Automatic Plant Irrigation System

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ABSTRACT

In activities associated with gardening and farming the critical activity is watering which is also labor intensive.The different weather conditions include dryness , wetness, hotness, cloudiness in the atmosphere. In all these weather conditions it is imperative that the quantity of water that reaches the plants is controlled.

The watering systems used presently are effective in providing the required amount of water to the plants.

This manual watering process must consider two important issues: quantity of water provided to plants and the time during the day at which water is provided. Our goal in the project is replacement of manual activities. This has the potential to make the gardener's work more easier. This goal is achieved by creating a watering system for plants which works automatically.When the above system is installed in agriculturalfield or thegardentheplants will get sufficient water for their growth and also water isconserved. The system is a combination of dripemitters and sprinklers. The implementation of the system makes use ofnozzles,pipes andsprinkler systems. The proposed system uses the micro-controller ATmega328. This isprogrammed for sensing level ofmoisture in plants at the required time.

A moisture threshold is predefined depending on the need of the particular plant. When the quantity of moisture becomes less than the threshold level the needed amount of water is provided to the plant until the moisture level reaches the predefined threshold value. All plants require water two times a day, specifically during morning and also during evening. Programming the microcontroller for the above requirement ensures that plants get the required water. The system reports the present state to the user and the user is sent remainders to ensure that water is added to the tank. These notifications are implemented using mobile apps. The prototype system developed makes gardening and farming activities an enjoyable experience and there are no issues to worry like forgetfulness.

Keywords— Farming, watering, automatic system, sprinkler systems.

1. INTRODUCTION

It is a well known fact that humans derive benefits from plants. Plants naturally clean the airand alsoproduceoxygen required by humans.People wantto grow plants in their home backyard. Lack of place forces people to use pot for growing plants which is keptonwindow-sill.Theseplants require waterand right quantity of sun light for theirgrowth.In the hectic scheduleof modernlife people canforgetto providewater to plants. This causes plants to suffer fromdisorders and finally they decay. Thetask of watering the plants needs to be doneautomatically in the modern world using an automatic system. Thesystem calculatesthe water requirements of the plant and provides the water at the required times. The system does not use excess water and keeps theplantshealthy. Thesesystems can be used for re-vegetation of indry areasandtimes when there is

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nonormalprecipitation.
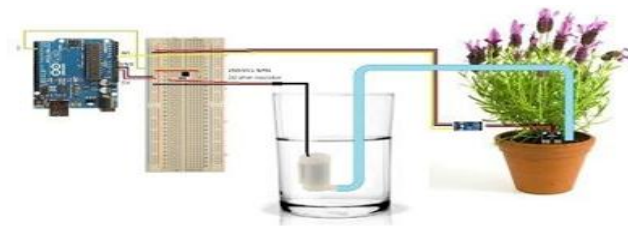
 The above diagram illustrates the use of moisture sensor and Arduino board for watering a plant

The system has many applications which includecropcreation, preventing growth of weeds on grain fields,coolinganimals, concealment ofdust, mining , sewage removal among others.

1.1 *TypesofAutomatedIrrigationSystems*

Thereare   many   methodsfor   automatedwatersystem.They   vary   in   the   method   which providewatertoplants.The primary objectiveis that each plant should get only required amount of water.

1) Microirrigationsystem:

Wateris provided to plants at lowpressure using channelednetworks and fixedpatterns.

2) Dripirrigationsystem:

Here water directly reaches roots of the plants.This method canbeproficient when managed properly by minimizing run-off and evaporation.The procedures used in farming include fustigation and deep percolation, dribblestrategy. Some of the processesareautomated.

3) Sprinklerirrigationsystem:

Here wateris made availableat a focal area in the field. Then using high-pressure overhead sprinklers water is spread over a wide area in the field. There are many types of systems available in this method.

