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AUTOMATIC PLANT WATERING SYSTEM

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Abstract - *We all know that watering the plants is the most important thing for plants to live and grow. Nowadays people often grow plants in their areas or houses they were kept in some pots or containers. Some times these plants suddenly die. One of the reason might be the area the plant grows in but the major reason behind this is lack of watering plants regularly. We all know that how much plants are important to us so for this not to happen we need to water them regularly. For this two aspects are needed when to water and how much quantity need to water. Most oftenly people do not water their plants due to their busy schedule, vacations or some other reasons. So for the people who grow plants and cannot water them this project automatic plant watering system can be used. By adding this automatic plant watering system to the garden or the area where the plants are grown it will be easy to water plants without our presence. This reduces the physical strain and saves the time for the user. This system consists and uses arduino board. This is the most important device and it is responsible for controlling all the connected devices. This system also consists of soil moisture sensor which checks the moisture content in the soil and water is supply whenever the water is needed and the water supply is stopped when the moisture level in the soil reaches the required level. So we believe that this problem is important to study and to design the automatic plant watering system.*

***Key Words*: IOT, Automatic Watering System, Watering Soil Moisture Sensor.**

1. INTRODUCTION

Plants are very useful to human beings in many aspects. Plants release oxygen which is used by human beings for respiration. Plants helps in keeping the environment clean and healthy. Many people love to have plants in their houses or nearby areas. But due to the lack of knowledge for the people they do not grow plants in a proper or healthier conditions. Instead they grow in some bad pots,areas etc. For the type of plants growing in such areas they need proper watering and exposure to sunlight. In busy schedule of day to day life, many time people forget to water their plants and due to this plants suffers many disorders and ultimately died. Now a days shortage of water resources has become one of the biggest problems. Agriculture is a demanding job to consume large amounts of water. It is very essential to utilize the water resources in proper way. Thus, a system is required, to handle this task automatically. Automatic plant watering system estimate and measure the existing plant and then supplies desired amount of water needed by that plant. It is minimizing the excess water use as well as keeping plants healthy.

2. Literature Survey

A thorough research was carried out to study various problems in Health sector in India. This document presents study findings from primary and secondary sources of data. Primary data is original and unique data, which is directly collected by the researcher from a source such as observations, surveys, questionnaires, case studies and interviews with the stakeholders. Sources of secondary data are websites, articles and internal records. So while secondary research is easily accessible they are not pure as they have undergone through many statistical treatments and editing.

2.1).Primary survey Questionnaire:

To know the thoughts and have clear understanding of people's opinions and ideas on plant's health, watering plants, automatic or self plant watering systems we prepared a questionnaire which mainly focused on the following aspects

