REQUIREMENTS FROM THE PROSPECTIVE PATENT APPLICANT

1. Full name, address and nationality of the Applicant/s:
    1. Dr. Vishwanath Karad MIT- World Peace University, Pune
    2. Rashmi Ashwinikumar Rane

2. Full name/s, address/s and nationality of the inventor/s:
    Inventor 1: Kashmira Patil
    Nationality: Indian
    Inventor 2: Fariha Naikwadi
    Nationality: Indian
    Inventor 3: Akanksha Shetty
    Nationality: Indian
    Inventor 4: Akshada Shinde
    Nationality: Indian
    Inventor 3: Dia Swami
    Nationality: Indian

3. What is the relationship of the inventor with the applicant (employee/ consultant):

4. Address for correspondence with name of the contact person, his designation, telephone, fax and email:

5. List of countries in which patent need to be filed by PCT/Conventional Route: India

6. TITLE OF YOUR INVENTION – WaterWise- Water Plants Wisely

7. NATURE OF INVENTION: - Scientific-Technological inventions

8. **PRIOR ART**: Existing Automated Plant watering systems. These are simple mechanisms demonstrating the model of how the system works. These models have not been implemented on a large scale and are only restricted to the domestic purposes of Educational projects. The existing systems make use of a single relay module and work for only one plant at a time. It is very much standardized with predefined limits and no scopes for manipulation.

8A. The deficiencies or drawbacks in the existing art ('Prior Art'):

1. **little scope for commercial prospects**: The existing models are experimentive and have little scope to be handled on a commercial scale or larger projects. Our model intends to solve this problem by coming up with a one-stop solution to all types of commercial avenues.
2. **lack of scientific monitoring:** Existing systems such as the sprinkler systems and the drip irrigation systems do not monitor environmental conditions such as incoming sunlight, temperature, humidity, real time weather conditions etc. With WaterWise, we intend to develop a model that becomes the blueprint of ideal plantation irrigation- both commercially and domestically.
3. **Home Automation aspects:** Integration of IOT systems in the irrigation systems is still not very well etched in India. Our model aims to make a breakthrough with IOT integration, providing users with daily statistics, plant health data and remote controls of irrigation systems. Interfacing with Home automation mediums or even developing an independent user interface for domestic applications is a prospective scope.

9. The purpose or object of your invention:

The proposed model offers a sustainable and a futuristic solution to smart plant irrigation systems. Our objective is to develop healthier and more sustainable plantations on a commercial as well as a domestic scale using monitored irrigation systems. These irrigation systems will be automated and controlled using various factors such as soil moisture retention, temperature, humidity, light intensity etc. We have developed a basic model using Arduino board and programming to demonstrate our plan for a more scalable deployment model.

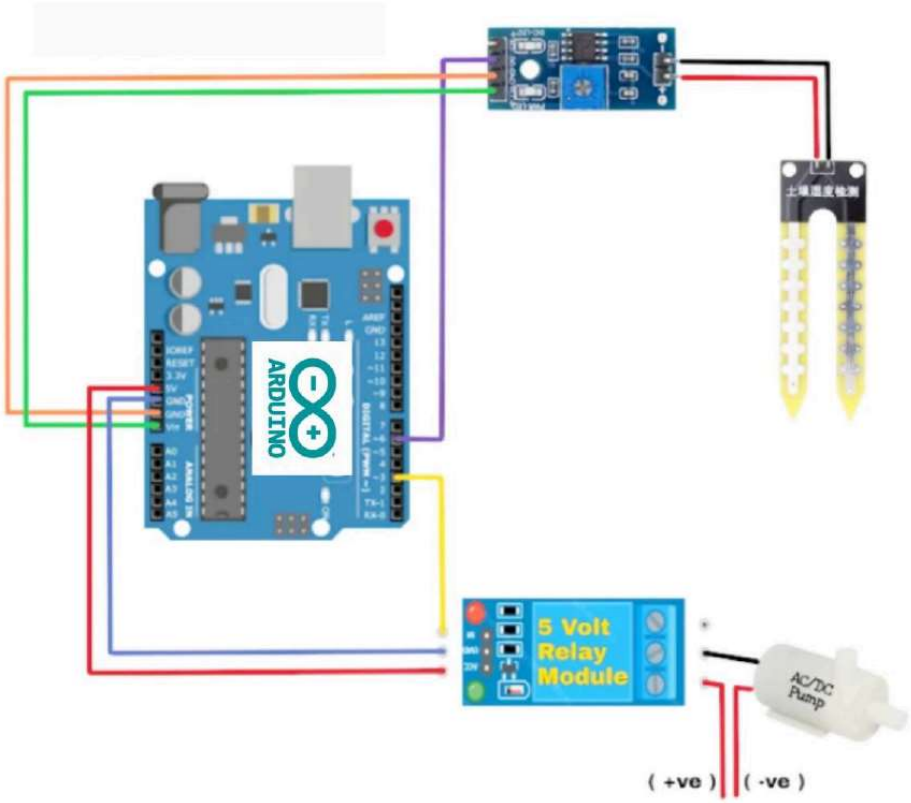
10. COMPLETE DESCRIPTION OF YOUR INVENTION, WITH THE HELP OF SCHEMATIC DRAWINGS (IF NECESSARY)

