer systems experience and manipulating more of the personal world than your desktop [5]. There are many forms of Arduino with many specifications. The device which is used in this project is Arduino ATMEGA 328. It has 28 pins and it has only one micro-controller which is created by ATMEGA. It's belongs to Mega AVR sequence, Fig 4.

The following specifications are:

- The ATMEL is an 8- bit AVR RISC based micro- controller which also comes along with 32 kb ISP flash memory.
- It has one kilo byte of Electrically Erasable Programmable Read-Only Memory and two kilo bytes of SRAM
- It comes with twenty-three general purpose Input/output lines and also with thirty-two working registers.

- To compare the different modes, it comes with three flexible timers.
- It also has a SPI serial port with six channel and ten-bit A2D conversions, it can be 8 channels up to in other packages like PQSP programmable version of timer with inner oscillator
- This operating system operates within 1.8 volts to 5.5 volts.
- It achieves through puts approaching 1 mega instruction per second per megahertz (MHz).

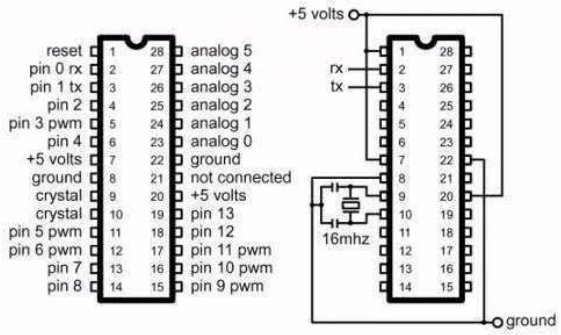

FIG 5: ARDUINO PINS

3.4.2 PINS:

- There are many types of pins which are made in different modes for the usage.
- It has fourteen digital output pins.6 pins which can be used as PMW outputs and the remaining 6 pins can be used as Analog inputs.
- For a technical pin it can throughput 20 milliampere of current for DC, it must not exceed 40 milliampere on any I/O Pin to avoid permanent damage to the micro controller and a typical 3.3-volt pin can output 50 milliampere of current.
- The clock speed can be ranging from minimum 4MHz or It is represented as 1MHz- 16MHz.
- It has internal oscillators in which one of them depends upon entirely how we program the fuses of the microcontroller.

DESCRIPTION: (PIN TO PIN):

- PIN_1 (PC6): RESET: - It is an active low signal which means it resets the microcontroller in an active condition whenever 0 volt is provided.
- PIN_2 (PD0): RXD, PIN_3 (PD1): TXD: These are serial communication ports, whenever a serial data is received, it should be received through RXD and whenever the serial data is transmitted it should be transmitted by TXD. They operate at TTL level.
- PIN_4 (PD2): INT0, PIN_5 (PD3): INT1: These are external interrupts that means any external event whenever it is registered to the microcontroller it resembles that it should monitor the external events according to the occurrence of events.
- PIN_6 (PD4): T0, PIN_11 (PD5): T1: It can be used as external timer to provide timing pulse.
- PIN_7 (VCC), PIN_8 (GND), PIN_22 (GND), PIN_21 (AREF), and PIN_20 (AVCC): These are the power signals.
- PIN_9(PB6): OSC1, PIN_10(PB7): OSC2:
  These are the oscillator pins or external 1 and external 2 pins across which will be connecting the crystal which is used to give external timing pulses to microcontroller that ranges from 1MHZ to 16MHZ.
- PIN_12 (PD6): (OCA/AIN0), PIN_15 (PB1):
  (OC1A): It is one of the PWM pulse giving signal. This signal giving pin is used to give PWM pulse to any external device to controller.
- PIN_13 (PD7): (AIN1), PIN_14 (PB0): (ICP1),
  PIN 16(PB2) (SS/OC): These pins are used as inputting or outputting digital pulses.
- PIN_17 (PB3) (MOSI), PIN_18 (PB4) (MISO):
  These are serial input and output which involves in serial peripheral interface communication.
- PIN_19 (PB5) (SCK): It gives the Serial clock pulse to the device in which HPI communication is desired.
- PIN_23 (PC0) (ADC0): This is the analog input, here the analog voltage can be received through the internal ADC such that the digital value can be generated.
- PIN_24(PC1, ADC1),
- PIN_25(PC2, ADC2),
- PIN_26(PC3, ADC3), These are the 5 analog pins which has 10-bit resolution that means 1 0 2 4 values will be
- Generated from various voltages
  - PIN_27(PC4, ADC4),
  - PIN_28(PC5, ADC5),

APPLICATIONS:

- It is used to design the robotic devices.
- It is used to control the motors.
- It is used to design sensor networks
- It helps in designing miniature applications.