1.2 UsesofIrrigationSystems

1) Savings in waterandtime:

2) Reduction inweeds

3) Improvement inplantdevelopment

4) Retaining the supplements present in soil for use by plants

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1.3 CurrentDevelopments

The selection of a suitable automatic system for providing water depends on factors which includegeography of the land, water,soil,climaticconditions and crops grown among others. Tables 1 and 2 display the crops which can be benefited usingIrrigationSystemand the responseofIrrigationSystem.

Table-1: CropssuitableforIrrigationSystem

SL.NO	Crop variety	Few examples
1	CashCrops	Cotton,Sugarcane,Strawberry
2	Vegetables	Capsicum, Onion ,Tomato, Chilly, Pumpkin ,Cabbage,etc.
3	OrchardCrops	Mango,Grapes, Lemon ,Orange,etc.
4	Flowers	Gerbera,Rose, Jasmine,Carnation,Orchids, etc.
5	OilSeed	Sunflower,Groundnut ,Oilpalm,etc.
6	Spices	Turmeric,Cloves,Mintetc,
7	Plantation	Tea,Coffee,Coconut,Rubber,etc.
8	ForestCrops	Bamboo,Teakwood,etc.

Table-2: ResponseofdifferentcropstoautomaticIrrigationSystem:

Crops	Percentage of Watersaved(%)	Yield increasein percentage(%)
Banana	45	52
Chilly	68	28
Sweetlime	61	50
Groundnut	40	152
Grapes	48	23
Sugarcane	50	99
Pomegranate	45	45
Tomato	42	60
Cauliflower	68	70
Cucumber	56	48

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III.   **PROBLEMSTATEMENT**

Many a time people forgetto provide water to plants and this is a major issue since availability of water keeps plants alive and healthy.   Farmers find it difficult to   managethefieldsandwater theplants when there is water scarcity. Since there is huge shortageofwater for farming purposes and agriculture needs large quantity of water, it is imperative that waterresources are usedin best possible ways. Hence there is a need for   implementing an automatedsystem for watering ofagricultural fields and gardens for keeping the plants in a healthy state. This is the motivation for the present project. Technology can be of great help topeoplein plantcultivation. One aspect isautomation and the other is by using digitalcommunications the user is notified with respect to the plant's present status.The project's aim is to develop a simplesystem making use of automaticirrigation. This system can be used to water crops or potted plants. Humanintervention is kept to minimum. Figures 1 and 2 show some of the existing scenarios in the present world.
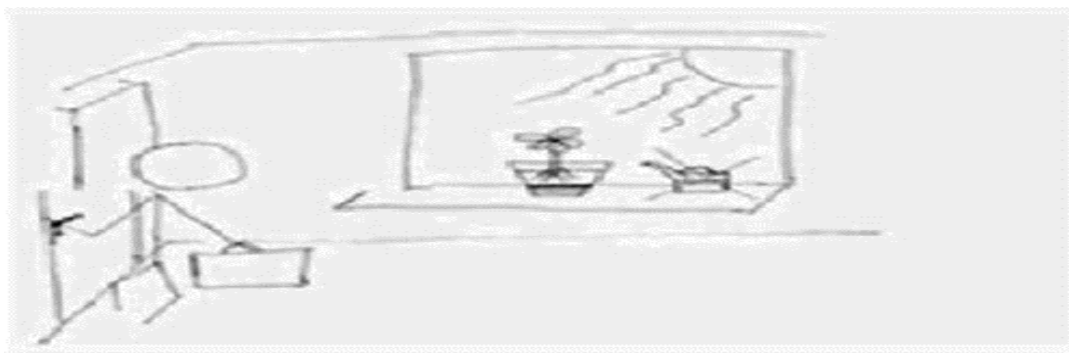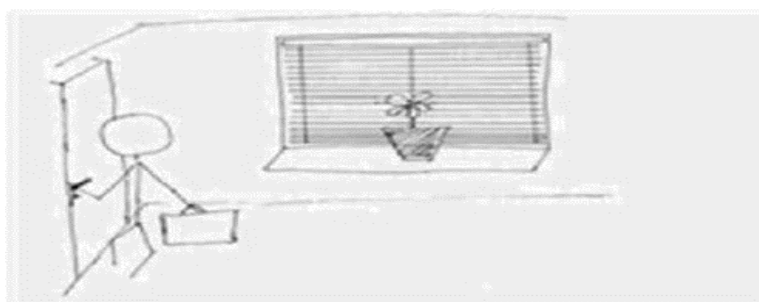

