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IMPLEMENTATION OF SMART IRRIGATION SYSTEM USING MICROCONTROLLER FOR WATER SAVING

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Abstract: As we know that in present era, water scarcity is the biggest problem in the agriculture field and we are living in 21st century, we know that digitalization and modernization playing an important role in all the places. Only agriculture is the one where exiting men power method is used and that uses water in a large extent. So, we need to develop a technical method, which will save water, increases efficiency, reduces human work and automated. So, here I have designed a smart irrigation system which consists of soil moisture sensor which detect how much moisture in the soil and according to that it will supply water to the plants.

Keywords: Soil moisture sensor, Arduino , Automated irrigation, Water management, Environmental monitoring.

I. INTRODUCTION

Our country is blessed with large amount of cultivable land but the output of the agriculture is not as we have amount of cultivable land. It is due to some problems like plants are not getting water at regular interval, Lake of regularity of farmers in their work etc. So, it is necessary to invent a system which uses water very judiciously as per the requirement of the plants.

"Smart irrigation system" basically depends on moisture sensors, arduino, power supply for moisture etc. So, this project detects moisture level in the soil with the use of moisture sensor and according to the percentage of moisture in the soil, it will supply water to the land with the use of proper arrangement.

II. NEED OF THIS SYSTEM

Our country is blessed with profuse amount water but due to increasing population demand for water exceeding supply.

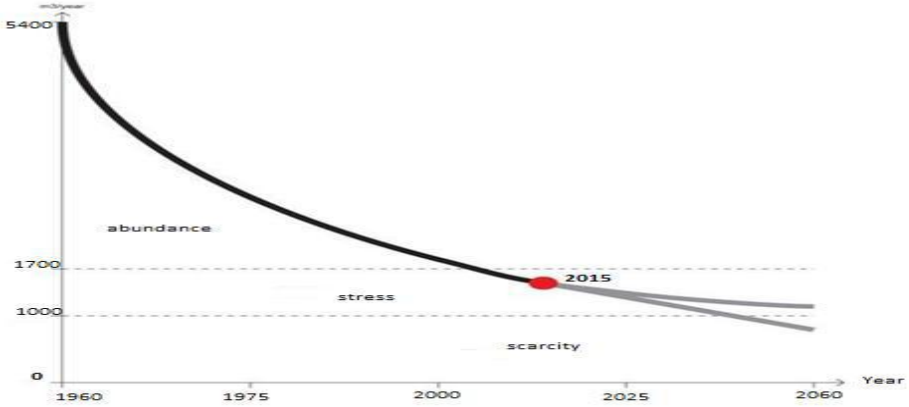

Figure 1:

III. IMPORTANCE OF IRRIGATION

As we know that agriculture in our country totally depends on monsoon and it is also uncertain sometimes. So, we need to think about another method of giving water to agriculture land.it is an artificial method developed to give optimum amount of water with the uses of pipes.

IV. METHODS OF IRRIGATION

There are various types of irrigation method used accordingly to atmospheric nature of that crop field and feasible of method of irrigation. Which are,

A. **Surface irrigation:**

In this type of method, water flows over the outer surface of the land due to gravity effect. This is the most common method of irrigation system throughout the world. Major problem of this method is that water flow cannot be controlled as well as it consumes lot of water. So, plants cannot get the water as per the requirement.

Figure 2:Surface irrigation system

B. **Sprinkler irrigation:**

In sprinkler system, when pump is started, then water flows through the main pipes as well as the perpendicular pipes. On the top of the perpendicular pipe, a nozzle is fitted, which is rotating at a regular interval of time. Main advantage of this method is that water wastage is less and fewer workers needed.

Figure 3:Sprinkler system

C. **Drip irrigation:**

Drip irrigation system, water is made to fall at the roots of the plants. Water supply is given to main pipe through sub pipes. Special prepared nozzles are attached to sub pipes. When water flows, these nozzles allow water to fall at the roots. Main advantage of this system is that it requires less water.

Figure 4: Drip irrigation

All the methods of irrigation consume lots of water, needs lots of human work and needed maintenance at regular interval. So, to overcome these all problems and to reach the scarcity of water smart irrigation system is developed.