* Plant's health

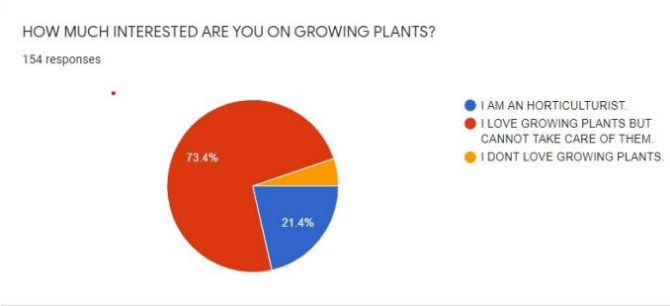
* Watering of plants

* How much do they care about their plants

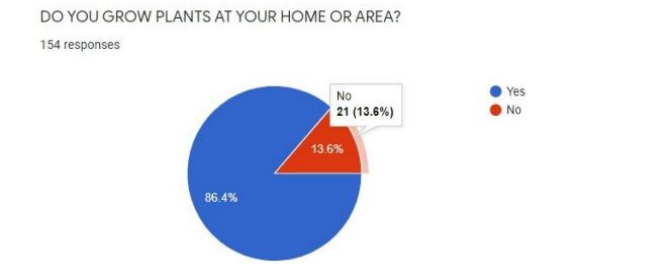
* Automatic plant watering systems

* Their thoughts on automatic plant watering systems

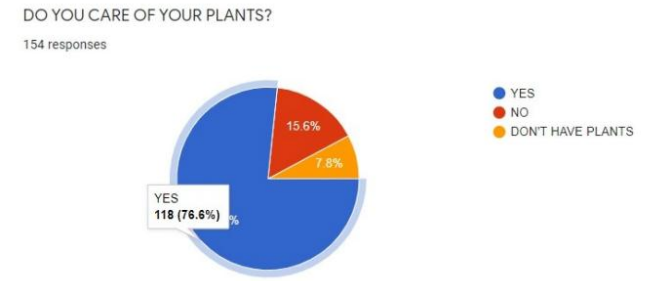
- On asking how much people are interested in growing plants 21.4% of people said they are horticulturists. 73.4% of people said they love growing plants but cannot take care of them. 5.2% of people said they are not interested in growing plants.



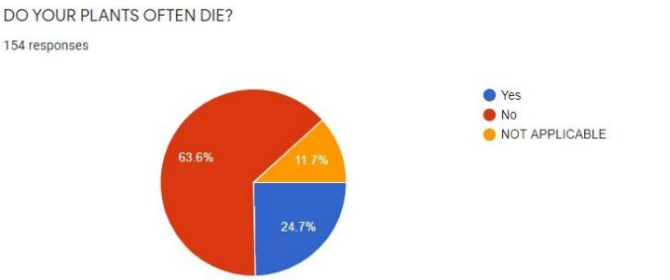
- On asking whether people grow plants at their home 86.4% said yes and 13.6% said no.



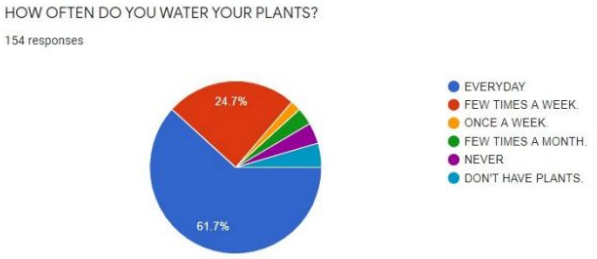
- On asking whether they take care of plants or not 76.6% said they do take care of plants. 15.6% said they don't take care of plants. 7.8% said that they don't have plants.



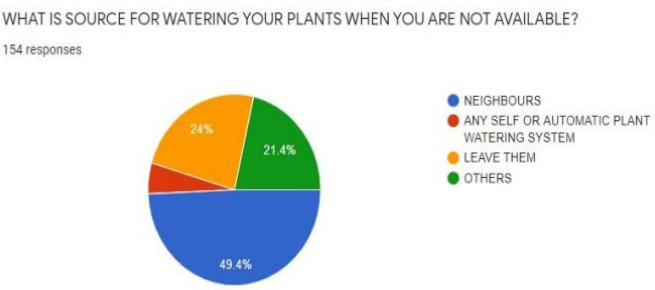
- On asking whether their plants often die or not 63.6% said no, 24.7% said yes, 11.7% said not applicable.



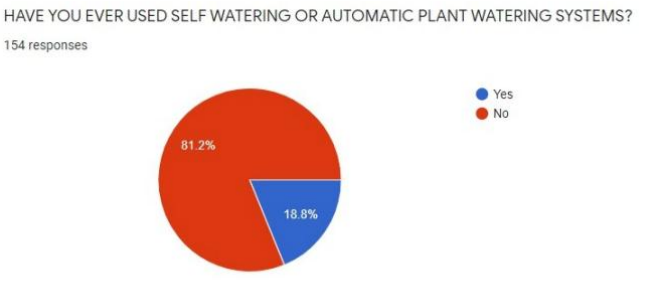
- On asking how often they water their plants 61.7% said they water everyday. 24.7% said they water few times a week. 1.9% said they water once a week. 3.2% said they water few times a month. 3.9% said they water never. 4.5% said they don't have plants.



