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MSP 430 Lunch Box Based Smart Irrigation System

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***Abstract* – The continuously increasing population in India demands for the rapid improvement in food production technology. Indian, economy is mainly based on agriculture. Water is the main resource for agriculture. Hence efficient water management of fresh water resources has a crucial importance. To save the water and to increase the yield of crop proper method of irrigation must be used. It is well known that irrigation is very economical and efficient. The conventional automated irrigation system is fully controlled and monitored by the farmer. This paper presents a fully automated irrigation system which is controlled and monitored by using MSP430 processor. Sensors are used to monitor the moisture content of the soil and depending on that the valves of the system are turned ON or OFF automatically for different interval of time. Turbidity sensor plays a important factor to be considered as it affects the chemical particles availability in the water. Sensor to detect the purity of the water is used and depending on the value of the soil moisture sensor, suggestions are given to the farmer to maintain the proper water.**

Keywords: MSP430G2553 Micro controller, Soil moisture sensor, Turbidity sensor, Motor.

I. INTRODUCTION

In many agricultural cropping systems irrigation is necessary. Large amount of water goes waste due to improper planning of water usage. The aim of farmer is to produce "more crop per drop", hence there is need to find the irrigation techniques which consumes less fresh water. These techniques are helpful in the regions where there is a scarcity of fresh water. In the modern irrigation systems, the most significant advantage is that water is supplied near the root zone of the crops due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land from time to time. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be hazardous to plants before wilting becomes visible. This problem can be perfectly solved if automatic controller based irrigation system is used in which irrigation will take place only when there is intense requirement of water. Irrigation system uses valves to turn ON or OFF automatically. Automatic Irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits. Along with water the other important resources to the crop are the nutrients. If the nutrients are available in the right amount for the growth of crops then the yield of the crops also increases. Thus the productivity can be raised with the proper management of water resources and nutrients.

II. LITERATURE REVIEW

[1] In Sensor based Automated Irrigation System with IOT mentioned about using sensor based irrigation in which the irrigation will take place whenever there is a change in temperature and humidity of the surroundings. The flow of water is managed by solenoid valve. The opening and closing of valve is done when a signal is send through microcontroller. The water to the root of plant is done drop by drop using rain gun and when the moisture level again become normal then sensor senses it and send a signal to microcontroller and the value is then closed. The two mobile are connected using GSM. The GSM and microcontroller are connected using MAX232. When moisture of the soil become low moisture sensor sense it and send signal to microcontroller, then the microcontroller gives the signal to mobile and it activate the buzzer. This buzzer indicates that valve needs to be opened by pressing the button in the called function signals are sent back to microcontroller. Microcontroller used can increase System Life and lower the power Consumption. There system is just limited to the automation of irrigation system and lacks in extra ordinary features.

[2] In Automated Irrigation System Using a Wireless Sensor Network and GPRS Module mentioned about using automatic irrigation system in which irrigation will take place by wireless sensor units (WSUs) and a wireless information unit (WIU), linked by radio transceivers that allowed the transfer of soil moisture and temperature data, implementing a WSN that uses ZigBee technology. It takes a measure of temperature and moisture using sensor and controlled by microcontroller. The WIU has also a GPRS module to transmit the data to a web server via the public mobile network. The information can be remotely monitored online through a graphical application through Internet access

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devices. This irrigation system allows cultivation in places with water scarcity thereby improving sustainability and it is feasible system. But due to Zigbee protocol this system becomes more costly. [3] In Wireless Sensor Network based Remote Irrigation Control System and Automation using DTMF code mentioned about using automated irrigation system for proper yield and handled remotely for farmer safety. Wireless sensor network and Embedded based technique of DTMF (Dual Tone Multiple Frequency) signaling to control water flow for sectored, sprinkler or drip section irrigation. Circuit switching instead of packet switching used by SMS controlled devices available currently in the market. The farmer can use his cell phone or landline phone for the purpose of starting and controlling the irrigation and the pesticide spraying, just by dialing and sending the DTMF commands over the GSM network. This system will be very economical in terms of the hardware cost, power consumption and call charges. Farmers have to control (on/off) the valves time to time (even at night) which increases the running cost because every time we have to make a call to on or off the valves and it is also very inconvenient. Farmers are unable to know the status of power supply at the field.