11.

- Introduction

Today, awareness about sustainable living and sustainable development has achieved its zenith due to the existing problems in society. Water crisis has led to people leaving their homes and moving out of cities altogether. Water sales have been commercialized and monopoly has taken control over a necessity of life. On the other hand, agriculture has for long been suffering from losses due to inadequate growth in the industry. The lack of a developed infrastructure and low provision of technologically advanced equipment for agriculture has cost a historically "farmer's country" to lose its green fields. With WaterWise- water plants wisely, we intend to improve one aspect of commercial and domestic plant life- Irrigation. By having monitored and automated large and small scale irrigation systems, we aim to solve the issues of sustainable water management as well as promoting a better irrigation practice. For experimentation purposes and to show the basic display of how the system works, we developed a soil

moisture sensor circuit using an Arduino Uno microcontroller. We programmed this to detect the soil moisture in the pot and control water supply accordingly.



Automatic_Plant_Watering_System_final.ino

```ino
int sensor_pin= A0;
int output_value;
void setup()
{
  pinMode(3, OUTPUT);
  Serial.begin(9600);
  Serial.println("Reading from the Moisture sensor…");
  delay(2000);
}
void loop()
{
  output_value= analogRead (sensor_pin);
  output_value= map (output_value,550,10,0,100);
  Serial.print("Moisture:");
  Serial.print(output_value);
  Serial.println("%");
  if (output_value<0)
  {
    delay(1000);
    digitalWrite(3, LOW);
  }
  else
  {
    delay(1000);
    digitalWrite (3,HIGH);
  }
  delay (1000);
}
```

- System Architecture with description

WaterWise consists of a microcontroller board, a temperature sensor, a humidity sensor, a light sensitivity sensor, a wifi module, A soil moisture sensor, water level sensor and an AC/DC water pump. In addition, valves and hose pipes are also used. All operations of the system are controlled by the microcontroller. The wifi module is attached to the microcontroller. Further, all the sensors used are connected to analog outputs of the microcontroller. We use a relay module in the architecture to manage electricity flow and voltage differences. The relay is connected to the microcontroller. The AC/DC pump is connected to the relay module. This connection helps us regulate the water flow based on the combined signals from all the deployed sensors. The water pump works on AC/DC operations. For domestic applications, small pumps with output values of 5-9V, 12V, 24V etc, can be used. For commercial applications, large motors can be used. Addition of time monitored water supply takes this model a step further. This helps prevent over watering, eradicates human error and ensures reduction in loss of plant life. The data from this device is split into channels based on the devices and is sent to the IOT platform where it is compiled and a decision to whether open the valves in the hose or not to water the plants is made.the mouths of the hose are placed such that they are near the roots of the plant but not exactly on them to avoid plant death by root suffocation. Now after this decision is made, the signal is sent to the Relay module which is mapped to binary outputs. Based on the mapping, if the signal is 0, water shall not be deployed, thus the valves won't open. If the signal is 1, the valves shall open and all the plants will be watered for the set time limit and the set quantity.

