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Smart Irrigation System Using 8051 Microcontroller and Fencing Control Using Bluetooth Module

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ABSTRACT: The project we have undertaken is "Automatic Plant Irrigation System with fencing control using blue-tooth module with vocal & text commands". This project is taken up as India is an agriculture oriented country and the rate at which water resources are depleting is a dangerous threat hence there is a need of smart and efficient way of irrigation. In this project we have implemented sensors which detect the humidity in the soil (agricultural field) and supply water to the field which has water requirement. Our aim of the work is to simplify the method of irrigation using vocal commands through the GSM technology. The Farmer just needs to open the app and utter the control commands through his phone. The control system at the field involves a PIC microcontroller interfaced with GSM modem to receive the command from the farmer and a voice recognition unit which decodes it. The motor is turned on/off according to the decoded commands by the controller. The moisture sensor attached to the system helps in collecting the moisture content of the soil and switch off motor when it reaches the required moisture.

KEYWORDS: Soil Moisture Sensor, Microcontroller, Automatic Irrigation ,High current circuit ,blue-tooth module ,GSM, Vocal & Text commands.

I. INTRODUCTION

The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land [1]. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes to waste. In modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drip by drip due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation techniques in India through manual control in which farmers [2].

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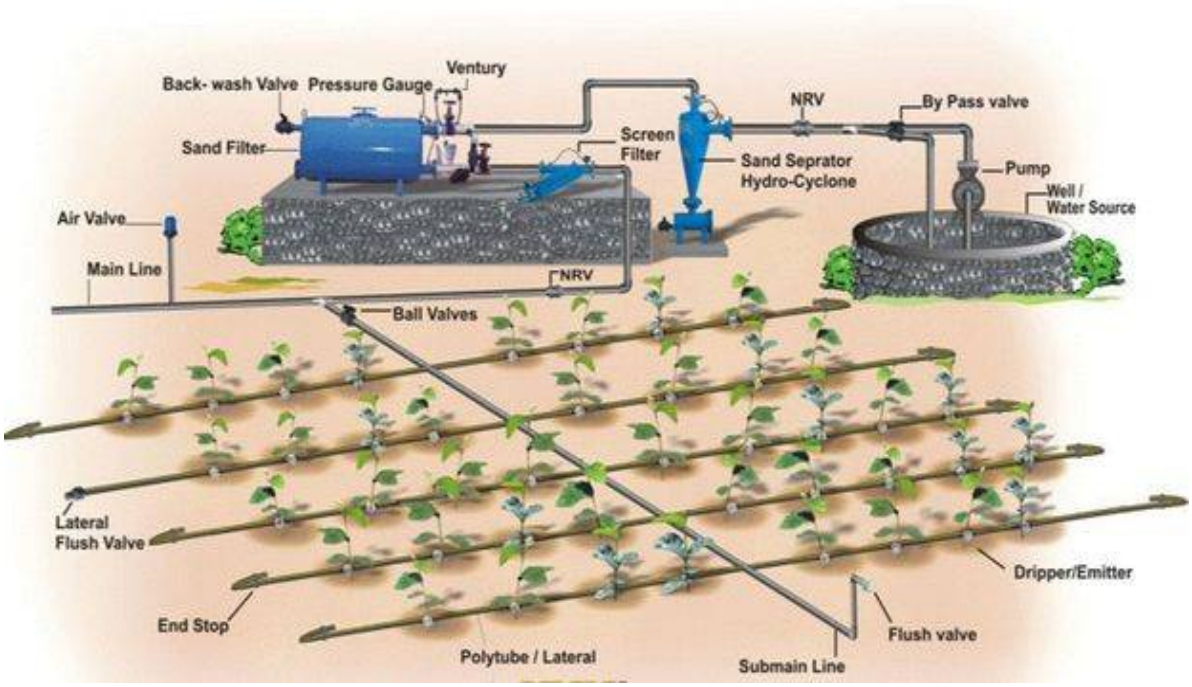
II. TYPES OF IRRIGATION

1.Surface irrigation 2. Localized irrigation 3. Drip Irrigation 4. Sprinkler irrigation



Overview of Automated Irrigation System

The above fig explains about important parameters to be measured for automation of irrigation system are soil moisture. The entire field is first divided into small sections such that each section should contain one moisture sensor. These sensors are buried in the ground at required depth[1] Once the soil has reached desired moisture level the sensors send a signal to the micro controller to turn on the relays, which control the motor[3]. In proposed system, automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the dampness content of the earth. In the domain of farming, utilization of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference. This automated irrigation project, the soil sensor senses the moisture content by giving input signal to an 8051 micro-controller, is programmed to collect the input signal of changeable dampness circumstances of the earth via dampness detecting system[3,4].

