Automatic Irrigation System

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Abstract: This system is designed to develop an "Automatic Irrigation System" which switches the pump motor ON/OFF on sensing the moisture content of the soil. In the field of agriculture, use of proper method of irrigation is important. The advantage of using this method is to reduce human intervention and still ensure proper irrigation.

1. Introduction:

In the world of advanced electronics life of human beings should be simpler. Hence to make life simpler and convenient we have made "Automatic irrigation system". A mode of controlling irrigation and facilitates to help millions of people. This model uses sensor technology with micro controller to make a smart switching design.

Now a day, present, labor-saving and water-saving technology is a key issue in irrigation. People now are working actively at intelligent irrigation systems because of their advantages of labor-saving and water saving. The present paper describes a design of low-cost irrigation system.

The system consists of a microcontroller (8051), soil moisturizing sensor and DC motor. The soil moisturizing sensor collects the air humidity parameters and sends it to the Micro controller. If the humidity values are low, microcontroller turns on the motor, to supply water to the crops. If the humidity values are high, microcontroller turns off the motor, to stop the supply water to the crops. These statuses are displayed on the LCD.

This project uses regulated 5V, 500mA power supply.7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

1.1 Purpose of this project:

This project "**AUTOMATIC IRRIGATION SYSTEM**" using domain internet of things (IOT) is used mainly in agricultural fields "To reduce Man power and make irrigation simple and easy".

2. EXISTING SYSTEM

In the existing system the irrigation is done simply by using water pumps to supply water to the agricultural fields which increases man power.

3. PROPOSED SYSTEM

The proposed system provides advanced irrigation system by using components like sensors, microcontroller, comparator in the system which reduces the manual monitoring of the field.

4. HARDWARE DESCRIPTION

4.1 Soil Moisture Sensor

This basic cheap soil moisture sensor consists of two probes (the metal rods) held apart at a fixed distance by some insulating material. The other factor is that part of the probe is insulated so that you can control at what depth you would like to take the reading.

So, our sensor starts with a 50mm thick (tall) insulating block. This does keep the rods apart, and is also just a booster it's a big, foam block sitting on the soil so you don't accidentally, dig up your sensor.

Fig 4.1.1: Soil Moisture Sensor

Next down is the insulated section of the probe (also 50mm). From here down, the probe will be under the soil.
If you want to change the depth of the reading, you can just change the length of this insulated section. You will not have to make changes to the local circuit.

Finally we have the exposed part of the probe (again 50mm). This is the part of the probe that actually takes the reading. You could experiment with different lengths here, but you will have to
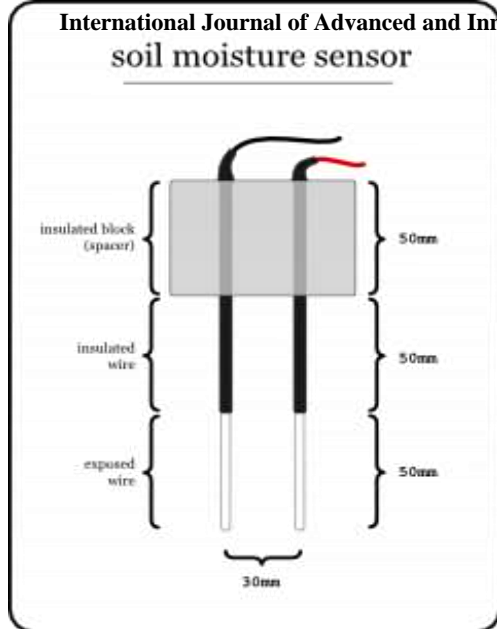
make changes to the local circuit (to adjust the voltage divider).

4.2) LCD

Liquid crystal display a type of display used in digital watches and many portable computers.

Fig 4.2.1 16*2 LCD Display

LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. Each crystal, therefore, is like a shutter, either allowing light to pass through or blocking the light.

The liquid crystals can be manipulated through an applied electric voltage so that light is allowed to pass or is blocked. By carefully controlling where and what wavelength (color) of light is allowed to pass, the LCD monitor is able to display images. A back light provides LCD monitor's brightness.

Here, The LCD is used for the purpose of displaying the words which we have given in the program code that is, it displays automatic irrigation system whenever the system is on, and if the soil is detected with dry, it displays soil is dry, motor on. If the soil is detected with wet, then it displays soil is wet, motor off. This code will be executed on microcontroller chip and displayed on the LCD screen.

4.3) DC Motor

Electric motors are extremely important to modern-day life, being used in many different places, e.g., vacuum cleaners, dishwashers, computer printers, fax machines, video cassette recorders, machine tools, printing presses, automobiles, subway systems, sewage treatment plants and water pumping stations. Electric motor is a machine used to convert electrical energy to mechanical energy. In this project we use three DC motors, two which control the direction of the robot and another which controls the arm of the robot.

An electric motor consists of two essential elements. The first, a static component which consists of magnetic materials and electrical conductors to generate magnetic fields of a desired shape, is known as the stator. The second, which is made from magnetic and electrical conductors to generate shaped magnetic fields which interact with the fields generated by the stator, is known as the rotor. The rotor comprises the moving component of the motor, having a rotating shaft to connect to the machine being driven and some means of maintaining an electrical contact between the rotor and the motor housing (typically, carbon brushes pushed against slip rings).

In this, the motor is connected in order to pump the water to the fields or to stop overflow of water in the fields.

4.4) Micro controller (AT89S52)

The system requirements and control specifications clearly rule out the use of 16, 32 or 64 bit micro controllers or microprocessors. Systems using these may be earlier to implement due to large number of internal features. They are also faster and more reliable but, the above application is satisfactorily served by 8-bit micro controller. Using an inexpensive 8-bit Microcontroller will doom the 32-bit product failure in any competitive market place. Coming to the question of why to use 89S52 of all the 8-bit Microcontroller available in the market the main answer would be because it has 8kB Flash and 256 bytes of data RAM32 I/O lines, three 16-bit timer/counters, a Eight-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.

