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DESIGN AND FABRICATION OF GSM BASED AUTOMATIC IRRIGATION SYSTEM

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Abstract: *More time and money are involved when farmers irrigate paddy grounds manually. The aim of this research is to fabricate an automatic irrigation pumping system using GSM (Global System for mobile communication) technology which can solve the problem. Sensors are occupied in the system which continuously senses the water level of the field and the operating system sends the respective massage to the owner. The system is also able to switch the pump on/off automatically depending on the condition of the water level. Moreover, the system provides the opportunity for the owner to operate pump via mobile by sending the respective commands to the kit through the GSM module.*

Keywords: Irrigation**,** GSM, Sensor, Water level, Pump.

1. INTRODUCTION

Irrigation can be defined as the science of artificial application of water to the land, in accordance with the 'crop requirements' throughout the 'crop period' for full fledged nourishment of the crops. It is used to assist in growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Manual irrigation is more time consuming and labor intensive as well as requires regular attention and vigilance. Moreover it often leads to problems such as over-irrigation or under-irrigation, and leaching of soil. Further there were issues like lesser yield, weeding of crop as an adverse effect of above mentioned problems. Hence it is necessary to design a system that can eliminate the direct involvement of the farmer with respect to irrigation of their fields. Several models for automatic irrigation system were developed by different researchers.

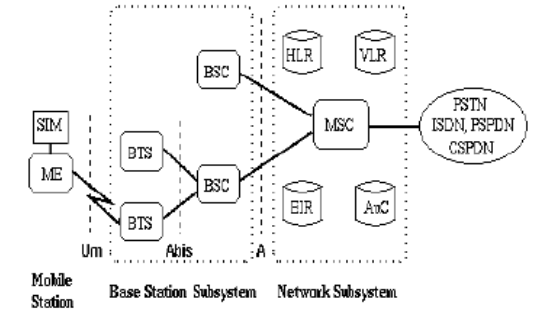
Galgalikar et al. reported the real-time automization of agricultural environment [1], where GSM is used to inform the user about exact field condition through a SMS on user request. The system developed on an ARM7TDMI Core 32 -bit microprocessor which operates through SMS. The system continuously monitors the soil moisture, water level of the well, temperature, humidity, dew point, weather conditions and provides the details about the field to user though SMS. Real time automation of agricultural system [2] was developed by Nagendra et al. which deals with the combination of ARM7 and GSM for programming and developing the automated system. The system can measure the soil moisture by using dielectric constant of soil and is informed to the centralized unit. The unit sends a message to the device which waits for a certain amount of default time for user response. If no response is received, it continuously monitors the field and keeps on sending the parameters to the centralized unit where it is stored in the EEPROM of ARM. Innovative GSM Bluetooth Based Remote Controlled Embedded System for Irrigation [3] proposes by Gautam et al. Here, GSM/Bluetooth based remote controlled embedded system is used for irrigation. The system sets the irrigation time depending on the environmental factors and can automatically irrigate the field. In addition to the GSM, a Bluetooth facility has also been interfaced to the microcontroller. Madidipatla et al. [4] proposes the integration of wireless technologies for sustainable agriculture system that eliminates the use of wired technology and improves the old method of collecting data and allows the farmer to control their sprinklers remotely. It utilizes wireless sensor networks to collect real time status of agricultural field and uses mobile phone to control the watering of the field using

sprinkler. Ultra low cost cell phone based embedded system for irrigation [5] developed by Vasif et al. The system develops on AVR ATMega32 microcontroller and includes protection against single phasing, over current, over voltage, dry running and probable bearing faults; and alerts the user through missed calls/buzzers on completion of tasks. RTC DS1307 and DS18S20 are used for time and temperature measurement.

This paper present a GSM based system, which automates the irrigation depending on the water level of land by combining various software and hardware approaches.

2. ELEMENTS OF THE CONTROL SYSTEM

A GSM based automatic irrigation system has two major technologies. Primary being the "GSM" and secondary one is the controller or processor. GSM is a standard set used to describe protocols for digital cellular networks. This GSM facility serves as an important part for controlling the irrigation on field and sending the results to the farmer using coded signals to a mobile device which indirectly controls the entire farm irrigation system. The processor or the controller works as a central core for functioning of the automated process after it has been initiated by the GSM based device and finally presents the output to the device. Figure-1 shows the layout of a generic GSM network. Using GSM networks, a system has been developed which control an agricultural motor.