III. SOIL MOISTURE

Soil moisture is an important component in the atmospheric water cycle, both on a small agricultural scale and in large-scale modeling of land/atmosphere interaction. Vegetation and crops always depend more on the moisture available at root level than on precipitation occurrence. Water budgeting for irrigation planning, as well as the actual scheduling of irrigation action, requires local soil moisture information. Knowledge of the degree of soil wetness helps to forecast the risk of flash floods, or the occurrence of fog. Soil water content is an expression of the mass or volume of water in the soil, while the soil water potential is an expression of the soil water energy status. The relation between content and potential is not universal and depends on the characteristics of the local soil, such as soil density and soil texture[6]. The basic technique for measuring soil water content is the gravimetric method. Because this method is based on direct measurements, it is the standard with which all other methods are compared. Unfortunately, gravimetric sampling is destructive, rendering repeat measurements on the same soil sample impossible. Because of the difficulties of accurately measuring dry soil and water volumes, volumetric water contents are not usually determined directly[3,6].

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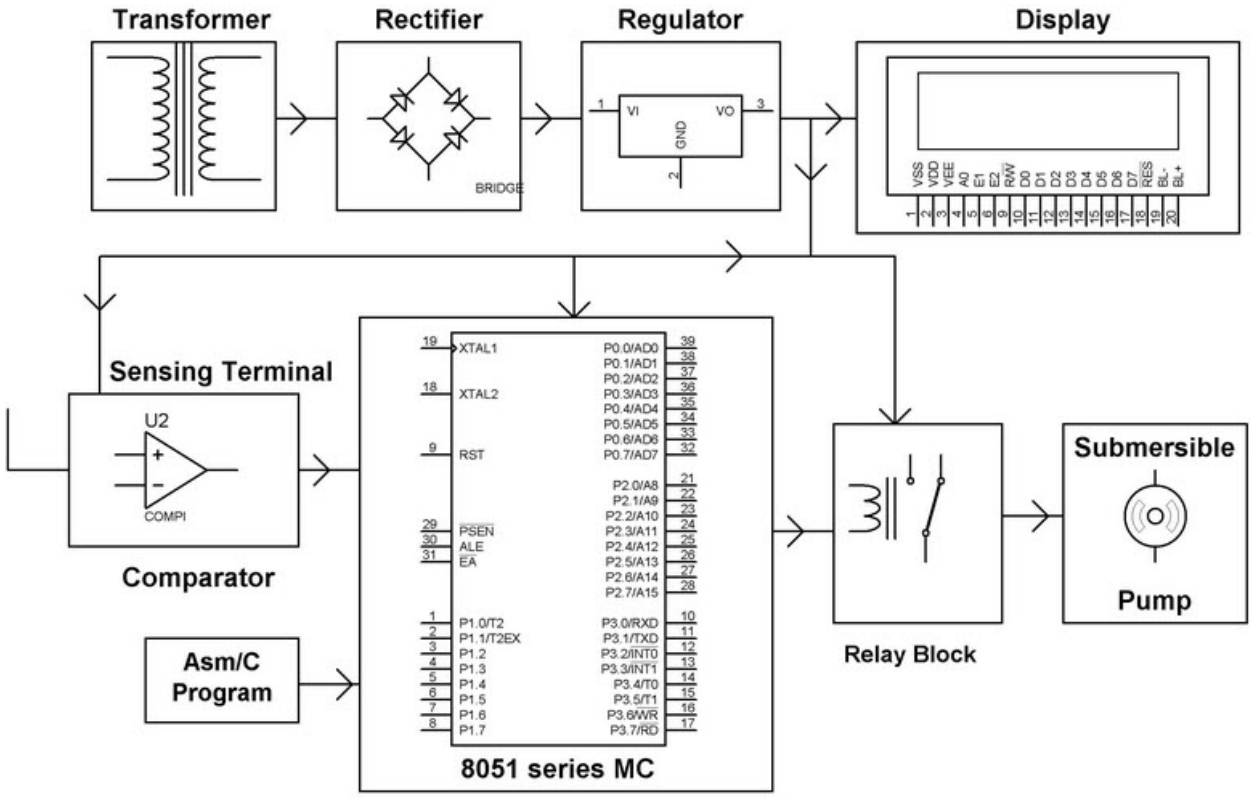

Block Diagram Of Automatic Irrigation System.