3.4.3 GSM MODULE:

GSM Modem SIM900 is made with Quad- band GSM/GPRS that may be embedded with inside the client applications with a SMT module [6]. If we take an industry-widespread interface, the overall performance for voice, messages, data packs are very good with the consumption of low power. With very small config of 24mm x 24mm x 3 mm, a SIM900 can fit almost all the requirements on your mobile-to-mobile application, in particularly for smooth and compact name of design, Fig 6.

FIG 6: GSM MODEM

3.4.4 TEMPERATURE SENSOR

A temperature sensor is a digital tool that measures the temperature of its surroundings and it converts input analog data into digital data for monitoring the temperature for each amount of time. It has four kinds of temperature sensors which are utilized in modern-day electronics [7]

- Thermocouples,
- Resistance Temperature Detectors (RTDs),
- thermistors
- Semiconductor based integrated circuits (IC).

3.4.5 SOIL MOISTURE SENSOR

Fig 7, Soil moisture sensor is a digital type sensor which measures the amount of water content present in the soil. It has three probes which can be used to dig into the soil for measuring the moisture. It checks the moisture content in particular area in terms of volumetry. This sensor takes some help of rules like insulator constant, electrical resistance and so on.

FIG 7: SOIL MOISTURE SENSOR

3.4.6 WATER PUMP

Water pumps are used to supply the water from the wells, rivers and so on for the house hold purposes and mainly for agricultural purposes. The water pumps will start by supplying of continues power to it. There are many kinds of water pump but in this paper, we are using electric pump.

3.4.7 VOLTAGE REGULATOR

Voltage regulators used in low-voltage electronic devices are usually integrated circuits. Power distribution center providing AC power to residential and industrial consumers use more sophisticated and mechanically large voltage regulators that maintain rated 110 V (US household standards) voltage regardless of consumption demands across the area [8].

Based on the physical design, voltage regulators can be seen in integrated circuits, electromechanical devices, or solid-state automatic regulators. The most common classifications of the active voltage regulators (that use amplifying components like transistors or op-amps) are linear and switching regulators.

3.4.7 POWER SUPPLY

It is an electronic gadget which supplies an electrical power to an electrical load. It converts the electric power to voltage, frequency and current for loading the power.

IV. RESULTS AND DISCUSSION

From Fig 8, the circuit had been designed and implemented as a prototype. In which the water pump will be in on condition when the soil moisture is less and in off condition when the soil moisture is high. Due to this we reduced the usage of water.

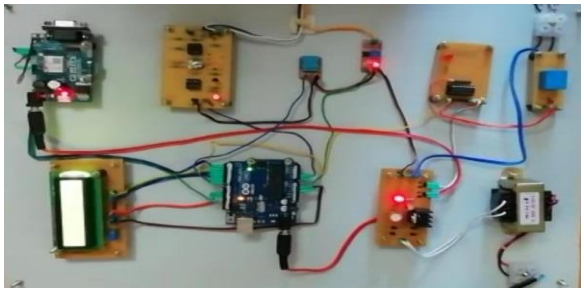

FIG 8: RESULTS

4.1 ADVANTAGES

- Less usage of man power.
- Increasing in production range.
- Largely decrease in soil erosion.
- More accurate.
- Consumption of power is very less compared to other systems.
- Less cost

V.CONCLUSION

The automatic irrigation system using soil moisture is an application that can be used in the agriculture purposes mainly for irrigation. Here we are keeping a soil moisture sensor in the soil and we will monitor the moisture content of soil for every interval of time. We will give minimum and maximum values for humidity as a form of program to the Arduino. Based on the values return by the soil moisture Arduino will decide to turn the motor in on or off condition. With the GPS system installed in the project the farmers will be able to get the values of humidity and condition of motor.

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