- On asking what is the source for watering plants when they are not available 49.4% said neighbours, 5.2% said any selfwatering or autowatering system, 24% said that they leave them like that, 21.4% said others.



- On questioning have they ever used automatic or self plant watering systems 81.2% said no,18.8% said yes.



2.2).Secondary Survey:

Research overview:

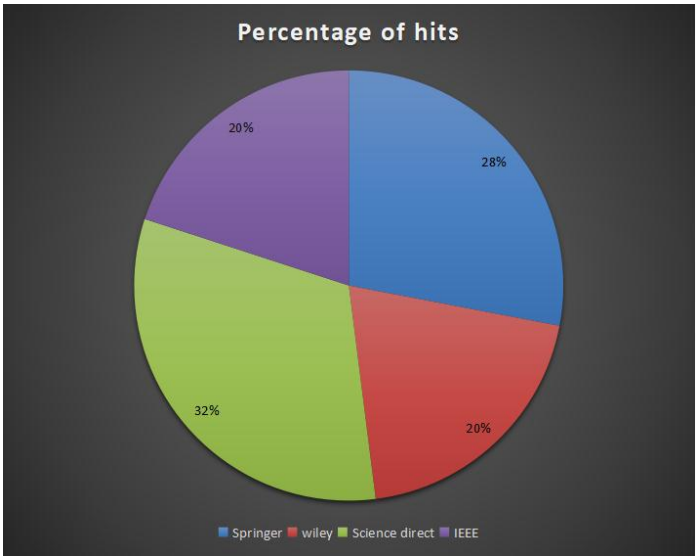
At the beginning we had gone through several websites, journels,articles and many more in online web resources. We had gone through the advanced search in resources

like IEEE Xplore, Willey, Sponger etc. We resorted the non-experimental methods like content analysis in form of observation and analysis of existing data to identify different types of approaches to water the plants. For this we searched for articles by keywords which are related to our problem statement and we found so many methods. We nearly got around 25 articles related to our problem statement. We then prepared codebook which consists of abstract, authors, publishing year, title etc.We also searched for the automatic plant watering systems and included it.

Data collection:

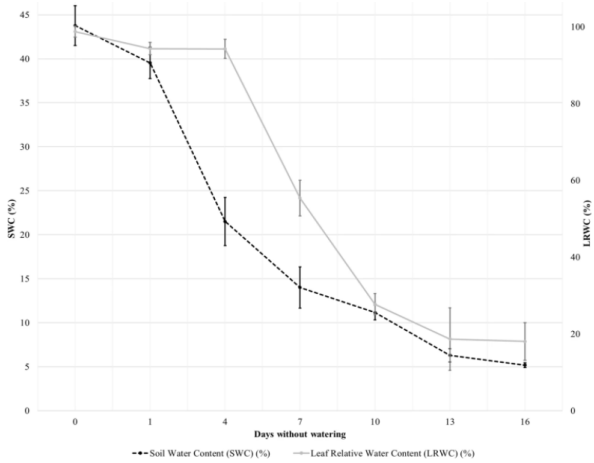
The key term search process has been adapted to IEEE Xplore. Science direct, Springer, Wiley onlinelibrary. The search process was manual process of identify specific journals.The selection is based under environment domain.We used certain key terms like automatic watering to plants,self watering to plants,plants growth by watering,nurseries etc.

Totally we have considered 25 articles.The following figure 1 represents the distribution of 25 articles between 4 databases.



Findings:

We usually grow plants in our areas.We need to water them on regular basis such that there is no improper growth in them.Sometimes we find sudden death of container plants improper watering is often the reason for sudden dying of plants.If u forgot to water for few days,it is possible that the roots dried up.However the opposite is also more likely,as too much water is often to blame for dying container plants. Rootrot can also be one of the reasons for sudden death in container plants.The problem is easy to see if you remove the dead plant from the pot.Healthy roots are firm and pliable while rooted roots are mushy with a seaweed like appearance. Don't be overly ambitious with the watering can when you replace the plant.Almost all plants are healthiest if the soil is allowed to dry between watering.Water the plant deeply until it drips through the drainage hole then let the pot drain completely before returning it to the drainage saucer.Never let the pot stand in water.Water again only if the top of the soil feels dry to touch.