The capacity of soil to retain water is a function of soil texture and structure. When removing a soil sample, the soil being evaluated is disturbed, so its water-holding capacity is altered. Indirect methods of measuring soil water are helpful as they allow information to be collected at the same location for many observations without disturbing the soil water system[5]. Moreover, most indirect methods determine the volumetric soil water content without any need for soil density determination. The new soil moisture sensor uses Immersion Gold which protects the nickel from oxidation. Electrodes nickel immersion gold (ENIG) has several advantages over more conventional (and cheaper) surface plating such as HASL (solder), including excellent surface planarity (particularly helpful for PCB's with large BGA packages), good oxidation resistance, and usability for untreated contact surfaces such as membrane switches and contact points[7]. A soil moisture sensor can read the amount of moisture present in the soil surrounding it. It's a low tech sensor, but ideal for monitoring an urban garden, or your pet plant's water level. This is a must have tool for a connected garden. This sensor uses the two probes to pass current through the soil, and then it reads that resistance to get the moisture level. More water makes the soil conduct electricity more easily (less resistance), while dry soil conducts electricity poorly (more resistance) [7].

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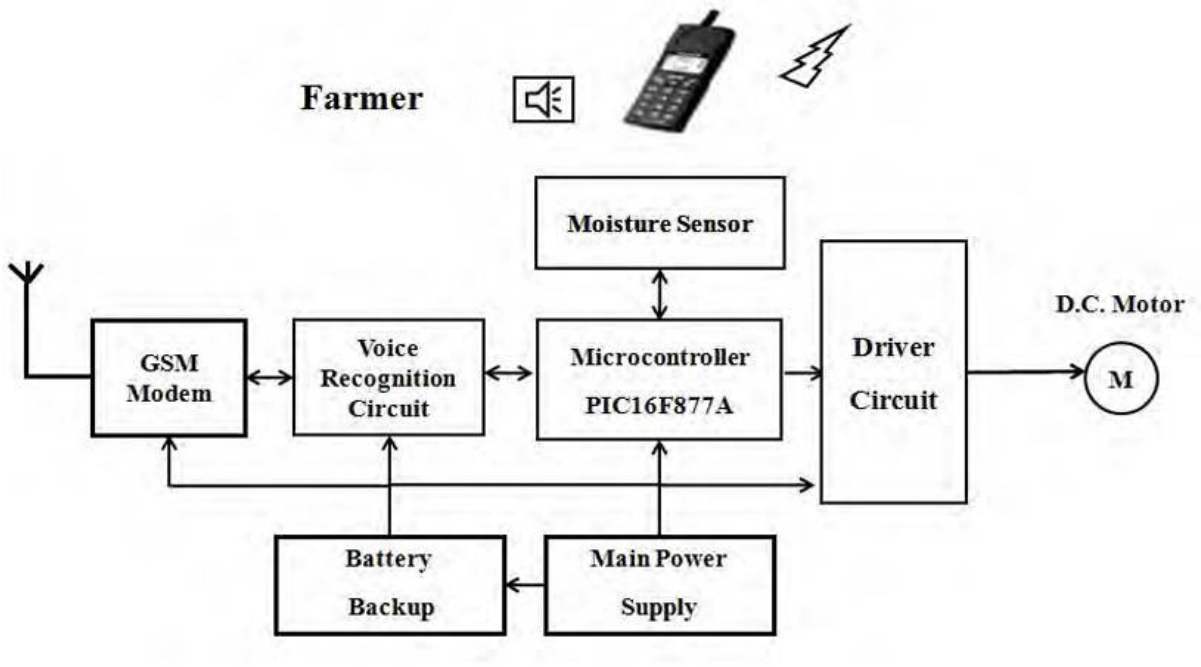

Block diagram of smart irrigation system using blue-tooth module.

The above fig shows Microcontroller based irrigation system proves to be a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently. The present proposal is a model to modernize the agriculture industries on a small scale with optimum expenditure. Using this system, one can save manpower, water to improve production and ultimately profit [2].

