



Design of Hi-Tech Irrigation System Using Microcontroller and GSM Technology

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Abstract: Automation is playing a key role in today's world. Everyone want to automate their work upto the extent it can be. The project in this paper is a demonstration of GSM technology in the agricultural field. By using this kind of technology one can save his/her time in operation of electrical devices or appliance in the farming areas. In this project we demonstrate that how a person from distance control his/her agricultural motor with the help of existing GSM technology and also control the distribution of water from the pump in different areas of farming field.

Keywords: WWW(world wide web), GSM(global system for mobile), DTMF(dual tone multi frequency), IC'S(integrated circuits), Vent.

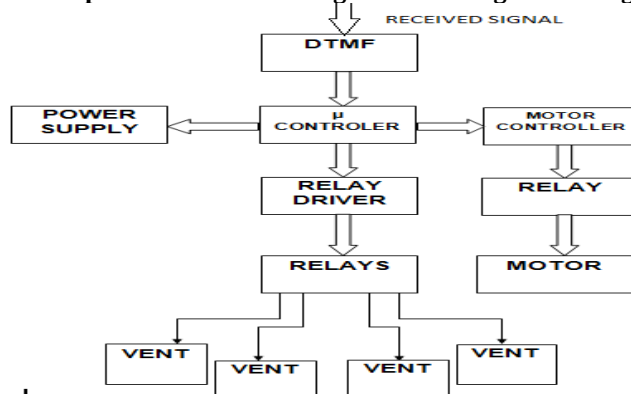
I. Introduction

Automation is increasingly playing its role in each and every field of life from manufacturing to controlling sector. Everyone wants easiness in their work by controlling their working devices with less energy. In this paper we design a system which is very much useful in agricultural field because by using this system farmers can control their tubewell motors through their mobiles from anywhere in the world through GSM technology. In this system we have used DTMF module to provide interfacing between mobile unit and microcontroller Module on the motor system. By using different relays we have controls the motors of different water vents going to different part of the fields. The main disadvantage of this system is that we can only close and open the vent from the mobile unit but we can not observe the water level in that particular part of the field .

II. GSM controlling vents and motor

Controlling devices using switches are common. From a few decades controlling devices using remote control switches like infrared remote control switch, light activated switches are becoming popular. But these technologies have their own limitations. Laser beams are harmful to mankind. Some technologies like IR remote control are used for short distance applications. Thus we require a system which does not emit any radiations or which is not harmful and it can be used from any distance from meters to thousand kilometers that is simple telephone line or mobile phone. To perform any operations through remote or phone line, the user needs to dial to the local cell phone (to which the interfacing circuit is connected) then the respective code of the device is dialed. This circuit does not require any complex IC, so any one with little knowledge of electronics can construct this circuit. This system detects the call signal from your cell phone with the help of auto answer and automatically switches ON.