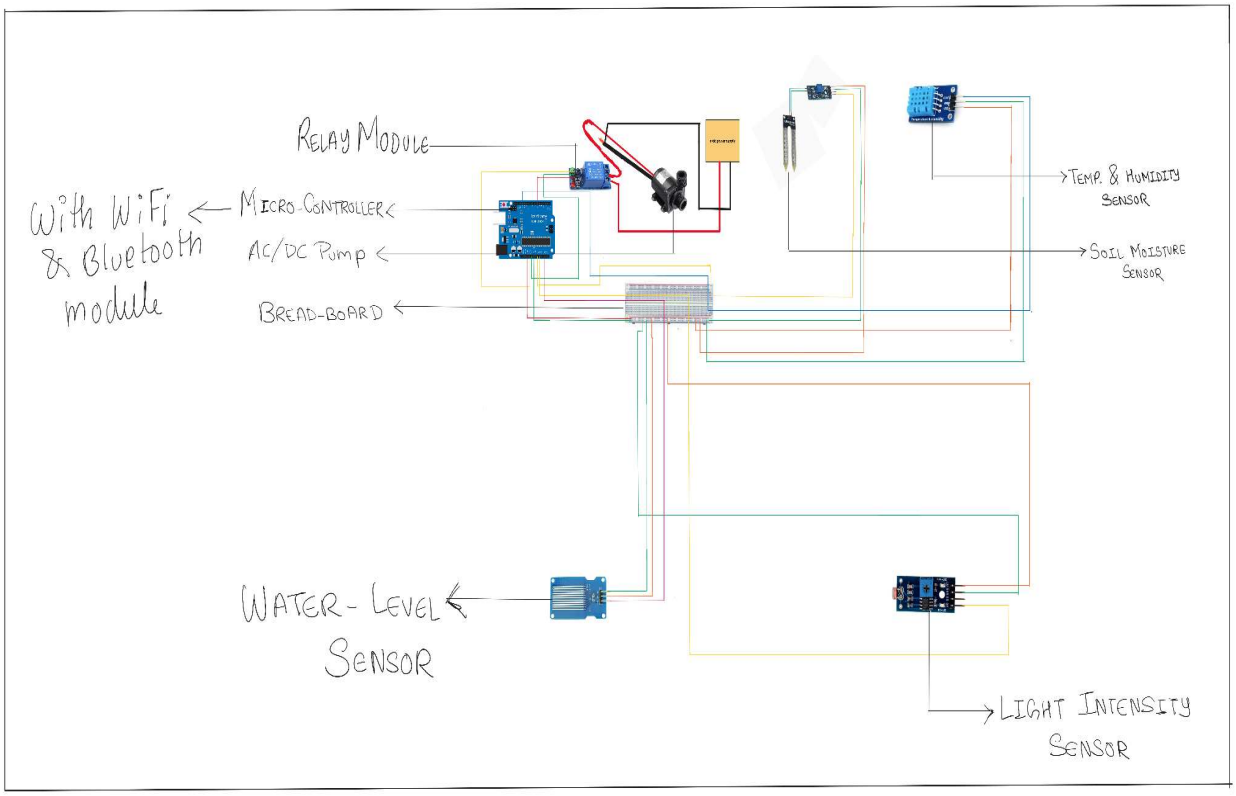
2. **individual placements**: For a smaller arrangement, we can install the sensors separately in the soil bed to monitor the daFor instance, if a plant requires 20 ml of water, and the pump rate is 5 ml/sec, then the motor shall be active for 4 seconds.

- Working

Domestic setups: we propose two models in domestic applications.

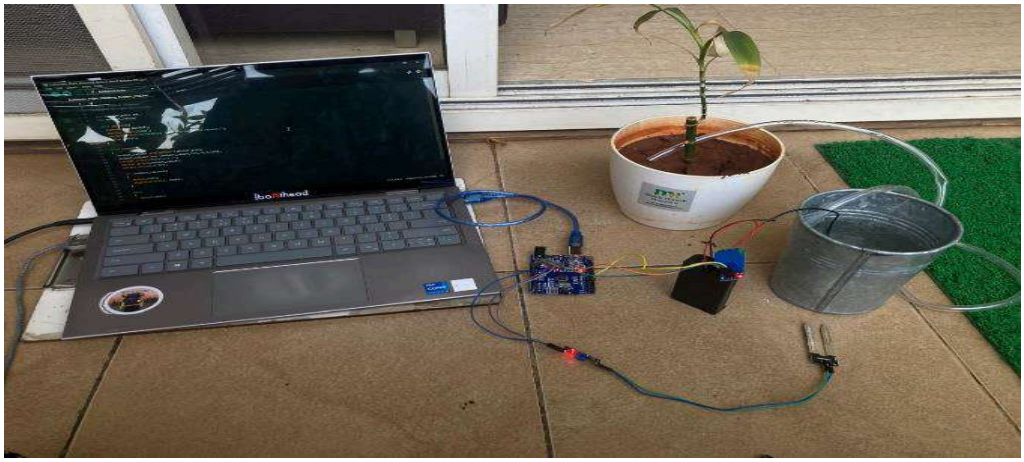
1. **Combined device**: A device consisting of all sensors combined is placed inside the soil bed near the location of the roots and combines them on the IOT platform, therefore again sending a single result to the Relay Module for further functioning.