In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port,

and interrupt system to continue functioning. The Power Down Mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next hardware reset. The Flash program memory supports both parallel programming and in Serial In-System Programming (ISP). The 89S52 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

Features:

Compatible with MCS-51 Products
8K Bytes of In-System Reprogrammable Flash Memory
Fully Static Operation: 0 Hz to 33 MHz
Three-level Program Memory Lock
256 x 8-bit Internal RAM
32 Programmable I/O Lines
Three 16-bit Timer/Counters
Eight Interrupt Sources
Programmable Serial Channel
Low-power Idle and Power-down Modes
4.0V to 5.5V Operating Range
Full Duplex UART Serial Channel
Interrupt Recovery from Power-down Mode
Watchdog Timer
Dual Data Pointer
Power-off Flag
Fast Programming Time
Flexible ISP Programming (Byte and Page Mode)

5. POWER SUPPLY

5.1) Block diagram
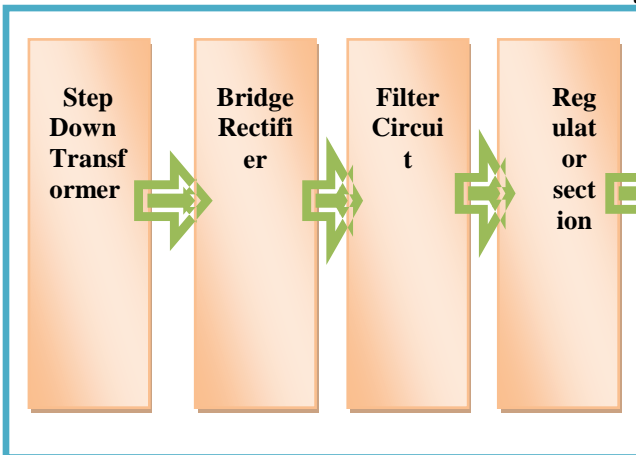
Fig 5.1.1 Power supply

Here I used 9 volts transformer for continuous power supply. We can also use a battery instead but in case of a battery sometimes the total current may loss so here i am using A.C Transformer. A.C transformer is giving the input to Bridge Rectifier. Bridge Rectifier converts A.C to D.C. After that we are using one filter capacitor 1000uf/25v electrolytic capacitor .We connecting this capacitor in parallel section. The main purpose of this capacitor is if there is any alternate peaks we need to reduce that peaks. Nothing but a filtering that repels. After that we are using LM7805 Regulator Most digital logic circuits and processors need a 5 volt power supply. To use these parts we need to build a regulated 5 volt source. We make a 5 volt power supply, The LM7805 is simple to use. First connect the positive lead of our unregulated DC power supply Input pin, connect the negative lead to the Common pin and then when we turn on the power, we get a 5 volt supply from the Output pin. Here we are using one red color led to indicate the power.

6. SOFTWARE DESCRIPTION

6.1 Keil Software

Keil Software, world's leading developer of Embedded Systems Software, makes ANSI C compilers, macro assemblers, real-time kernels, debuggers, linkers, library managers, simulators, integrated environments, and evaluation boards for the 8051, 251, ARM7, and C16x/ST10 microcontroller families. Keil Software implemented the first C compiler designed from the ground-up specifically for the 8051 microcontroller.

Keil development tools offer a complete development environment for ARM, Cortex-M, and Cortex-R processor-based devices. They are easy to learn and use, yet powerful enough for the most demanding embedded applications.

Keil Software provides the premier 8051 and 251 development tools in the industry. To help you become familiar with how we distribute our tools, we would like to introduce the concept of a tool kit. A tool kit is comprised of several application programs that you use to create your 8051 application. You may use an assembler to assemble your 8051 assembly program, you may use a compiler to compile your C source code

into an object file, and you may use a linker to create an absolute object module suitable for your in-circuit emulator. While it makes little sense to have a compiler without a linker, it also makes little sense to have a linker without a compiler or assembler. Therefore, our tools are packaged into various kits.

7. PROJECT DESCRIPTION

Working:
Here we have used an AVR AT89S52 microcontroller which is programmed to receive the input signal of varying moisture condition of the soil through the sensing arrangement. This is achieved by using an LM358 op-amp as comparator which acts as interface between the sensing arrangement and the microcontroller. Once the controller receives this signal, it generates an output that drives a relay for operating the water pump.

An LCD display is also interfaced to the microcontroller to display status of the soil and water pump. The sensing arrangement is made by using two stiff metallic rods inserted into the field.

7.1 Advantages

- Highly sensitive
- Works according to soil conditions
- Complete elimination of man power
- System can be switched into manual mode when ever required.

7.2. Disadvantages:

- Applicable only for large Forms
- Have limited life after installation due to decomposition of plastic components in a hot arid climate when exposed to ultraviolet light.

7.2 Applications
References:

- Irrigation in fields.
- Irrigation in Gardens and parks.
- Very efficient for paddy, rice fields.

8. PROTOTYPE

In this prototype we can see two plants, here one is wet and the other is dry. Whenever the the sensor is inserted in the soil it detects and performs an action.

Fig: 8.1 prototype of the Automatic Irrigation System

9. CONCLUSION

In present days farmers are facing many problems in watering there agriculture fields. So by using this system we can water the plants automatically even in the absence of farmer.

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[3]Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, Miguel Ángel Porta-Gándara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS module", *IEEE Transactions On Instrumentation And Measurement*, vol. 63, no. 1, January 2014.
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