III. HARDWARE & SOFTWARE DESCRIPTION

3.1 MSP430 Microcontroller

The Launch Pad kit is from Texas Instruments It is an inexpensive, simple micro-controller kit with an on-board emulation for programming and debugging, as well as buttons and LED's for simple user interface

Few features of it are:

a) USB 2.0-enabled 16-bit MCU
b) Up to 25 MHz CPU speed
c) 12KB Flash and 8KB RAM
d) 12-bit SAR ADC
e) 40 pin Booster Pack ecosystem
f) 5V and 3.3V through a efficient DC/DC converter
g) Serial communication interfaces like UART, I2C, SPI are available

3.2 Soil Moisture sensor

Soil moisture sensor is one kind of sensor used to detect the soil moisture content. This sensor has two outputs like the analog output as well as the digital output. The digital o/p is permanent and the analog o/p threshold can be changed. The working principle of soil moisture sensor is open & short circuit concept. Here the LED gives an indication when the output is high or low. When the condition of the soil is dried up, the flow of current will not flow through it. So it works like an open circuit. Therefore the o/p will be maximized. When the soil condition is soaked, the flow of current pass from one terminal to the other. Soil works like a closed circuit. Therefore the o/p will be zero. Here sensor is coated with platinum, and anti-rust to make higher efficiency as well as long life. The sensing range is also high which will pay for the farmer at a minimum cost.

Specifications:

- Input voltage: 3.3-5V
- Output voltage: 0-4.2V
- Input current: 35mA
- Output signal: Both analog and digital.

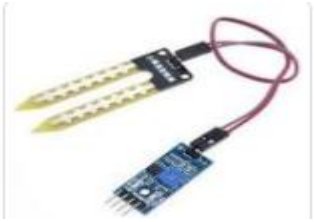

Figure 1: Soil Moisture sensor

3.3 Turbidity sensor

Turbidity sensor senses the turbidity in the measurement of water quality and clarity. Suspended sediments such as particles of clay, soil, frequently enter the water from disturbed sites and affect water quality. Suspended sediments can contain pollutants such as phosphorus, pesticides or heavy metals. High turbidity affects the type of vegetation that grows in water. Such particles may cause harm to plants and human health. We can detect such type of water using turbidity sensor. So that plants and human can survive healthy.

Specifications:

- Operating Voltage: 5V DC
- Operating Current: 40mA (MAX)
- Response Time :<500ms
- Insulation Resistance: 100M (Min)
- Analog output: 0-4.5V
- Digital Output: High/Low level signal (you can adjust the threshold value by adjusting the potentiometer)
- Operating Temperature: 5°C~90°C
- Storage Temperature: -10°C ~90°C
- Weight: 30g
- Adapter Dimensions: 38mm*28mm*10mm/1.5inches *1.1inches*0.4inches

