Filter Outlet Pressure Based Drip Irrigation System

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Abstract— Drip irrigation is a type of micro-irrigation system where it is probable to save water and nutrients by allowing water to drip slowly to the roots of the plants. Water is incredibly precious to all living beings in addition to plants, trees.The major amount of fresh water is utilized by the agricultural industry for irrigation. In drip irrigation, the water need to be maintained at the constant level which aids in the survival of the plant i.e the water can spread to the roots by going drop by drop.On the other hand, if there is insufficient water, then, the plants may die due to lack of water. Hence there arises a need for the farmer to maintain the water content on the field.The Microcontroller based drip irrigation mechanism, a real time feedback control system is usedfor monitoring and controlling all the activities of drip irrigation system. This system reduces runoff, less watering, saturated soils, avoid irrigating at the wrong time of the day. It improves crop yield and helps in time saving.A filter outlet pressure based drip irrigation system has been implemented in small version and microcontroller is used for ON&OFF of the motor through relay circuit using water flow sensor.

Key words: Microcontroller, Filter, Embedded System

I. INTRODUCTION

Agriculture uses 85% of available fresh water resources worldwide and this will continue to be prevailing in water consumption because of population growth and increased food demand [1]Moreover, there is an urgent need to develop strategies based on science and technology for viable use of water. Hence, drip irrigation is an extensively accepted most efficient irrigation technique as it permits high uniformity of water and nutrient application.An automated supervision of greenhouse brings precise control required to produce the foremost correct condition of plant growth. The five most dynamic parameters to consider are drip irrigation humidness, temperature, ground water, carbon dioxide, light intensity.

There are many systems to achieve water saving in various crops from basic ones to more technologically advanced ones. For instance in one system, plant water status is monitored and drip irrigation is implemented based on linear programming [2]. The system has distributed wireless networks of soil moisture and temperature sensors placed in the root zone of the plants. In addition, a gateway unit handles sensor information, trigger actuators and transmits data to a webpage using GPRS module for monitoring and supplying water[3]. For further details on the drip irrigation system one can refer [4]-[10].

There are many pieces of equipment required for drip irrigation system. It includes plastic hose or pipe, spaghetti hose, emitters, valves, fertilizer tanks, filters.One of the foremost necessary things within the hardware for drip irrigation systems is the filter.The problem with the existing system is that the water flow based pressure output is not monitored and controlled. Hence there might arises a chance that the total system may get damaged if the filter is not monitored and cleaned periodically. Therefore, the proposed system is introduced to overcome the above said problem using water flow sensor.

In section II, description is given for the proposed drip irrigation system. Section III discusses about the performance of the drip irrigation system. The conclusion part of the paper is discussed in section IV.

II. PROPOSED SYSTEM

The block diagram of the proposed drip irrigation system is shown in figure 1. The single phase 230 V AC supply is given to the power supply circuit, motorand transformer. The transformer step downs the voltage level to 12V. Subsequently, rectifier unit is used for rectification and voltage regulator is applied to regulate the voltage to 5V. The output of the power supply circuit is given to the input of the microcontroller. The microcontroller used is Arduino due to its cheap and efficient performance. Relay circuitis connected to the input of the microcontroller, which cuts the supply to the motor based on the signal from the microcontroller. The water from the motor output is passed to the filter and then provided to the plants by means of respective hoses. The water flow sensor is connected at the outlet valve of the filter. It continuously monitors the pressure value of the filter outletbased on the Hall Effect principle and provides feedback to the microcontroller. If there is any fault in the filter outlet, then the pressure in the filter outlet increases. The pump motor is operated based on the output of the sensor. If the value of pressure increases above the predetermined value, then the motor comes to OFF condition. The message about the status of the motor is provided to the farmer with the help of GSM modem. This will greatly reduce the waste running of pump motors. ON condition of submersible motor represent the normal working status and the OFF condition represent the increase in pressure level. When there is increase in pressure level, the levels are indicated in the LCD display. Then the filter is blocked by the relay circuit when the pressure increases beyond the set values. Subsequently, the message regarding the filter block is given to the farmer via SMS. The messages are displayed in the LCD display. After the message is received, further actions like cleaning the filter is carried out. Now the motor operates normally preventing the wastage of water.

