Sensor based Automated Irrigation System with IOT

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ABSTRACT

Irrigation for plants, fruits and vegetable gardens and farms has been the need Of mankind from early days of history. Automatic Irrigation system is a modern method of Irrigation the vegetables And fruit, farms, gardens and landscaping areas as against the conventional Method, which uses large number of man-hours and uncontrolled water Quantity.These methods are mainly based on irrigating the fields and other areas with River on or well water. Damn and barrages are constructed across the river to Store the river water upstream and distributing it to various areas through a Network of canals. In case of well, the water is lifted by pumps and other Mechanical means. The main aim of this paper is to provide automatic irrigation to the plants which helps in saving money and water. The entire system is controlled using micro controller which is programmed as giving the interrupt signal to the sprinkler. Temperature sensor and humidity sensor are connected to internal ports of micro controller via comparator. Whenever there is a change in temperature and humidity of the surroundings these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller and thus the sprinkler is activated.

Keywords: *Comparator,pumps, sensors, automation.*

Introduction

Irrigation for plants, fruits and vegetable gardens and farms has been the need of mankind from early days of history. Automatic Irrigation system is a modern method of Irrigation the vegetables and fruit, farms, gardens and landscaping areas as against the conventional Method, which uses large number of man-hours and uncontrolled water Quantity. Various methods of irrigation are being used in various parts of the world. These methods are mainly based on irrigating the fields and other areas with River on or well water. Damn and barrages are constructed across the river to Store the river water upstream and distributing it to various areas through a Network of canals. In case of well, the water is lifted by pumps and other Mechanical means. During the past 50-60 years, irrigation like many other fields has been automized by using unmanned electrically operated irrigation system for Agriculture and landscaping purpose. This field is still in the process of Development and more and more products are entering in the market. The Pressure and flow figures etc. ascribed to various irrigation equipment in the Following paragraph are only for guidance purpose and may vary with time and From manufacturer to manufacturer. Automatic irrigation system is a wide Subject and is now taught and a course in several universities. The purpose of This paper is to give a general idea about the system. This system has been developed and widely used in the USA, Europe and Middle East countries; However it is not so common in Asian and African countries. Smart Controller for irrigation work on a simple principle: provide the Appropriate watering schedule, adjust for the weather changes and irrigate Based on the needs of the landscape. There are a variety of weather-based "smart" controllers available for Commercial applications. Whether it is real-time on-site weather data, the new "Smart" controller leaver the little room for error. With smart controller installed on your commercial property, you will be able to Avoid overwatering and excessive run-off by scheduling the amount of irrigation Based on the type of landscape and current weather conditions. You

can Protect you landscape investment and improve the health and look of your Landscape. Statistics show that as much of the 50% of commercial water is used for Irrigation.With many cases of over-irrigation, excessive run-off and poor Landscape planning, water agencies are tapping common sense and technology. To improve water conservation efforts and enhance the health and beauty of our Landscapes.

Motivation

In our project the humidity sensor will sense the humidity near the ground surface of crop & convert this humidity into voltage form & output ofsensor is given to analog to digital converter IC ADC 8591. The ADC IC convert the analog input into digital form. The digital equivalent is depend on the reference voltage of an ADC. The output of ADC is given to microcontroller. In microcontroller first we store the reference humidity the microcontroller compare the reference humidity with incoming humidity depend on the result it will send the signal to relay. Then relay connect the supply to pump & pump will turn ON & start pumping the water into the farm.

Major Components

Sensors:

Sensirion's family of relative humidity and temperature sensors have become established as the industry standard - mainly due to their high performance and integration (CMOSens® Technology) in a miniature format. The capacitive humidity and temperature sensors provide digital and fully calibrated output which allows for easy integration without the need for additional calibration. The excellent long term stability has been very well perceived and the cutting edge low energy consumption is unachieved and makes them the right choice for any remote application. The digital humidity sensors are provided in different packaging types: SMD type (SHT1x series), pin type (SHT7x series) and the new DFN type (SHT2x series). The SHT1x and SHT2x are reflow solderable while pin type humidity sensors are used for devices where flexible integration is crucial or easy exchange is necessary. A humidity sensor, or a hygrometer, measures and shows the relative humidity in the air. In other words, it measures both air temperature and moisture to get the ratio of actual moisture in the air to the highest amount of moisture air at that can contain. The most common type of humidity sensor is "capacitive humidity sensor" which uses capacity measurement. It depends on electrical capacitance, the ability of two paralleled electrical conductors to generate a electrical field between them. A humidity sensor becomes standardized in the field, based on its high performance and integration technology (CMOSens® Technology) in miniature format. CMOSens® Technology enables the sensor component to connected with the analog and digital signal processing circuit on a silicon CMOS chip.