SIM Subscriber Identity Module
BSC Base Station Controller
MSC Mobile Services Switching Center
ME Mobile Equipment
HLR Home Location Register
EIR Equipment Identity Register
BTS Base Transceiver Station
VLR Visitor Location Register
AuC Authentication Center

Figure-1: General Architecture of a GSM network [6]

The system consists of a unit, like a mobile base station, consisting of the subscriber number. This forms the link between the user and the device/mobile. The user communicates with the device through voice call whereas the device uses SMS service to do so with the user and can save the massage. The call/SMS signal also received by the GSM with the help of the SIM card. The GSM sends this data to Microcontroller PIC 16F 72. Microcontroller also continuously receives the data from sensors in some form of codes and takes necessary action. The motor used in this research is controlled by a simple manipulation in the internal structure of the starter. The starter coil is indirectly activated by means of a transistorized relay circuit. The flow diagram for the automatic operation of the system is shown in Fig.2. The circuitry is equipped with DTMF decoder, resistor, capacitor, diode, LED, crystal oscillator, IC regulator, relay, etc.

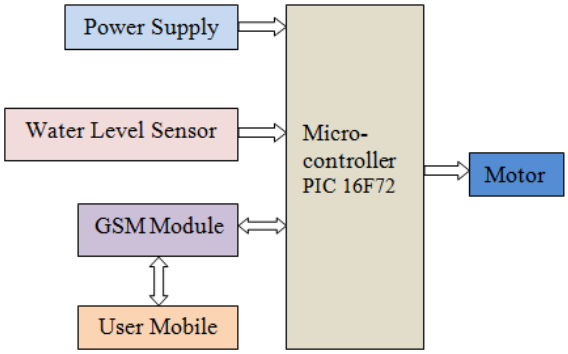


Fig. 2: Flow diagram of the system

3. WORKING PRINCIPLE

The working principle starts with the water level of field. For test purpose, three different heights namely high level, medium level and low level (2.9 inches, 2 inches, and 1 inch correspondingly from the ground level) are chosen and water level sensor is placed on that position. When the water passes across the high level and medium level, after receiving the signal from sensor, the device sends SMS to the owner. The owner gets alert about the water level condition and can make a call to the device. The device receives the call and switch on the pump. In case of water passing the low level, besides sending SMS, the system automatically switch on the pump. Figure 3 shows the experimental setup.

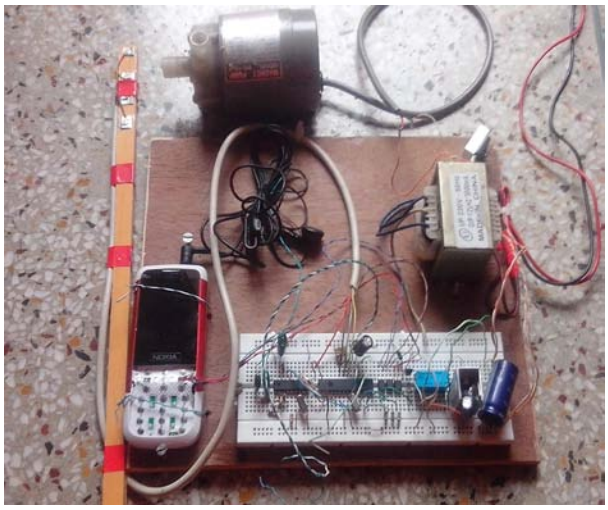


Fig.3. Experimental Setup

4. RESULT

For testing the accuracy of the entire system, three water level sensors fix at the definite height on a wood stick and insert it into a water filled container. It has been observed that, for the different level of water, the sensors send instructions as input to the Microprocessor, through GSM using mobile, it sent to the user mobile via SMS. It also has been noticed that the motor can switch on via phone call from the user mobile.

5. CONCLUSION

The results obtained from the experiment have shown that the performance is quite reliable and accurate. The system leads to a very positive approach on the impact of GSM technology in farm irrigation method. The continuously decreasing costs of hardware and software, the wider acceptance of electronic systems in agriculture, and an emerging agricultural control system industry in several areas of agricultural production, will result in reliable control systems that will address several aspects of quality and quantity of production.

6. REFERENCES

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