

Automated Water Irrigation System using Arduino Uno and Raspberry Pi with Android Interface

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Abstract: The project presents the use of correct soil moisture sensors which helps to ease out the pain to monitor and keep records about the changes in soil moisture. Using the Arduino-Uno micro controller with hygrometer moisture sensor and temperature sensor, humidity and temperature are measured and analyzed. The hygrometer is sensor which, when placed in a soil for a certain duration, provides information related to the moisture status of the soil. The Arduino Uno will collect and process the data received from the hygrometer. When a threshold moisture level of the soil is reached, the water will be supplied accordingly. This is essential because water must be provided to the plant at a particular time for a good yield. Time stamps and humidity levels will be recorded in a CSV (Comma Separated Values) file throughout the process using Raspberry Pi. Raspberry Pi will then store this CSV file over the internet. User can access this file from any remote location to keep a track of his crops or plants. This system efficiently manages both, water and energy, it also analyses the collected data by sensors and gives specific suggestions about suitable crops to grow on the basis of the properties of that land. This system ensures the healthy growth of the plant without the presence of the user.

Keywords: Arduino-Uno; Hygrometer, Raspberry Pi, CSV file.

1. Introduction:

Agriculture has been an excellent primary occupation in many countries but it has got a main role in Indian economies. Despite there is a necessity to improve development in this sector. But it mostly depends on the rainfall and its exposure. Less quantity of rainfall and Extensive rainfall can be generating various problems to the farmer. Hence farming process is mostly depends on the quantity of rainfall. Considering these problems, irrigation systems were introduced to manage the water efficiently. In modern development smart irrigation systems manage the level of the water and make assurance that the water is reached at the root of the plant.

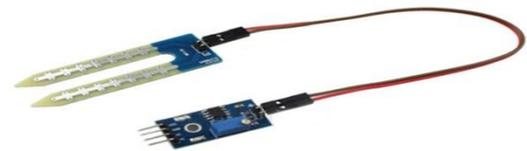
In India farmer irrigate the land time to time using irrigation system through manual control. This process sometimes exhausts water. Automatic irrigation scheduling consistently has shown to be valuable in water use efficiency with respect to manual irrigation based on direct soil water measurements. It requires more time for

Irrigation of plants in a reasonable amount of time; it needs a large amount of human resources. All the steps were executed by humans traditionally.

So for that one by one discuss the following important points:

A. Hygrometer

Various types of sensors can be used for the measurement of soil humidity. In that project, these sensors are used for soil moisture. Hygrometer is one type of humidity sensor which has the ability of measuring the water vapour in the atmosphere. It is used for both digital and analog. Output of the sensor gives as an input of an Arduino Uno.



Soil Humidity Sensor Hygrometer

B. Arduino Uno

It is a flat-form, open source hardware and software which has the ability to control the water purveyance from a hygrometer. It is also called a microcontroller. It also handles the 'On' and 'Off' instructions from the Raspberry Pi. It also collects the analog input from a hygrometer using an analog-to-digital converter and it is stored using any variable.



C. The Raspberry Pi

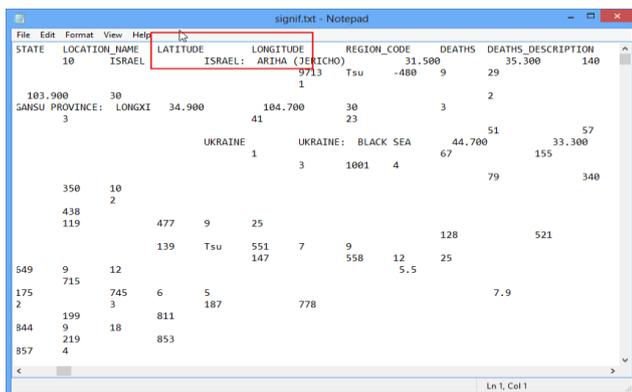
The Raspberry Pi is a hardware kit define as a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries.

The Raspberry Pi is a cheap, rectangular, small sized computer that plugged onto a display, and uses standard input devices like keyboard and mouse. It is a little device but powerful enough that enables people of all age groups to explore computing, and to learn how to program in different languages like Scratch and Python. It is doing anything whatever you expect from computer like browsing internet, playing HD video ,audio ,making spread sheet, playing games, word processing.



D. CSV FILE

In computing a CSV is called as **comma-separated values** file store data in plain text .Each line of the file is a data record. Each and every record consists of one or more fields, separated by commas. In particular file format uses comma for separating specific fields it refers as source of a file.



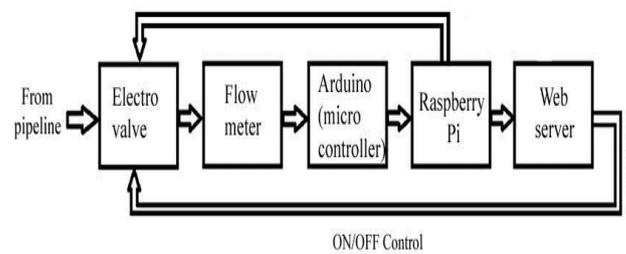
STATE	LOCATION_NAME	LATITUDE	LONGITUDE	REGION_CODE	DEATHS	DEATHS_DESCRIPTION
10	ISRAEL	ISRAEL: ARIMA (JERICHO)	31.500	Tsu	-480	9 29 35.300 140
103.900	30	34.900	104.700	30	23	3 2
GANSU PROVINCE:	LONGXI	41	104.700	23	51	57
3		9713	3	1001	4	67 44.700 155 33.300
350	10	2				79 340
438			477	9	25	
119			139	Tsu	551	7 9 128 521
549	9	12			558	12 25 5.5
175	715		6	5	187	778 7.9
844	199		811			
857	219	18	853			
4						

CSV FILE DIAGRAM

File record tabular data (numbers and characters) in simple text by using **comma-separated values (CSV)** . Each line of the file is a data store. Each record consists of one or more fields, separated by commas. File format uses comma as a field separator refers as a source. The use of the comma as a field separator is the source of the name for this file format.