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Figure 2: Turbidity sensor

IV. IMPLEMENTATION

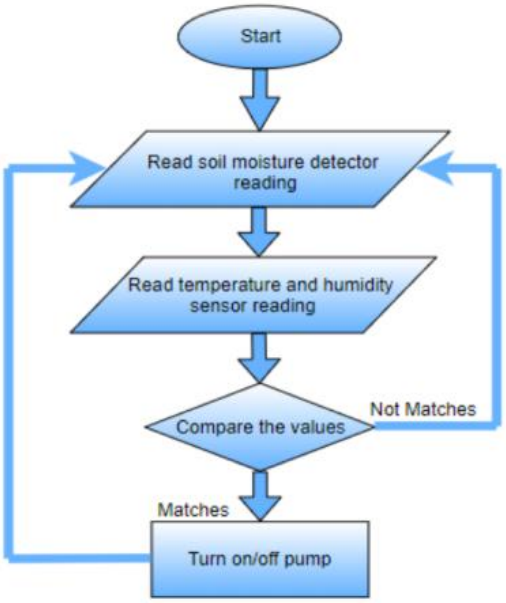

Figure 3: Implementation Flow chart

V. WORKING OF THE SYSTEM

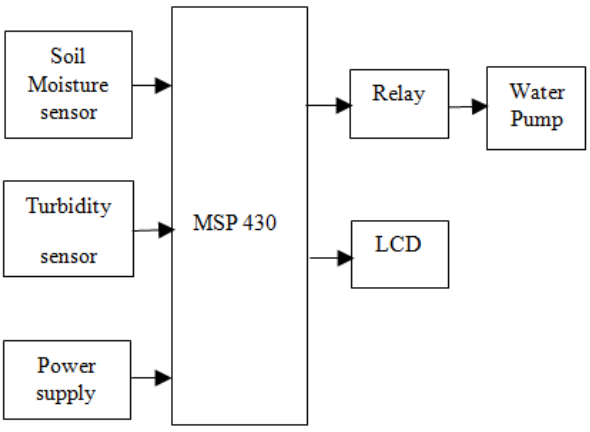

Figure 4: Block diagram of proposed system

The system is used for sensing, monitoring, controlling and for communication purpose. Automatic irrigation system is gaining importance when there is need to use water resources efficiently and also to increase the field productivity. The system is used to turn the valves ON or OFF automatically as per the water requirement of the crop. Different sensors are used to detect the different parameters of the soil like moisture, purity of water. Automatic irrigation system has to be designed for the proper water supply in the fields. An automatic irrigation system which automatically senses the moisture content of the soil and decide whether irrigation is needed or not and how much water is needed for soil. This system uses MSP 430 microcontroller. It is programmed to sense the moisture content if the soil over a period of time. The moisture sensor output will help to determine whether to irrigate the land or not depending upon the moisture content. Along with moisture sensor the turbidity sensor output can also be taken into consideration while irrigating the land. Turbidity sensor is detected and measured. It will sense water purity. Depending upon the purity of water, suggestions can be given to the farmer to supply water to the crops order to achieve the desired turbidity level of the soil for good crop growth.

VI. RESULT

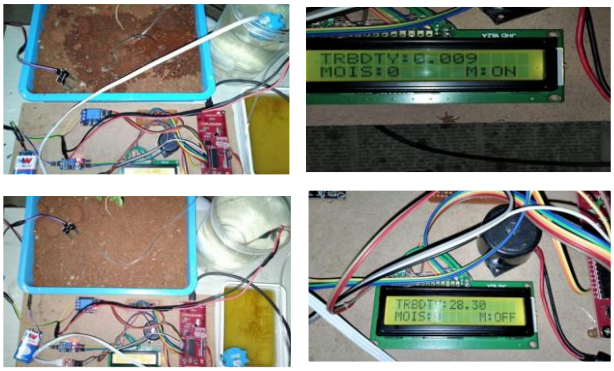

Figure 5: Result

Advantages

- This makes increase in productivity.
- Reduces manpower.
- Reduces water consumption.
- Works according to the soil moisture condition.
- Fully automated irrigation system which will turn ON and OFF a water pump as per the level of moisture in soil.

Applications

- It can be used in agricultural fields, lawns & as drip irrigation systems.
- It can be used for cultivation purposes.
- It can be used to provide water in nursery planting area.
- It can be used for wide range of crops as one can customize reference required for different kind of crops.

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VII. CONCLUSION

- In present days, especially farmers are facing major problems in watering their agriculture fields, it's because they have no proper idea how much of water is required to the field.
- Even after then they need to wait until the field is properly watered, which makes them stop doing other activities.
- Here is an idea that helps not only farmers even for watering the gardens also, which senses the soil moisture and switches the pump automatically.
- Automated Irrigation System is very useful.

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