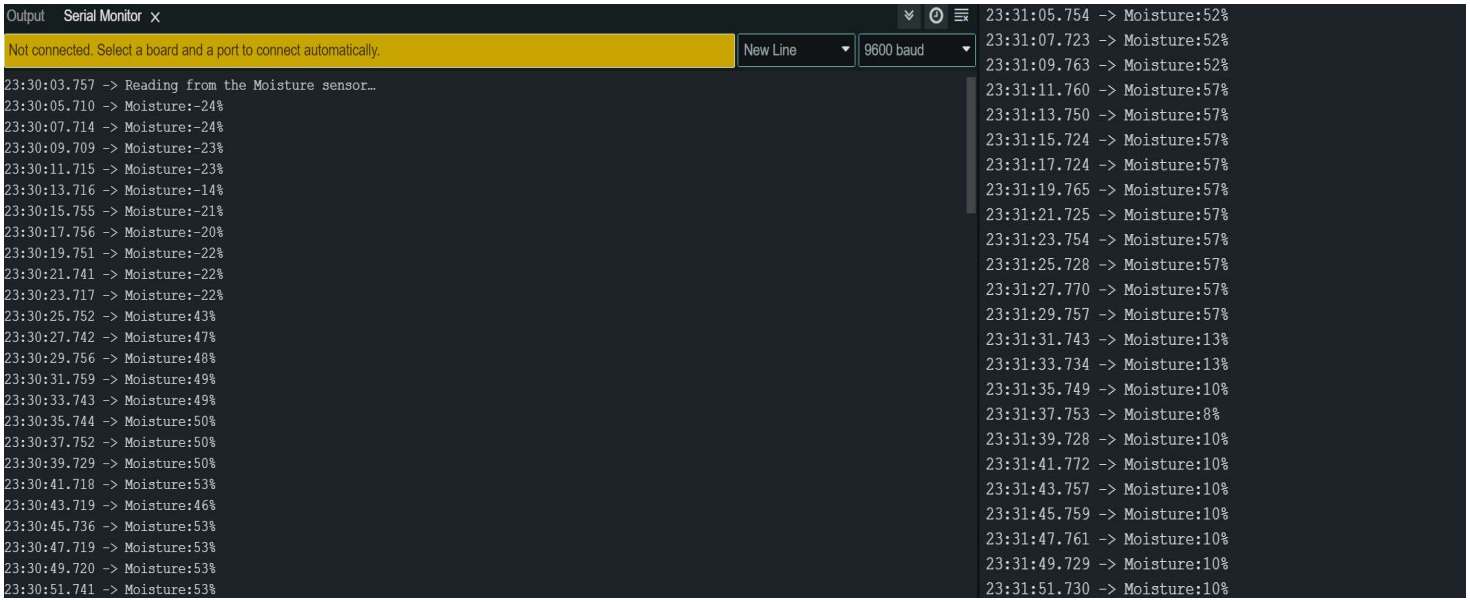
Commercial setups: For commercial purposes, we plan on using a device with all fitted sensors and placing them at regular distance intervals for consistent data monitoring and mapping. The motors will be monitored using large scale controllers which shall open and close the valves on the hoses depending on the data that comes in through the cloud.