The above graph shows soil water content and leaf water content for different days of not watering the plant.

By seeing this graph we can see that without watering plants death rate will increase. Watering the plants is very important. But people because of their busy schedules or some other reasons they don't water plant regularly. Because of this plant may die suddenly. So to overcome this automatic plant watering system can be used. It can be designed in several ways like Arduino, soil moisture sensor etc. People can use this when they are not able to water the plants.

Analysis:

By this survey the following points are analysed

* Plants health.
* Factors affecting plants health.
* Watering of plants.
* Effects of not watering the plants.
* Automatic plant watering systems.

There are many simple ways to water plants when away like basic bottle method, water wicking, bottle drip system, self watering planter etc…

There are also many complex and other ways to water plants like by using automatic plant watering systems.

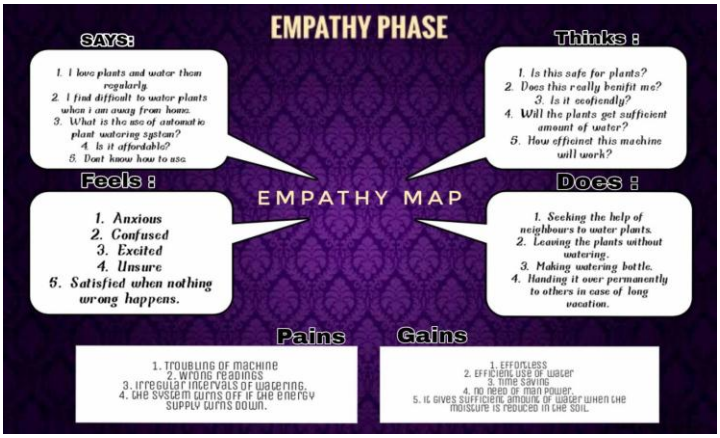
Some of the automatic plant watering systems are IOT based watering system, system consisting of soil sensor, automatic watering system by arduino etc. By using these systems we can able to water plants without the presence of human beings. Some of the methods can be controlled by a mobile applications while some other can be done normally. These are very helpful when we are away. These systems can also reduce the problem of over watering of plants.

2.3).EMPATHY TOOLS:

After completing the primary research by analyzing and observing the data from primary research we designed an empathy map to visualize the data in more simplified and creative way by dividing the sheet into 6 sections or quadrants. Those 6 quadrants are

- Says- What the user says in an interview
- Thinks- What the user thinks during the interview.
- Does- Actions done by the user according to the research.
- Feels- The emotional state of the user while responding.
- Pains- Disadvantages for the user.
- Gains- Advantages.

An empathy map is created by using this 6 blocks which showcases the user's experience.



INSIGHTS:

By analyzing the empathy map we discovered the following insights

* Most of the container plants die due to lack of watering.

* People often leave their plants while they are away.

* Their are interested in automatic plant watering system.

2.4).DEFINE PHASE:

In the define phase of the design thinking process, we design challenges and problems from the data that we collected in the Empathise phase. This allows us to gather and generate ideas to resolve the issues faced in a certain domain.

DEFINE TOOLS

- **POV:**

  A Point Of view (POV) are meaningful and actionable problem statements, which will allow you to ideate in a result-oriented manner .We developed the following POV statements from the data collected:

  1.One of the major problems faced by people who grow plants in their houses is watering the plants on regular basis.

  2.People need to water the plants regularly,check the soil conditions,making sure the container plants are kept in proper places such that there is no lack of sunlight to maintain good health of the plant.

  3.Many people whom we surveyed said that they will leave their plants alone without watering when they go for trip or vacation.

  4.Some people said that they love to grow plants but cannot take care of them.

  5.Some of them even said that they don't even water their plants in their houses.

  6.Due to lack of watering container plants suddenly die.