Figure 1 represents the block diagram of the high tech irrigation system

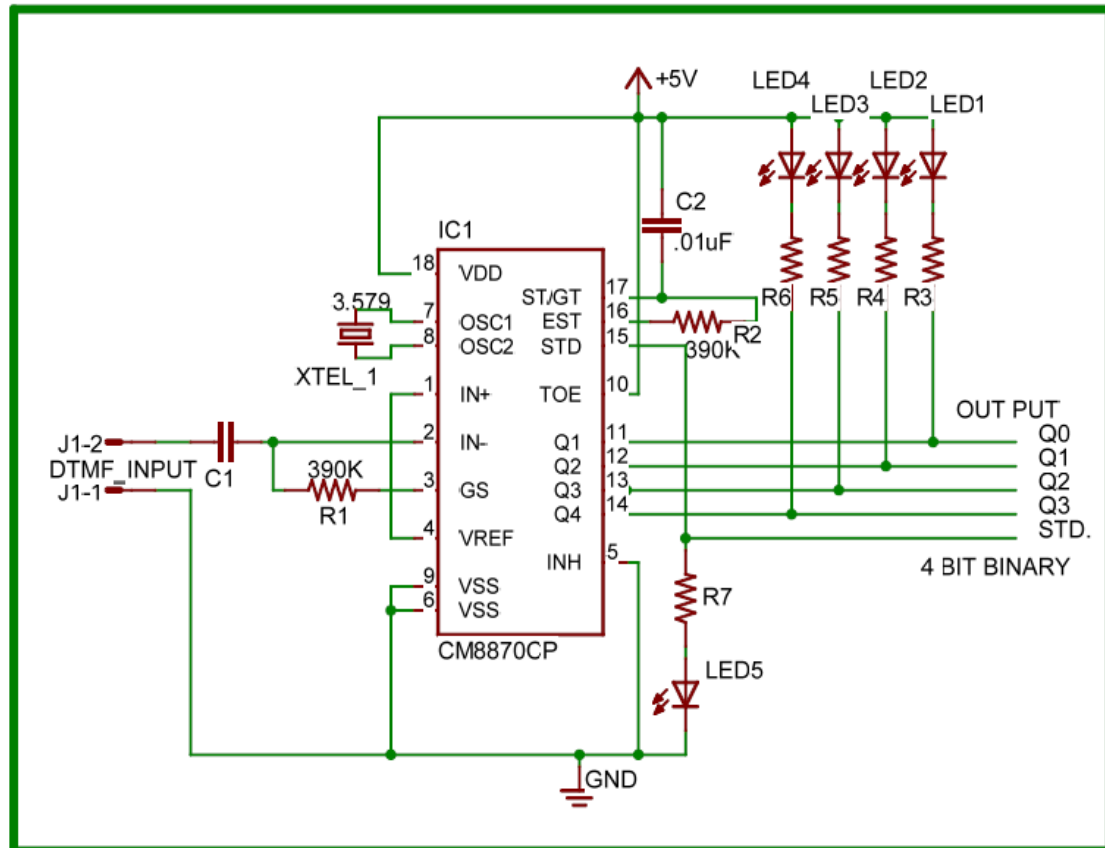


A. DTMF Decoder

It is not easy to detect and recognize DTMF with satisfactory precision. Often, dedicated integrated circuits are used. It is rather complicated, so it is used only marginally. Most often, a MT 8870 or compatible circuit would be used.

The MT8870 is a complete DTMF receiver integrating both the band split filter and digital decoder functions. The filter section uses switched capacitor techniques for high and low group filters; the decoder uses digital counting techniques to detect and decode all 16 DTMF tone-pairs into a 4-bit code. External component count is minimized by on chip provision of a differential input amplifier, clock oscillator and latched three-state bus interface .

Figure 2 represents DTMF module



B. Microcontroller

A microcontroller (also MCU or μC) is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers, watchdog, serial and analog I/O etc. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a, typically small, read/write memory.

The AT89S51 is a low-power, high-performance CMOS 8-bit microcontroller with 4K bytes of In-System Programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-Standard 80C51 instruction set and pin out. The on-chip Flash allows the program Memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with In-System Programmable Flash on a monolithic chip, the Atmel AT89S51 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

C. Relays

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. It was invented by Joseph Henry in 1835. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

When an electric current is passed through the coil, the resulting magnetic field attracts the armature, and the consequent movement of the movable contact or contacts either makes or breaks a connection with a fixed contact. We have also used ULN2803 which is the darlington array which is a current amplifier which amplifies the current of the signal coming from the microcontroller.