A/d Convertor:

The analog to digital converter convert the analog input which is sense by humidity sensor. It basically converts the analog value i.e voltage generator by the sensor into digital value i.e 1's & 0's because microcontroller is a digital machine it understand only machine level language. So it is required to convert analog input to digital output.The PCF8591 is a single-chip, single-supply low power 8-bit CMOS data acquisition device with four analog inputs, one analog output and a serial I2C-bus interface. Three address pins A0, A1 and A2 are used for programming the hardware address, allowing the use of up to eight devices connected to the I2C-bus without additional hardware. Address, control and data to and from The device are transferred serially via the two-line bidirectional I2C-bus. The functions of the device include analog input multiplexing, on-chip track and hold function, 8-bit analog-to-digital conversion and an 8-bit digital-to-analog conversion. The maximum conversion rate is given by the maximum speed of the I2C-bus.

Microcontroller:

Microcontroller is a digital machine which can understand only machine level language i.e 1's & 0's. Microcontrollers in AVAS are settled by territorial criterion, i.e. in places where there is maximum number of sensors of systems and executing mechanisms. One microcontroller can serve sensors and executing mechanisms of different systems by the principle of its proximity to an object of control. One microcontroller serves up to 10 sensors and executing mechanisms. Only one type of microcontroller is used in AVAS; it is directly connected to the vehicle power cable in the voltage range from 5 to 75 volts.

Power Supply:

In This power supply circuit the AC main (230v, 50Hz) voltage is applied to the Transformer primary & at secondary we get 12v AC supply. This AC is converted into DC with the help of bridge circuit and filter circuit. The main requirement of the microcontroller is that it work on +5v supply so to provide +5V supply we used IC 7805 it is the three terminal positive regulator IC which supply the required +5V power supply to microcontroller.

Clock:

The 89V51RD2 has an on-chip oscillator but requires an external clock to run It. To drive the device from external clock circuitry, the external clock signal Should be applied to XTAL1 pin, while XTAL2 should be left unconnected.

Reset:

Reset is an active high input pin. When a high pulse is applied to this pin for two machine cycles, microcontroller gets reset and it terminates all of its
activities. This is called as Power on reset. This clears all the registers and Makes program counter as 0000H.

Circuit Diagram:

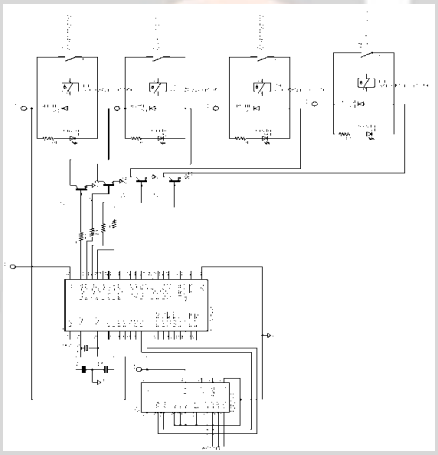

Fig 1 Circuit diagram

Working of circuit diagram:

The humidity sensor placed above the surface of the farm where the humidity.In the air is continuously measured by the sensor. Depending upon the Humidity the sensor will generate the analog signal(Voltage) which is applied To Analog to Digital convertor IC (PCF8951P).This ADC IC converts analog Signal into digital form depending upon theReference voltage applied to it.The output of ADC is digital but this IC differ from the normal IC (0808)Because this IC produce digital signal serially i.e. only one pin is used For the communication and hence the complexity is reduced and hence we Require less number of connections.The digital output of ADC is applied to port 1.6 and port 1.7 of microcontroller (IC 89v51rd2). In microcontroller initially we stored the reference Humidity (reference value)as per our requirements so the microcontroller.Compare the reference humidity with incoming humidity (voltage produced Due to humidity in the surface of our farm). If the incoming signal is less Than the reference value then microcontroller sends the signal via port 0.0 And port 0.3 where the base of transistor IC (TIP 122) is connected via a Current limiting resistor. The transistor is used for increasing the signal the strength up to sufficient

Level The emitter terminal of the transistor is grounded and the collector is Connected to the coil terminal of the relay. And also it is given to the diodes Anode terminal and the LED via resistor to indicate to see that relay is turn ON Turn OFF. The 12V DC supply applied to anothercoil terminal of relay and one Wire of pump coming from AC mains is connected to the centre terminal of Relay and another end of pump wire is connected to the normally open (NO) terminal of the relay . So when the relay is turned on by the amplifier the circuit of pump is complete And pump will start functioning and will water the farms automatically. As the humidity in the farms is increasing the sensor output will change according to humidity above the surface of fields. As soon as the humidity is above the reference value the microcontroller will send a signal to turn off the transistor via port 0.1 and 0.3 .so the relay will connection is turned off so the electrical path of pump is disconnected and pump stops pumping.