2. Proposed System:

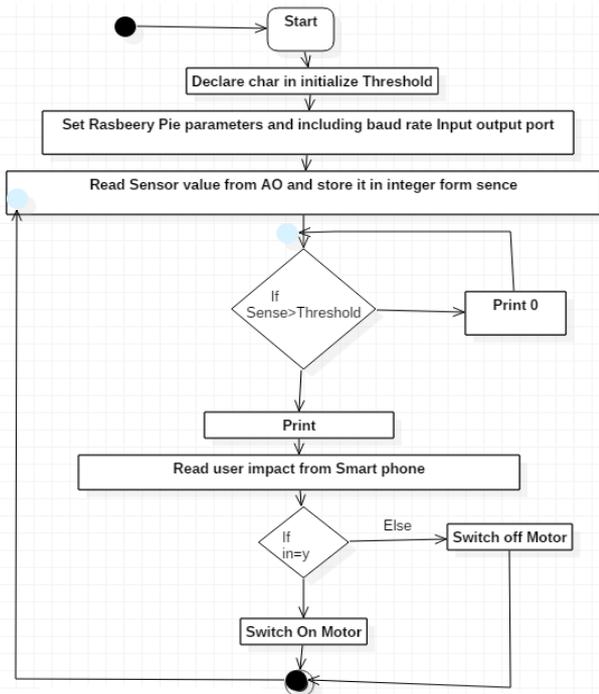
Considering the current scenario and the need for automation, introduction of a computer controlled microcontroller system is inevitable. The proposed system uses a microcontroller Arduino Uno along with compact sized computer, Raspberry Pi. Hygrometer is used to sense moisture level of soil, and a temperature sensor is used to sense intensity of light, are attached to Arduino Uno.



When moisture level of soil goes below a particular value and temperature remains at low value, Arduino triggers water supply to the soil. These particular values (threshold values) are set after experimentation on different plants in different types of soil under varying temperature conditions. Raspberry Pi monitors the working of this system and keeps log of the moisture levels of the soil. Raspberry pi, when connected to the internet, uploads the log file to a server and hence, can be viewed from any remote location by the user

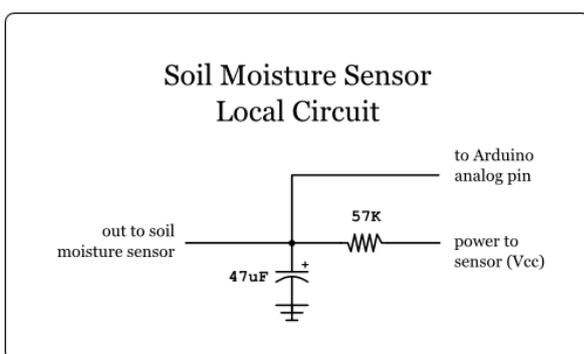
3. Hardware and Software Implementation

Data logging and remote accessing requires Raspberry pi. Raspberry pi is configured using commands in terminal when raspberry pi display is available via HDMI or Remote Desktop connection. To run and use Arduino Uno, Arduino IDE is installed on the raspberry pi. A program on Arduino IDE known as sketch is used to read inputs and prints required outputs. This program (sketch) has different variables to store the received input values.



Flow Chart Diagram

For Checking moisture level of soil basically need Hygrometer sensor moisture it maps result in 10 bits of data. Hygrometer is connected to the analog pin of Arduino Uno. Temperature sensor senses intensity level of light and maps output to another analog pin on Arduino Uno. Calibrations can be made after trial- and-error attempts. A threshold value of moisture is set (different for different types of plants) for allowing the flow of water according to the reading of the hygrometer. If input reading is less than threshold value then water will be supplied whereas the supply will be cut when reading goes above threshold value. Since these values are numerical, program is written such that when desired inputs are received and suitable digital pins are used to give outputs. Output from the sensor is also printed over serial port to Raspberry Pi.



This is new moisture sensor the main improvement to the sensor is that we need to execute the current both forward

and reverse. This allows us to use our cheap two probe soil moisture sensor without electrolysis more or less.

4. Conclusion:

The need for automation and remote understand ability particularly increase the importance of this system in the field of research .this system requires only one time implementation. Also user need not report at the site usually for watering the plant. In case of any default such as water in reservoir is consume and any fault in the circuit. The user will get report by an electronic mail. Thus, this system ensures the following:

- Efficient management of water
- Healthy growth of plant
- Very less frequency of human effort
- Remote access and monitoring.

5. References:

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[2]Raspberry-pi(raspberrypi.org/help/what-is-araspberry-pi/)

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[4] Arduinio Uno (arduino.cc/en/Main/ArduinoBoardUno)