# Weather based Smart watering system using soil sensor and GSM

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*Abstract*— **In agriculture fields or lawns watering systems such as sprinklers or drip water wires are fitted to feed the plants to reduce human load. Normally sprinkler systems operate with respect to time, which means if we program it on 9 am it will be on even if rain occurs during that particular time. Since water is a precious resource we need to use it very carefully. Here we are proposing an idea of smart sprinkle system where human interaction and automation are combined. A soil sensor is used which gives the moisture content in the soil. If the moisture content is bellow particular level the sprinkler systems automatically gets on. We have also integrated current weather report, which can be used to augment the system. Based upon the weather data, watering the plants can be delayed for few days if there is rain prediction in the immediate days.**

***Keywords— sprinkler; GSM; soil sensor; weather report***

## I. INTRODUCTION

Water is a precious resource which has to be used very carefully. Wasting water is a social crime. But there are many situations where water is being wasted, one example can be watering the plants when rain is occuring. These miss-happening can be avoided by using smart sprinkler, which uses the data from soil sensor, current weather report, and human command. Where human command is having the highest priority.

Watering in fields or lawns is a tedious task. We can automate watering plants by switching it on when the moisture content in soil is less. But when there is prediction of rain, watering the plants can be delayed by one or two days to reduce the consumption of the water. Here we used weather information supplied by Indian metrological department to know the weather in future days. If there is a chance for the rain to occur the watering system will be delayed till the soil state goes form dry to very dry. Normally fertilizers are given to the plants separately which requires human labor. Some farmers use fertilizers which get diluted in the water. When fertilizer diluted in water is fed to the plats the workload of humans can be reduced. But when rain occurs for longer days the fertilizer need to be given separately to the plant, because heavy water may damage the plant. If we can delay watering the plats by analyzing the weather report this problem can be avoided.

The hardware kit is given in figure 1. Here ARM microcontroller is used to integrate the data from the moisture soil sensor and weather report. By processing these data watering the plants can be controlled.

Figure 2 shows the block diagram of watering system

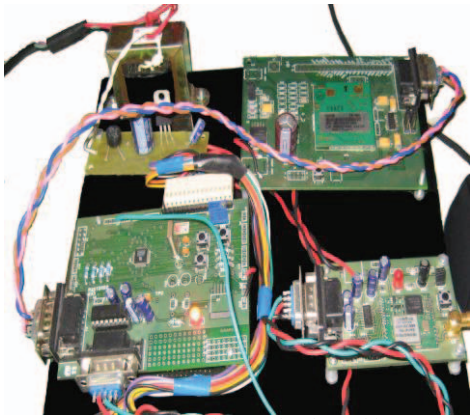

Figure 1 hardware kit

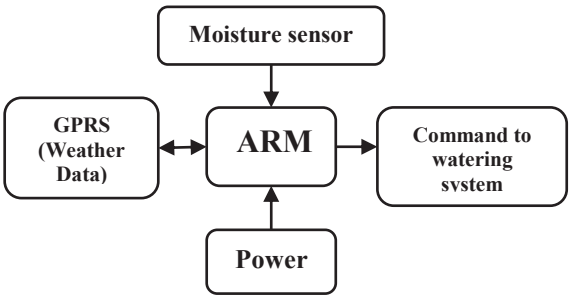


Figure 2. Block diagram of watering system

## II. EXISTING METHODS

The current technologies will help to water the plants for a particular time. If it is program to switch on by 11 am it will switch on even when rain occurs during that time. Later moisture sensor came into the picture, which will measure the moisture content in the water. When water level is reduced the watering system gets automatically on. But if the local weather department predicts rain In the near future watering the plants can be delayed.

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## III. Moisture Sensor & Weather Report

Moisture sensor is used here to know the water content in soil. The working of moisture sensor is described in the immediate section

### A. *Moisture Sensor Working*

Normally dielectric permittivity of the surrounding medium can be measured by soil moisture sensor using capacitance. The dielectric permittivity in soil is a function of the water content. In proportion to the dielectric permittivity a voltage is created by the sensor, so that the moisture level in water can be measured.

The water content over the entire length of the sensor can be averaged by the sensor. W.r.to surface of the sensor two cm of flat influence zone is existing. The extreme edges has no or little sensitivity. The figure 3 shows the capacitive active soil sensor

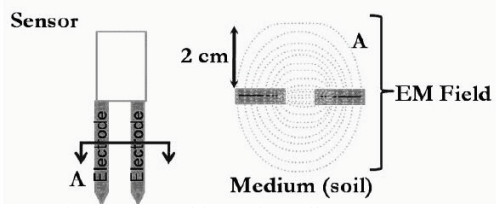


Figure 3. Capacitive active soil sensor

### B. *Weather Data*

The weather data for the required area can be gatherd from any weather forecasting website. Here The Data from the Indian government website http://www.indiaweather.gov.in/ has been collected which is available at free of cost. The website gives weather information of next 6 days, and also last 24 hours weather information. It also gives maximum and minimum temperature details, which can be used to know the water absorption level of soil.