RS-232 and max IC:

Serial RS-232 (V.24) communication works with voltages (between -15V ... -3V are used to transmit a binary '1'and +3V ... +15V to transmit a binary '0') which are not compatible with today's computer logic voltages. On the other hand, classic TTL computer logic operates between 0V ... +5V (roughly 0V ... +0.8V referred to as *low* for binary '0', +2V ... +5V for *high* binary '1'). Modern low-power logic operates in the range of 0V ... +3.3V or even lower. So, the maximum RS-232 signal levels are far too high for today's computer logic electronics, and the negative RS-232 voltage can't be grokked at all by the computer logic. Therefore, to receive serial data from an RS-232 interface the voltage has to be reduced, and the *0* and *1* voltage levels inverted. In the other direction (sending data from some logic over RS-232) the low logic voltage has to be "bumped up", and a negative voltage has to be generated, too.

Pin Description:

Max IC 232

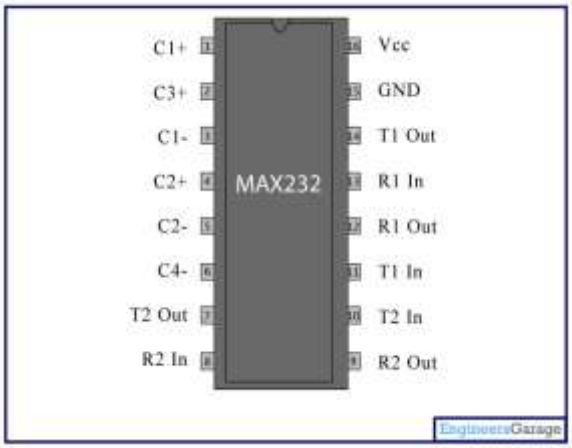

Fig 2 Pin diagram

Pin No	Function	Name
1	Capacitor connection pins	Capacitor 1 +
2		Capacitor 3 +
3		Capacitor 1 -
4		Capacitor 2 +
5		Capacitor 2 -
6		Capacitor 4 -
7	Output pin; outputs the serially transmitted data at RS232 logic level; connected to receiver pin of PC serial port	T_2 Out
8	Input pin; receives serially transmitted data at RS 232 logic level; connected to transmitter pin of PC serial port	R_2 In
9	Output pin; outputs the serially transmitted data at TTL logic level; connected to receiver pin of controller.	R_2 Out
10	Input pins; receive the serial data at TTL logic level; connected to serial transmitter pin of controller.	T_2 In
11		T_1 In
12	Output pin; outputs the serially transmitted data at TTL logic level; connected to receiver pin of controller.	R_1 Out
13	Input pin; receives serially transmitted data at RS 232 logic level; connected to transmitter pin of PC serial port	R_1 In
14	Output pin; outputs the serially transmitted data at RS232 logic level; connected to receiver pin of PC serial port	T_1 Out
15	Ground (0V)	Ground
16	Supply voltage; 5V (4.5V – 5.5V)	Vcc

Table 1 Pin description

Advantages:

1. The parameters to be controlled and measured are quite accurate of use in Irrigation system.
2. Less description of plants.
3. Better quality of the plants can be achieved.
4. Operation range of control is large.
5. Labour work is reduced tremendously
6. It is easy to control the parameter using computer also the operation is very fast.
7. It is not time consuming.
8. Because of the array of green-house glow in of specific plant is possible in any season.

Disadvantages:

1. The controlling port is limited only up to computer literature person.
2. It is one man control work &this results in unemployment.
3. Circuit is complicated.

Conclusion:

From the project we conclude this, The system provides with several benefits and canoperate with less manpower. The system supplies water onlywhen the humidity in the soil goes below the reference. Due tothe direct transfer of water to the roots water conservationtakes place and also helps to maintain the moisture to soil ratioat the root zone constant to some extend. Thus the systemis efficient and compatible to changing environment.

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