III. Implementation of the design

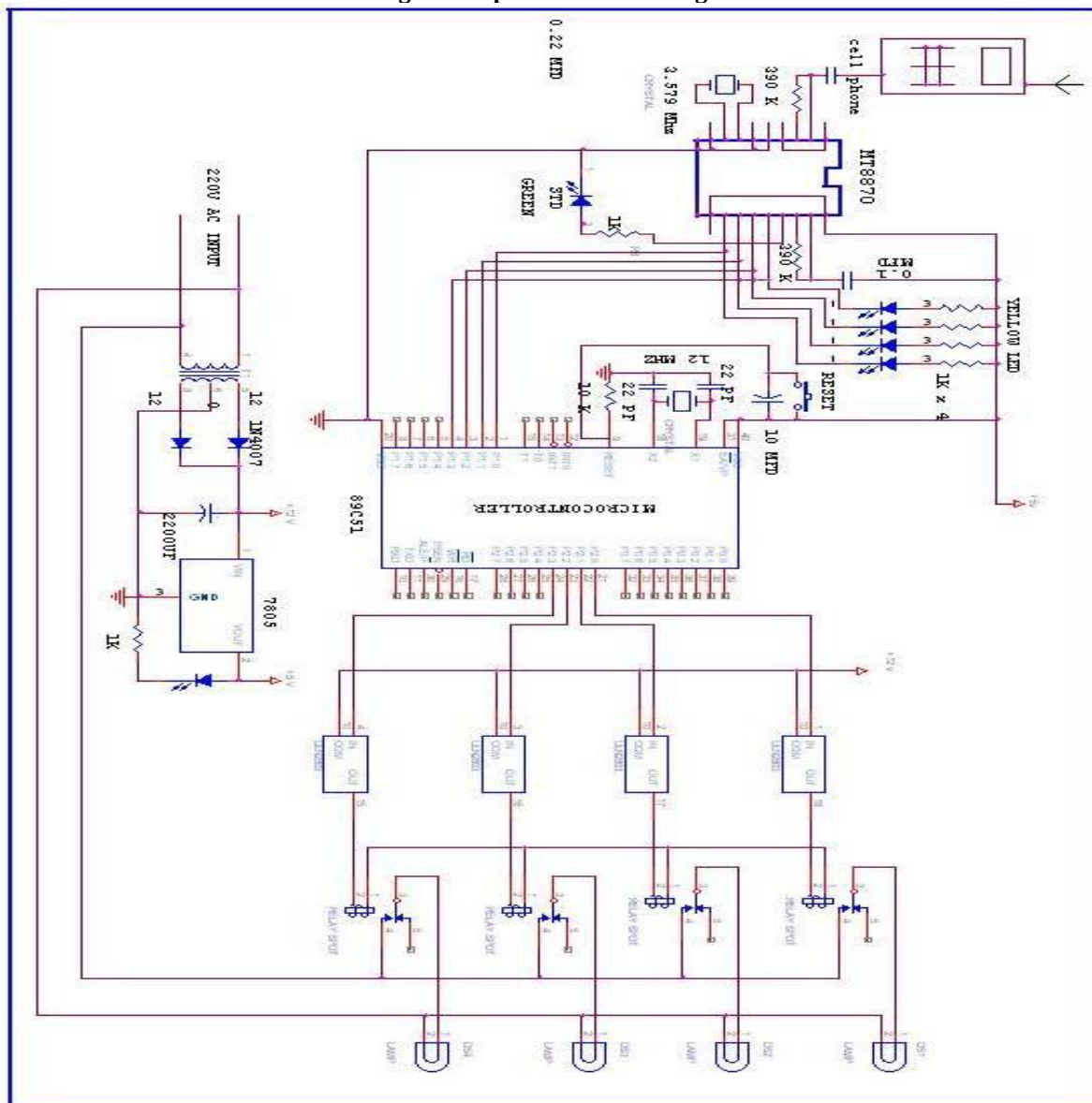
On dialing a no. from the cell phone or landline, the bell starts ringing at the receiver end. When the person picks the call the process of communication takes place between the receiver and the transmitter. The voice signal at the transmitter end is modulated by the phone. GSM act as carrier. On the other hand the signal at the receiver end is first demodulated and the resultant information signal is produced at the speaker of the phone.

DTMF is the world standard frequency which is present in the keypad of all the phones. Reason being if different countries have different frequencies then the modulated signal produced at the transmitter end cannot be demodulated at the phone (present in some other country) because of mismatch in frequency.

When we dial the no. of the phone attached with our device. The auto answer in the phone will pick the call. When we come to know that phone has been picked then we select the device through the keypad button. According to the button pressed DTMF gets generated, modulated and send by the GSM to the other phone. We will get the same tone from the speaker after demodulation.

DTMF is an analog signal and as microcontroller is the digital device so it cannot read the DTMF signal. That's why we have used DTMF decoder MT8870 in which we have given the input at pin no.2 through the capacitor. When signal is interfaced then DTMF decodes into a 4 bit binary output through the pins 11,12,13 and 14(more information can be obtained through datasheet). Yellow colour inverted LED's display the binary output. When LED's are glowing then the output is zero and when it is not glowing then the output is one.11,12,13 and 14 pins are connected to the port one of the microcontroller.

Figure 3 represents circuit diagram



When microcontroller receives this 4 bit binary signal then according to the program it controls the functioning of the device connected to the port 2. Now the signal at the output of the controller lacks sufficient current therefore it cannot control the functioning of the devices which require large current.

Therefore we connect the output of the controller to the ULN2803 which is a 8 bit darlington array. It gives the output current upto the value of 500mA. The relays are connected to the output of the ULN2803. A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of operation. Thus it can be used to control the functioning of the high current devices when connected to the output of ULN2803. And depending upon the no. we have pressed on our phone we can control the corresponding motor or vent attached on our system. In the figure no. 3, at output of the circuits lamps are representing corresponding vents. This whole system is controlled through programming of the microcontroller with the assistance of various software's like keil etc.

IV. Conclusion

In this paper we have designed a irrigation system in which we can control the motor and vents through the use of our mobile system by using the DTMF module, microcontroller and relay drivers. This will definitely save the important time. The only drawback of this system is that we can not judge the quantity of the water in our fields. So research can be done in this area.

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