V. SMART IRRIGATION SYSTEM

- ***Block diagram of smart irrigation system:***

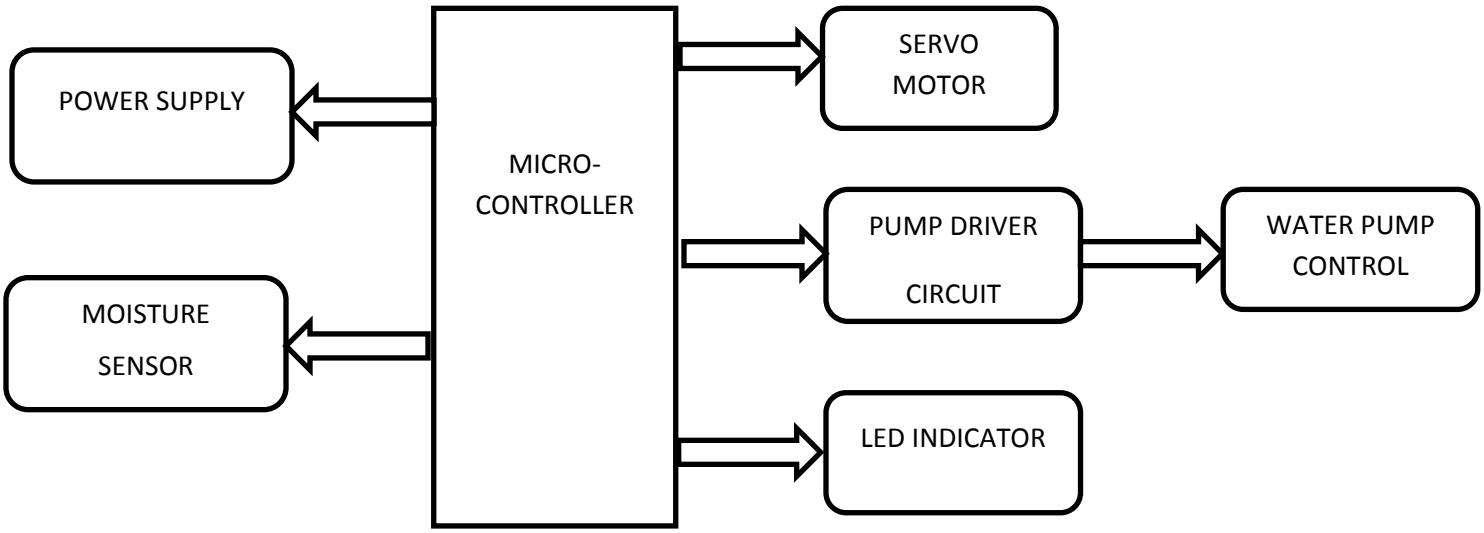

Figure 5:Block diagram of smart irrigation system

VI. TECHNICAL DETAILS OF COMPONENTS

1. Moisture sensor:

Operating Voltage: 3.3V ~ 5V
Sensing Probe Dimensions: 60x30mm
Panel PCB Dimensions: 30 x 60mm
On-board LM393 comparator

2. Arduino Uno:
Microcontroller: ATmega328P
Operating Voltage: 5v
Input Voltage: 7-20v
Digital I/O Pins: 14 (of which 6 provide PWM output)
Analog Input Pins: 6
DC Current per I/O Pin: 20 mA
DC Current for 3.3V Pin: 50 mA
SRAM: 2 KB
EEPROM: 1 KB
Clock Speed: 16 MHz
Length: 68.6 mm
Width: 53.4 mm
Weight: 25 g

VII. HARDWARE DESIGN

In my project, I have demonstrated watering system for only one pot so that I have used only one soil moisture sensor. Depending on the number of pots or amounts of land, quantity of soil moisture sensor will be increased. When we interface moisture sensor with arduino, it will measure the value of moisture based on soil resistance. If soil is wet, then value of resistance is low else high but the output of the moisture sensor is in analog form. Inbuilt analog to digital converter in arduino will convert analog signal into digital form, which represent resistance. A servo motor is programmed, which is operated at 3.3 V and it does not require any driver circuit. Servomotor can be rotate 0-180 degree. Rotating mechanism is attached to the motor for providing base for the movement of pipe.