Fig1:Scenewhere theownerwatersaplant

Fig.2 : Scene where requiredsunlight is binded by the closed window

2. PROPOSED IDEA

The two components   usedare motor- pump and moisture sensor. The Arduino board isprogrammed making use of IDE(Integrated Development Environment). The humiditysensor measures content of moisture in the soil. The combination of motor-pump supplies water for

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plants. The system is programmed for predetermined temperature and soil moisture ranges for the specificplants. The systemoperates based on the above settings. The ATmega328 Microcontroller controls all the functions in the system.The differentsensors are intfaced to the microcontroller's input side. The actuators are interfaced to output side. If the value of soil moisture drops lesser than the threshold the water pump operation is automatically triggered by the system. This continues till the stage the value of moisture sensor returns to threshold. The pump is then automatically put into off mode. The user knows the complete activities through notifications sent bymobileapps. Figure 3 illustrates the proposed system.
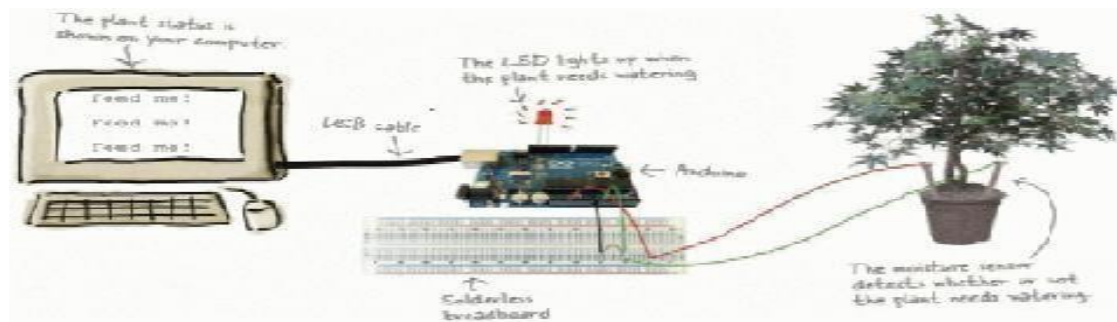
Fig.3:Real-time illustration of theproposedAutomatedSystem for Gardening

A. *Moisture content detection in soil:*

B. This is accomplished by usingmoisture sensor. It isconnected to the microcontroller. The sensor determines the soil's humidity level. Based on this information the controller decides if the plant requires watering and a required signal is sent to the sub system of the controller.