  7.Among all the necessary thing plant need to grow healthy water and sunlight should be given the atmost priority these are the basic needs that plant needs in order to stay healthy and prepare their food.

- **HOW MIGHT WE:**

  How might we(HMW) questions helps to come up with the wide range solutions to the challenges statement in POV statements.

  1.How might we water the plants on regular basis?

  2.How might we make sure that plant is in good health condition?

  3.How might we overcome the problem of watering the plants during a vacation or a trip?

4.How might we take care of the plants?

5.How might we able to help the plant to grow?

6.How might we able to overcome the problem of sudden death of plants?

7.How might we able to provide basic needs for the plants to grow healthy?

3) PROPOSED WORK

3.1).Ideation Phase:

By basing on the above problems we generated some ideas which can be the solutions for the above problems. Among those generated ideas one idea is chosen. Below are some of the tools taken in reaching the solution.

Brainstorm:

It is a process of finding various relevant solutions for the particular problem statement. Brainstorming can generate many wonderful ideas. By this method some of the proposed ideas were as follows:

1. PVC drip irrigation.
2. Sprinkler irrigation system
3. Automatic plant watering systems using Arduino.
4. Plant saucer setup can be implemented.
5. Plastic bag greenhouse
6. Water Wicking method
7. Iot based smart phone application.
8. Capillary irrigation can be implemented.
9. Automatic drip kit timer method.
10. Glass bottle method.
11. Bottle drip system.
12. String drip method
13. Water bulbs

NABC (need, approach, benefit, competition)

NEED:

Plants need water for their survival.Watering is very essential for plants to grow.But people nowadays are not watering the plants regularly because of their busy schedules or their might be some other reasons. This irregular watering leads the container plants to death.We all know how much plants are needed to us.So when people cannot water their plants regularly they should arrange some other ways to water them.And even some people over water their plants which leads to wastage of water.Automatic plant watering system is one of the best solution for this problem.These systems can be used to water them on regular bases and not wasting the water.

APPROACH:

An automatic plant watering system can be designed to water the plants regularly. It contains arduino. The tip with soil sensor is kept in the soil. This soil sensor will check the moisture content in the soil. If the moisture content in the soil is not up to the minimum required level then watering is done to the container plants through a pipe which is kept in the container. Now if the moisture in the soil reached the minimum required level then the water is stopped from the pipe.

BENEFITS:

As to water the plants in regular basis automatic plant watering system are used which has its own benefits. Some of the benefits are

* This saves the time of the people.

* It also reduces the over watering of plants.

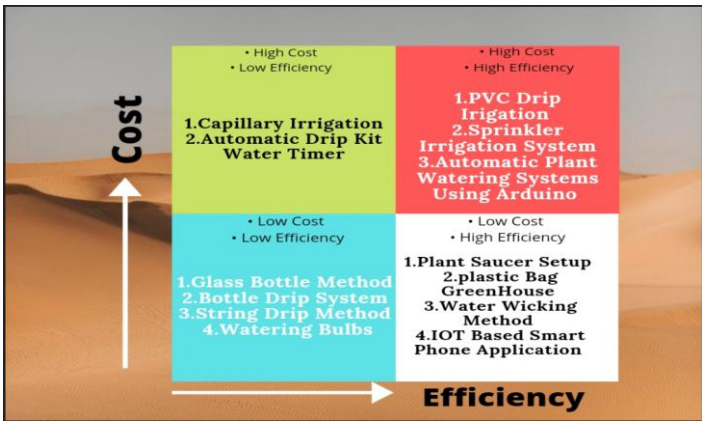
* It does not waste water.

COMPETITION:

There are some automatic plant watering systems available in the market. But some of them are highly expensive. And some people even don't know about this systems, So in this project this system is not as expensive as that of in the market and even brings awareness to the people about this system.

2x2 Matrix:

From the above ideas we have taken some top ideas which can be classified on their cost and efficiency. Those ideas are shown below in a 2x2 matrix form.

