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An Intelligent And Automated Drip Irrigation System Using Wsn

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ABSTRACT

In past few years, automatic irrigation system has seen a rapid growth in terms of technology. At present cost-saving technology, laborsaving are the addressing key issues in irrigation. An automated Drip irrigation system was developed in order to facilitate continuous and efficient irrigation under water and labour scarcity conditions. Due to reliability, robustness and limited resources, resistive sensors were chosen. It proposes an automatic irrigation system for the agricultural lands. Currently the automation is one of the important roles in the human life. It not only provides comfort but also reduce energy, efficiency and time saving. In this paper, we propose an intelligent and an automated drip irrigation system using wireless sensor network in low cost, which is usable by Indian farmers. Renesas microcontroller is the main heart of the whole system. Temperature, humidity, soil moisture value of the land will be given to user via GSM/GPRS module.The pump incorporates an automatic pressure demand switch such that the pump will commence when a tap is opened and turn off when the tap is closed.

Keywords: Global system for mobile communication (GSM), Renesas Microcontroller, Moisture sensor, Temperature sensor, water level sensor, Photo voltaic cells (PV).

I. INTRODUCTION

The requirement of building an automation system for an office or home is increasing day-by-day. Industrialist and researchers are working to build efficient and economic automatic systems to control different machines like lights, fans, air conditioners based on the requirement. Automation makes an efficient use of the electricity and water and reduces much of the wastage. Drip irrigation system makes the efficient use of water and fertilizer. Water is slowly dripped to the roots of the plants through narrow tubes and valves.

Water is fed directly to the base of the plants, which is a perfect way to water plants. There should be proper drainage in the fields or pot plants to avoid any water logging which in case may affect the productivity. There already exist automatic drip irrigation systems, which water plants based on soil humidity, pH value of soil, temperature and light. These parameters are required in big agricultural fields where productivity of the crop matters. In small areas like office premises, buildings, house gardens etc. where watering plants at regular interval intervals. This paper presents a smart irrigation system to water plants with the use of devices like Renesas microcontroller and other sensors. GSM is used to control the system wirelessly while embedded C programming language is used for automation purpose. This paper contributes an efficient and cheap automation irrigation system. System once installed has no maintenance cost and is easy to use.

This graduate project defines the implementation of a mobile driven intelligent and completely automated wireless drip irrigation system. The system together provides a very advanced control over the currently implemented manual system. The implementation involves use of valve control, drip control and pump control using a microcontroller based board.

LCD board is provided to collect moisture and temperature level feedback from various types of plants with different moisture content. This helps the user in collecting different feedback for different types of the moisture level with separate breeds of crops that can be cultivated accordingly. The concept is enhanced by integrating GSM technology, such that whenever the water pump switches ON/OFF, an SMS is delivered to the concerned person regarding the status of the pump.

All the above features are distinct and hence making it better than projects already existing also few more such advantages are differential feedback from each plant, pump and valve control to manage flow to individual drips, complete monitoring over text message, for different seasons variable valve timings can be saved. This it is easy to control as well as beneficial from small ranging home arrangements of flower to varied farm crops.

II. METHODS AND MATERIAL

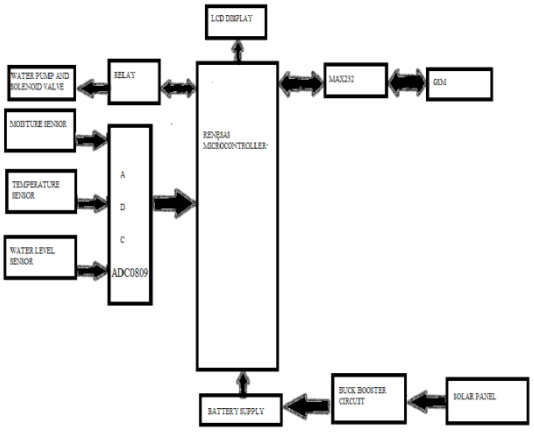

Figure 1

The important parameters to be measured for automation of irrigation system are soil moisture and temperature. The entire field is first divided into small sections such that each section should contain one moisture sensor and a temperature sensor.

- The Soil moisture sensor is used to determine the moisture content present in the soil. This Information is given to the microcontroller in terms of resistance. The best of determining the soil moisture is by using the electrodes.
- The temperature sensor is used to determine environmental temperature. It is a device, which is designed specifically to measure the hotness or coldness of an object.
- These sensors are buried in the ground at required depth. Once the soil has reached desired moisture level, the sensors send a signal to the micro controller to turn off.
- For the sake of safety, a message is sent via GSM Modem to the farmer to carry out the safety precautions.
- Solar power is the cleanest, most reliable form of renewable energy available, and it can be used in several forms to help power your home or farm. Solar powered photovoltaic (PV) panels convert the sunrays into electricity .Here we use PV panels to supply power to the microcontroller via battery.
- Using Renesas microcontroller, the minimum execution time can be changed from ultra-low speed to high speed. Depending upon series and number of pins ROM provides storage about 16-512KB and 2-32KB of RAM. Most of pin of Renesas has multi task feature. It is less prone to damage due to electrostatic charge. It operates with 5V power supply.
- Water pump is controlled by the microcontroller through relay on decision made by user. Every information is stored in the database for further process.
- Bug booster (step-up converter), is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load).Since the PV panel is able to produce least amount of power bug booster is used to boost up the power for the supply.

- ADC0809, it is used to help the user to interface an analog to digital convertor (ADC) with FPGA.
- Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices, which are controlled via SMS using a GSM.

III. RESULTS AND DISCUSSION

An Automated Drip Irrigation System using Wireless Sensor Network proves to be a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently. The project is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications.

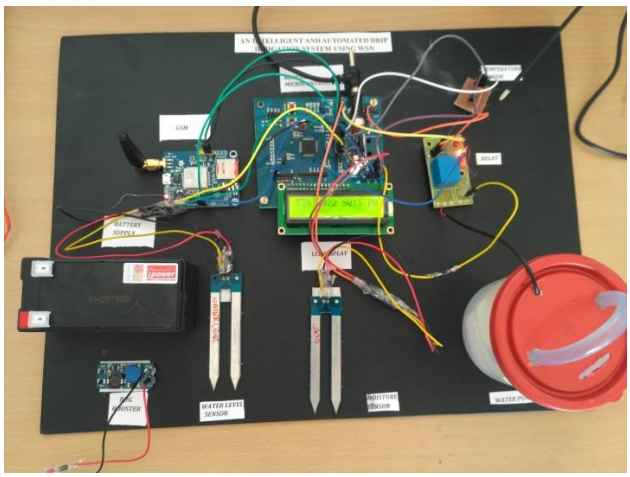

Figure 2

IV. CONCLUSION

The system provides with several benefits and can operate with less manpower. The system supplies water only when the moisture in the soil goes below the reference. Due to the direct transfer of water to the roots water conservation takes place and helps to maintain the moisture to soil ratio at the root zone constant to some extent. Thus, the system is efficient and compatible to the changing environment. Also, the system saves the water and improves the growth of plants.

By using the automatic irrigation system one can optimizes the usage of water by reducing wastage and reduces the human intervention. The excess energy produced using solar panels can also be given to the grid.

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