Fig.4: System blockdiagram

C. *UserNotifications and AutomaticWatering:*

When the necessary logicalhighsignal is received a sub system, the controller notifies the user using a buzzer. The controller isused with control switch and relay for controlling the operation of motor and the system's completefunctions. A 9V battery which is external to the system drives an motor which isinterfaced to the controller. Fig 5 shows the activities performed in the system using a flow chart.
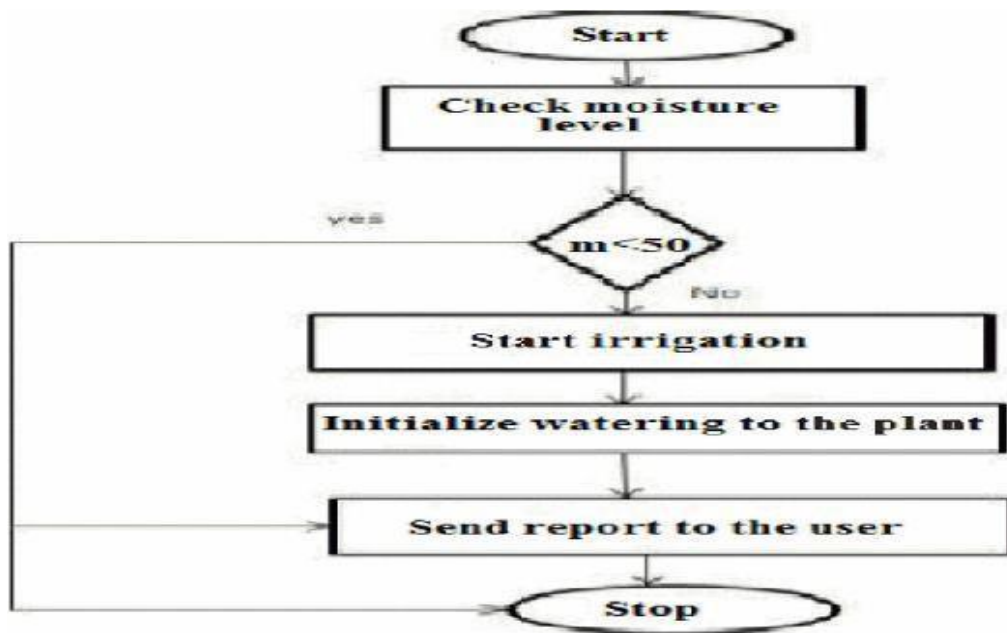
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Fig 5 System Flow chart

3 COMPONENTS USED FOR SYSTEMIMPLEMENTATION

1.   ArduinoUno

ATmega328 is the microcontroller which is present in ArduinoUnoboard. There are fourteendigitalinput-outputpins. Six of can function as PWM outputs. There are sixanalog inputs. Other systems are USBconnectivity, ceramic resonator whose frequency of operation is 16 MHz, power jack, resetbutton and ICSP plug. The board has all sub systems required for functioning of the micro-controller. The USB cable is connected to computer for power requirements or an AC-to-DC adapter/battery can be used.

Fig.6:ArduinoUno

2.   Sensor for measuring soil moisture

This sensordetermines watercontent present insoil.The moistureprobe can consistof anyofthe following and also other types: capacitive sensor which operates in frequency domain, NMR(Neutron moisturemeter)

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The present projectusessensors which should beinserted in the soil formeasurement.

Fig.7:MoistureSensor

3 WaterPump

The operation of pump is controlled by micro-controller. The operation is triggered by a signal. It is turned off when required. The project makes use of hydraulic pump andH-bridge.

Fig8:Waterpump

4. RelayModule

Fig 9 Relay

A switch which operates electrically is relay. Relays wereused in computers and telephones. In computers they performedlogical operations. They can be used for switching solenoids and are also used in mechanisms which are operated mechanically.

4 RESULTSANDDISCUSSIONS

The system was tested in practical conditions. The results conclusively proved that the system was a best option for an agriculture field of medium size. The reference voltage in the op- amp can be modified depending on the type of crop and availability of moisture on the field. The water wastage in the tested field was reduced by 50% as compared to wastage in the usual irrigation method. Less human attention was needed on the field due to the

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implementation of the system. The process of irrigation becomes simplified and easy with the use of system. The moisture sensor output and threshold level system implementation produced the required output.

Typeofsoil	Moisture levelpresent	Required moisture level
Redsoil	25.78	27.4
Clay	19.54	20.13
Finesand	16.13	15.00

5 CONCLUSIONS

The design and construction of the system was completed and tested practically. All the required componentsare easilyavailable. They perform reliable operation. There is an improvement in irrigation's efficiency with the use of this system in agriculture. The system works well in dry places which have insufficient rainfall. Using the measurement of moisture content in the soil the water requirements of the field are met. In today's world,land is irrigated at regular intervals using methods which use excess water resulting in its wastage. A major aim in developing the system is to help farmers who put in lot ofeffortsforwateringthe crops in the field.

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