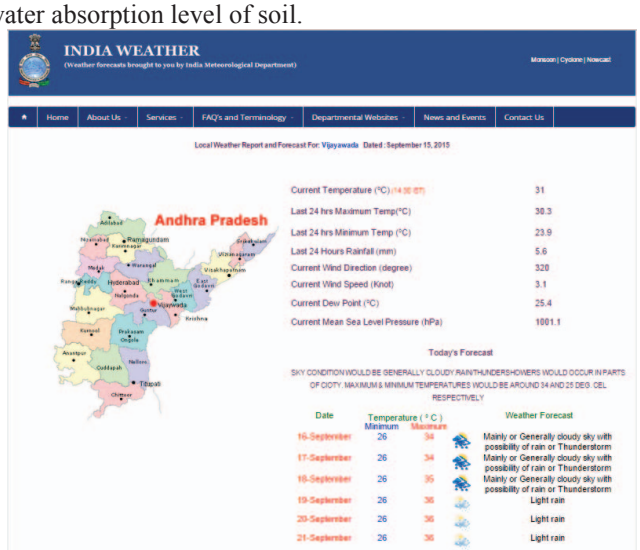


Figure 4 Future weather data from Indian government website

The data from the website can be load to the microcontroller through UART, which will be used to control the watering system.

## IV. Sysytem operation

Initially the weather data from Indian metrological site has been loaded in to the Arm microcontroller. With this data, future six days weather data can be analyzed which includes temperature, rain fall etc. Using this data the smart watering system will regulate the flow of water. The watering can be fed to the plants either using sprinkler or using drip irrigation.

By analyzing the data from the soil sensor, web forecast data and human i/p the watering system can be on / off. The human i/p will overwrite the commands generated from the automation system. The human can give i/p s from the android app or from his personal computer. The data can be send to smart watering system using GPRS.

The flowchart for the smart watering system has been given bellow, where the human command has most priority, when compared with weather data or moisture sensor report.

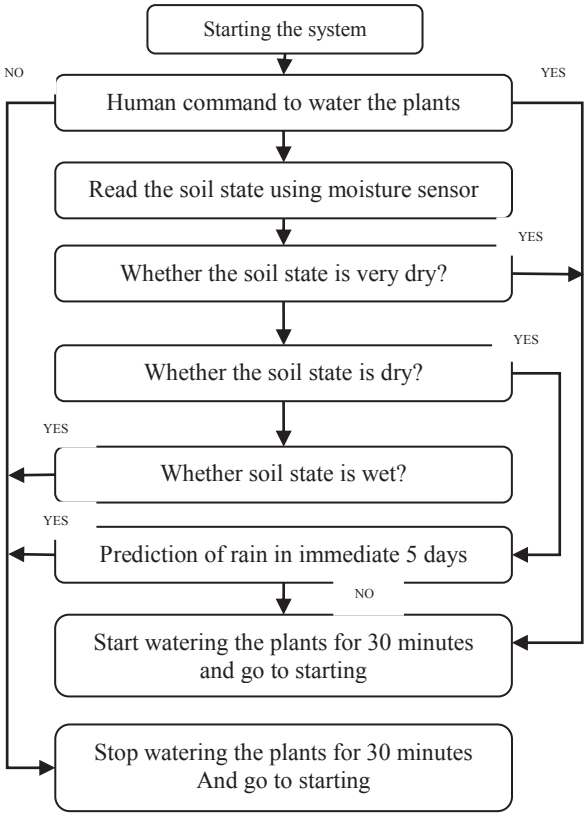


Figure 5 Flow chart

As show in flow chart the soil state is checked for every 30 minutes, then based upon the weather condition and soil state using moisture sensor, watering the plants can be decided. Watering will occur when the soil state is very dry, irrespective of weather data. When the soil state is dry, weather data will be checked to predict the rain in immediate days. If rain is predicted watering can be delayed until the soil state reaches dry to very dry state. When the soil state is wet watering will be stopped. Here we are assuming that plants can withstand up to very dry soil state situation.

## CONCLUSION

Here a smart watering system using soil sensor and weather report has been developed. The wastage of water has been reduced by adopting weather data into the system. The problem of giving fertilizers in rainy season also has been solved. The disadvantages of time based watering system have been overcome by need based watering system, which saves gallons of water.

## FUTURE WORK

Burying moisture sensor in one location and getting the data from them may not work well when the land consists multiple soil types, or various crops are planted in that land. In multi-crop, each crop requires different level of watering, which also apples to multi soil land. It is also very problematic to locate the moisture sensor once the location it is buried is forgot. To overcome this problems it is planned to devolve a mobile moisture sensor kit, which will move along the field using GPS co-ordinates. By using the GPS coordinates, with respect to the plant or the crop the watering can be adjusted, so that the multi-crop or multi soil problem of watering can be solved.

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