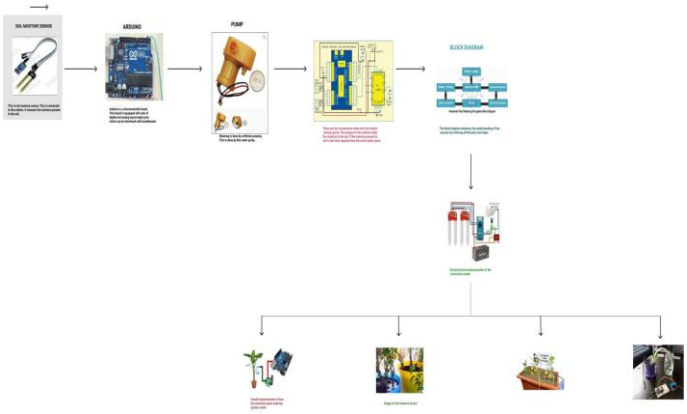


Idea chosen:

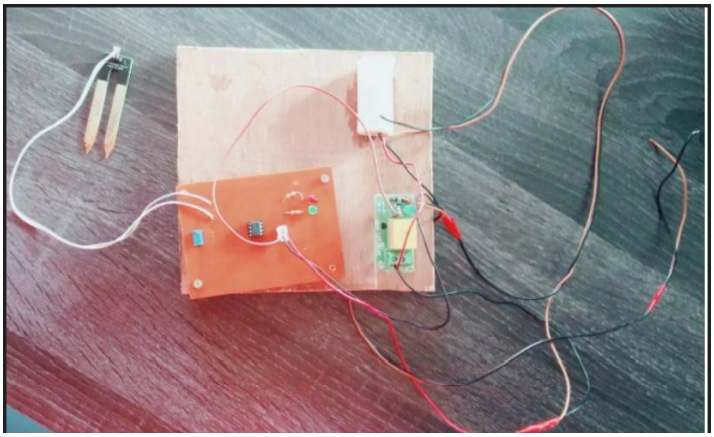
We have chosen automatic plant watering system using arduino method over IOT application because in IOT application we need mobile to water plants. Sometimes we may not have phone with us. Or else battery might die. In such cases we cannot water them.And also sometimes we might start watering and forget to stop it. In such case excess water is lost.Over watering should not be done to plants. Where as in case of arduino method no human presence is needed. It contains a soil sensor which checks the moisture content in the soil. So when the moisture content in the soil is less than needed then it automatically waters the plant. And it stops watering when the moisture content is reached its level. It make sures that over watering is not done and water is not wasted. It also saves the time.

Template:

The following template shows the approximate design of the automatic plant watering system.

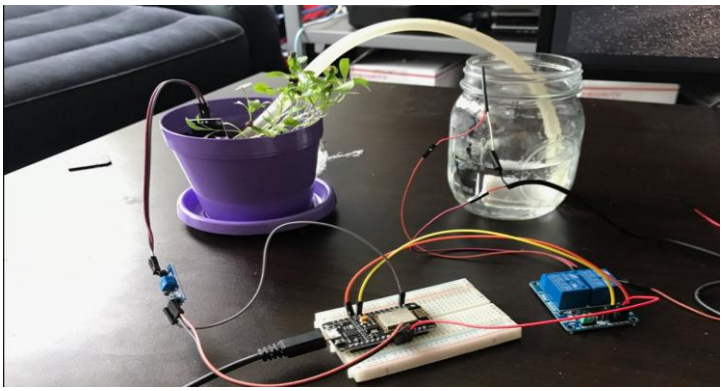


4.Results and Analysis:



The above shown figures are the working models of the automatic plant watering system.

The overall view of the automatic plant watering system will be as shown in the below photo.



5. Conclusion

The working model and overview of the automatic plant watering system is shown in above slide. This idea of automatic plant watering system helps the people in watering the plants without the presence of human. It saves the person's time and he/she need not worry about watering their plants. It saves the water. It only waters the required amount. This system either can be made in their houses or can buy in the market.

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