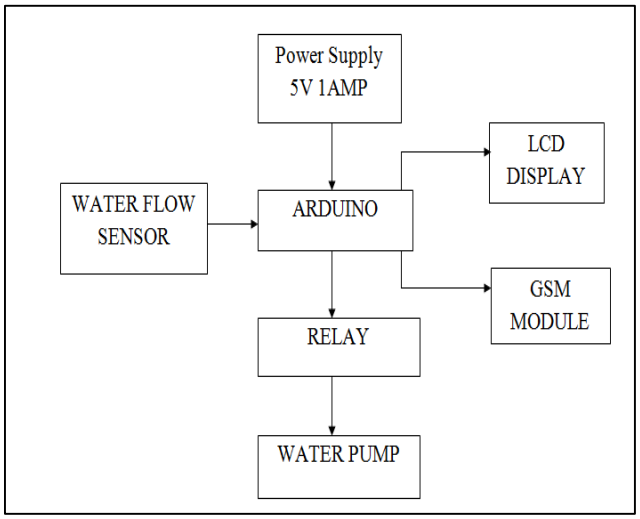

Fig. 1: Block Diagram

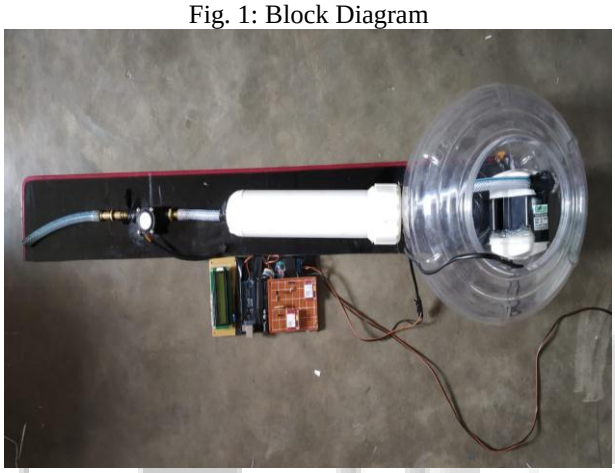

Fig. 2: Hardware Implementation

III. PERFORMANCE EVALUATION

The performance evaluation of the system shown in figure 2 is as follows. When soil blocks the flow of water in the pipe, pressure in the pipe increases and it is sensed by the water flow sensor when the pressure exceeds the fixed value. The microcontroller gives the signal to the relay circuit and the motor is stopped immediately to prevent the damage. Table1 shows the performance of system. ON/Off status of the motor (message) is sent to the farmer to take further actions. A filter outlet pressure based drip irrigation system has been implemented in small version which detects the deposition of soil, salt or any other dusts etc in the tube. Microcontroller is used for ON&OFF of the motor through relay circuit.

SET VALUE (Pa)	PRESSURE VALUE (Pa)	MOTOR STATUS
150	Greater than 150	Motor stops and message sent to farmer
150	Lesser than 150	Motor continues to run

Table 1: Performance of the system

IV. CONCLUSION

The Microcontroller centered drip irrigation system proves to be a true time feedback system that monitors and controls all the activities of drip irrigation system with efficiency. The present system may be a prototypical to modernize the agriculture industries at a mass scale with optimum expenditure. It can offer irrigation to larger areas of plants with less water consumption and lower pressure. Using this system manpower can be saved and production can be enhanced.

Agriculture is the back bone of India. India is a better place with suitable climatic condition for agriculture. A filter outlet pressure based drip irrigation system has been implemented in small version and microcontroller is used for ON&OFF of the motor through relay circuit. With the help of this system our nation can move a step ahead.

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