“CROP ROTATION CONTROL AND BIRD/ANIMAL PREDATION CONTROL BASED AUTOMATIC IRRIGATION SYSTEM”

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Introduction:
The continuous increasing demand of the 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[. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes waste [5]. In the 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 [3].

At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals.
This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic microcontroller based drip irrigation system in which the irrigation will take place only when there will be intense requirement of water.

Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoid valves [3]. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off [3]. In addition, farmers using automation equipment are able to reduce runoff from over watering saturated soils, avoid irrigating at the wrong time of day, which will improve crop performance by ensuring adequate water and nutrients when needed [1]. Automatic Drip Irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation [2]. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits [2].

**Objectives:**

- **Crop rotation technique:** To facilitate “*Crop Rotation Technique*”. This system can be use for different crops based on the water requirement of each crops. It is customizable to the plant and turf needs.

- **Provide an Automatic low cost Irrigation system:** No more spending long hours watering with a hose. You won't have to worry about remembering to move the hose every 20 minutes either. Your new systems will do all the remembering for you.

- **Save Water & Electricity:** An automatic irrigation system can save you literally thousands of gallons of water a year simply by remembering to turn itself off at the right time. Also eases the work of switching of the motor for pumping the water from tanks.

- **Avoid Bird/Animal predation:** Many farmers don’t realize the extent of their crop losses and lost profits due to predation of birds and animals! This method will reduce the loss margins to a higher extent.

- **Protect your financial investment:** The installation charges are one time investments. This system will also minimize the labour wages.
Methodology:

![Block Diagram](image)

**Fig. 1** Block Diagram
Fig.2: Irrigation control arrangement for multiple farms

The system is basically designed for agriculture & is very much useful in saving water & avoiding the predation of birds and animals. The main part of the system is the microcontroller. It runs on a 12V power supply.

The soil moisture sensor which is built is placed at regular intervals in the field which senses the moisture level of the soil & passes its output to one of the port of the microcontroller. The microcontroller compares the input with the pre-set value as set by the user (farmer) through crop rotation control inputs. If the value being compared is more than the threshold then the pump will be switched off, till then the water will be supplied constantly, and when the value recorded goes below the threshold, the motor turns on and the water is supplied to the farms. Also by using the XOR gate logic We adapt two liquid sensors one at the top and other at the bottom to avoid overflow and underflow of the water in the overhead tank to avoid dry run condition of the motor, which is given as an interrupt to the microcontroller.

<table>
<thead>
<tr>
<th>Soil Moisture Level in ml</th>
<th>Sensor 1 (Built sensor) Output (V)</th>
<th>ADC VALUE SENSOR1</th>
<th>Sensor 2 (Readymade sensor) Output (V)</th>
<th>CROP ASSIGNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.77</td>
<td>01110111</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>2.43</td>
<td>10000111</td>
<td>2.37</td>
<td>RAGI</td>
</tr>
<tr>
<td>100</td>
<td>2.26</td>
<td>10010011</td>
<td>2.29</td>
<td>WHEAT</td>
</tr>
<tr>
<td>150</td>
<td>2.13</td>
<td>10011011</td>
<td>2.18</td>
<td>PADDY</td>
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</table>
The system also has a *bird & animal repellent system* which uses controlled *ultrasonic sound* as a weapon against the birds & animals so that it doesn't harm them. This arrangement is controlled by a laser detection system which will generate an interrupt to the microcontroller if anyone enters the farm. This system allows crop rotation on a particular field as well as it can provide irrigation control for many crops on a single field.

**Results and conclusions:**

We can conclude that a system for automatic irrigation system along with the crop rotation control input as well as bird predation system is implemented successfully. The results have proven the system to be effective and efficient compared to the conventional automatic irrigation system. It addresses the limitation of currently existing automatic irrigation systems such as inconsistent watering needs and also animal and bird predation. A study on different crops and the water requirement is done and the microcontroller is programmed accordingly.

**The two stages in the project are:**

1. Proposed Automatic irrigation system was programmed for crop rotation control input and water level detection in the tank. In which the soil moisture sensors were built and were compared with readily available sensors in the market, the sensor which we built had a wider range compared to the readily available sensor also the sensor proved to be cost effective. The system keeps on checking the moisture level in the field in which it is installed. The system checks and compares the moisture level with pre assigned values and irrigates to the field accordingly. It is also possible to install this system irrespective of area of the land with the help of multiplexers.

2. Under a theoretical assumption that the ultrasonic frequencies above 20 kHz prove irritating to birds and animals an ultrasonic sound generation circuit was built.

**Scope for Future Work:**
This system can be implemented for multiple farms in a field and a fertilizer control arrangement can be added to the current system which can inject the fertilizers along a separate pipeline to the various parts of the field.

Addition of a GSM module to the system will allow the farmer to control the system throughout the world through a mobile phone in case of any emergency occurs. Along with this the data generated can be used by the Data Analytics for various analysis, such as the water consumed per sprinkler, total power consumption per day, Ph level of soil etc. The analyzed data can be stored in an EEPROM. Farmer can get all those information whenever he wishes to. In other words, the information about entire field is at the fingertips of the farmer. *Kisan Help Center* provides necessary information by analyzing the data which is generated.

**References:**