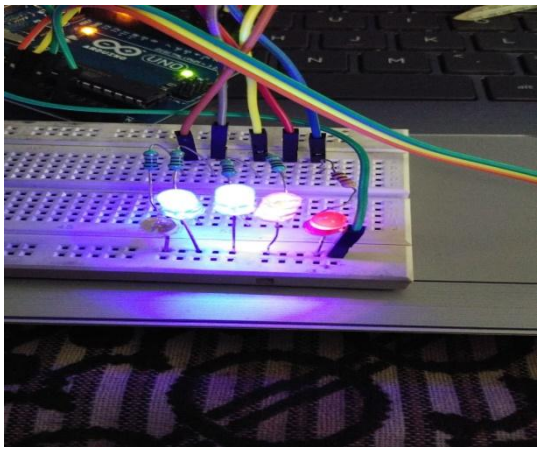

Figure 6:Breadboard implementation

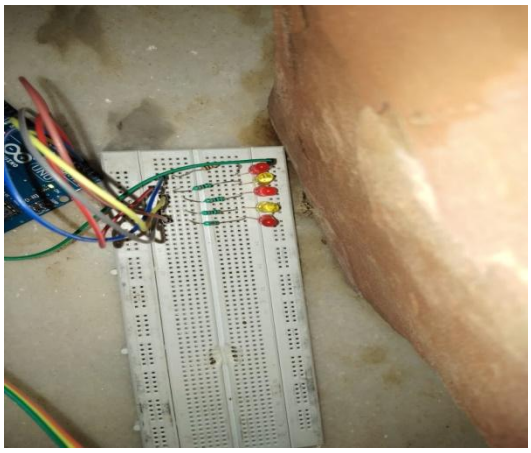

Figure 7: Breadboard connection with arduino

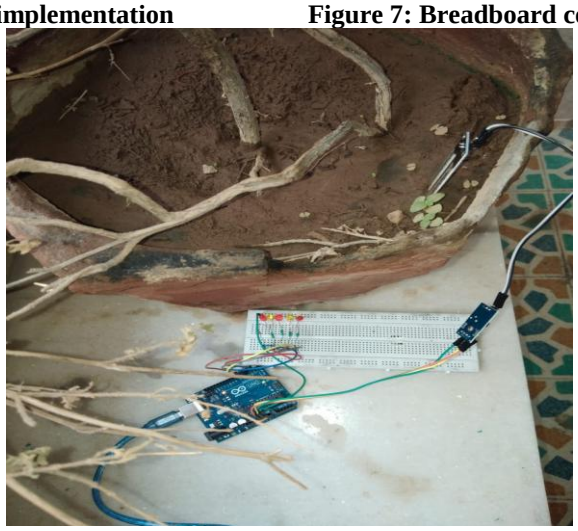

Figure 8:moisture sensor inside pot to sense moisture content

VIII. SOFTWARE DESIGN

In our project, the software used is arduino. It has no of library function to make the programming easier. In our project, I have used AtMega328 is programmed in arduino.

IX. COST ANALYSIS

Total cost	Quantity	Unit cost	Components
210	1	210	Soil moisture sensor
450	1	450	Arduino Uno
	1		Power supply 12 V
5	5	1	Resistors (1K)
150	1	150	Breadboard
1	1	1	Resistor (10K)
50	20	-	Connecting wires

Approximate Total amount of whole system for small home garden: 870 Rs.

I. ALGORITHAM

1) Start
2) Moisture content in soil is detected using soil moisture sensor.
3) As per the moisture content, LEDs will be blown so that user can observe from outside.
4) As per the level of moisture in soil, it will take decision how much water has to supply.
5) Then this signal is given to the motor.
6) As per the water requirement, motor supplies water to the crops.
7) Stop

II. COCLUSION

In the present epoch, farmers are using exiting methods of irrigation in which manual control is required as well as it uses water in a large extent. So, with the use of smart irrigation system, it accurately measures moisture inside the soil and based on that supplies water judiciously to the crops. Moreover, this system works on the microcontroller which can be operated at very low voltage level.

III. ACKNOWLWDGE

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