IV. WORKING PRINCIPLE

The deficiency of water in the field is sensed by the op-amp based sensor. Whenever there is need of water in the particular field, the high signal appears on the output pin of the sensor of that particular field. The output pins of all the sensors are connected to the PORT 2 of microcontroller. The high signals (logic 1) from the sensor is entertained by the microcontroller at a particular pin. By knowing the position of the pin on which signal appears , the microcontroller rotates the water funnel type cup at the desired angle (i.e. 90 ,180 ,270) by using stepper motor connected at PORT 0 in clockwise direction. & switch ON the RELAY (i.e. Water pump) connected at port 0. Now water starts flowing into the required field. After completion of watering the sensor sends low signal (logic 0) to microcontroller. When uc receives this signal , it switches OFF the water pump & rotates the stepper motor in anticlockwise direction to the previous angle to bring the funnel cup in its initial position [7] . now uc starts sensing the signal at PORT 2. Whenever there is signal at any pin the uc repeats the above process[9]. So this process continues & we get the automatic irrigation the fields by using intelligent device uc 8051. the main of the project is to simplify the method irrigation using vocal commands and text commands through the mobile phone. The control system at the field involves a PIC microcontroller interfaced with GSM modem to receive the command from the user and the voice recognition unit which decodes it[10]. The moisture sensor attached to the system helps in collecting the moisture content of the soil and switch off the motor after it reaches the required value[6].

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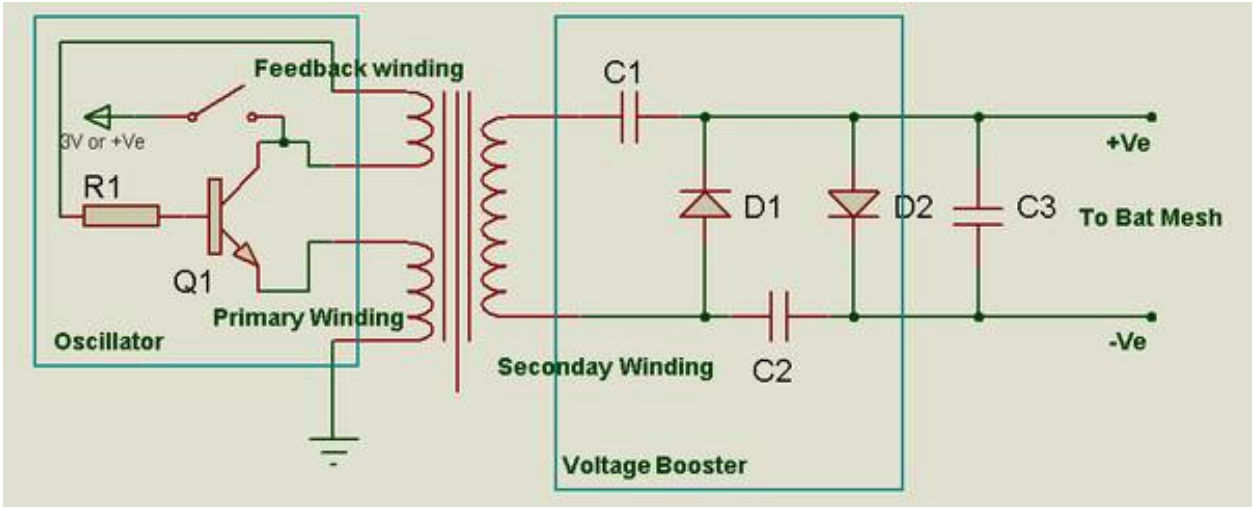

Circuit Diagram Of High Current Circuit

An electric fence is a barrier that can be used as electric shock to away the animal from crops. The high voltage shock may effects leads to death of animal. Most electric fence are used today for the safety of crop. Although they are frequently used to enhance the security of sensitive areas. We can also control the motor through vocal commands and the fence which protect the fields by animals and other things is connect with the high current circuit[11]. It produce spark when the an animal or intruder makes contact with these wires, the circuit is completed and a shock is delivered. For more update on the project is that the motor is also operate by voice as well as text control by using blue-tooth module connect with the microcontroller [8]. When the command A is given by vocal or text command the motor is operate and for off the motor we use B command for fencing operation[12].

V. RESULT

Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays major role in producing the output. It is very easy to protect the field with electric current circuit having in the fence with automatic voice control as well as text control. By cell phone we can operate the fence high current with the use of blue-tooth module.

VI. CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants and less manpower in their respective areas to security purpose. The use of mobile phone get extra advantage by controlling the motor as well as fencing. An animal control fence controls animal movement on a farm It also covers those farmers who are wasteful of water during irrigation. The project can be extended to greenhouses where manual supervision is far and few in between. The principle can be extended to create fully automated gardens and farmlands. Combined with the principle of rain water harvesting, it could lead to huge water savings if applied in the right manner. In agricultural lands with severe shortage of rainfall, this model can be successfully applied to achieve great results with most types of soil.

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