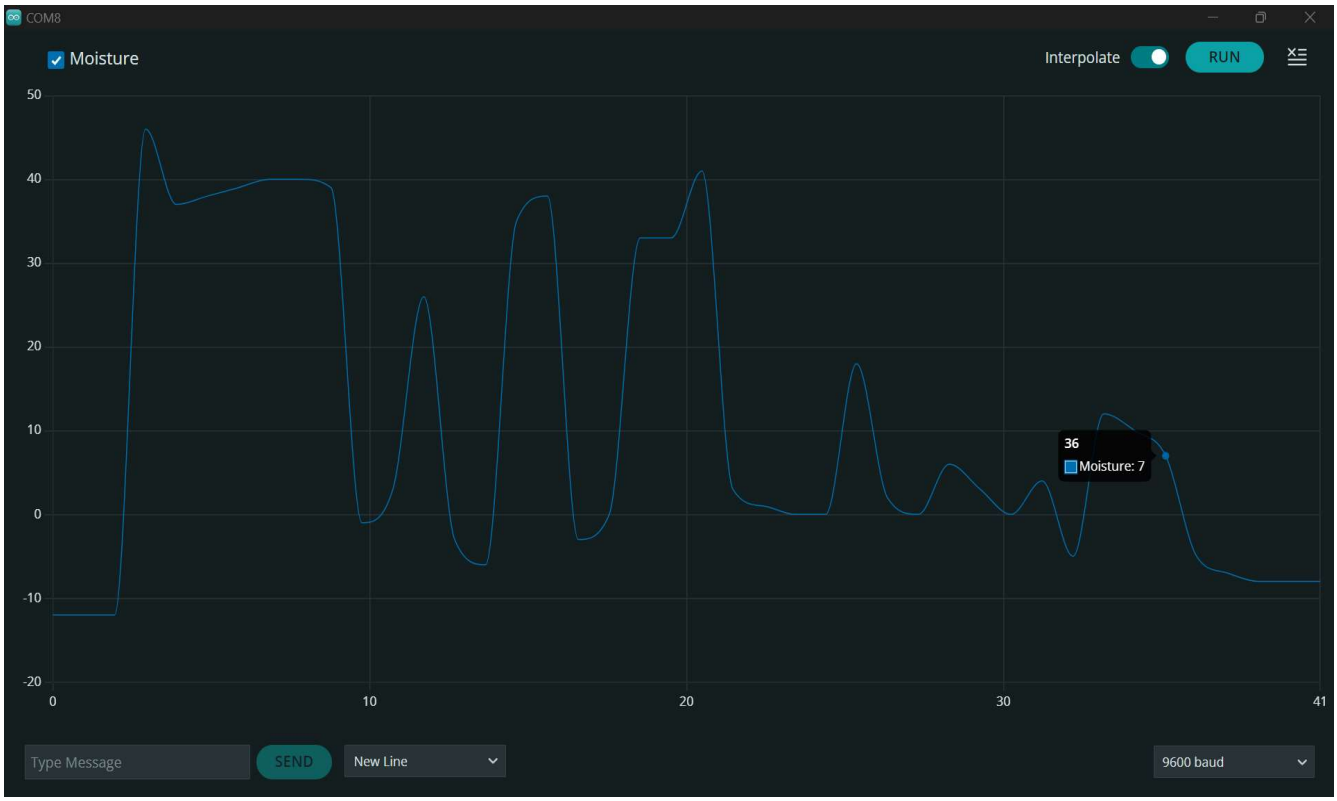


- Features
    1. Detailed control and monitoring using multiple sensors for monitoring factors like humidity, temperature, light intensity, water level in soil etc.
    2. IOT connectivity for data monitoring will help in sustainable planning of consequent cycles.
    3. stand-alone User interface in terms of an app or integration with home automation platforms for better monitoring.
    4. Remote system on and off features.
    5. Maintenance alerts from time-to-time.
    6. sensors can be programmed as per deployment needs [that is, ranges for calculation can be manipulated accordingly]

- Results (Tables/Screenshots)




Output
Serial Monitor
Not connected. Select a board and a port to connect automatically.
New Line
9600 baud
23:30:03.757 -> Reading from the Moisture sensor…
23:30:05.710 -> Moisture:-24%
23:30:07.714 -> Moisture:-24%
23:30:09.709 -> Moisture:-23%
23:30:11.715 -> Moisture:-23%
23:30:13.716 -> Moisture:-14%
23:30:15.755 -> Moisture:-21%
23:30:17.756 -> Moisture:-20%
23:30:19.751 -> Moisture:-22%
23:30:21.741 -> Moisture:-22%
23:30:23.717 -> Moisture:-22%
23:30:25.752 -> Moisture:43%
23:30:27.742 -> Moisture:47%
23:30:29.756 -> Moisture:48%
23:30:31.759 -> Moisture:49%
23:30:33.743 -> Moisture:49%
23:30:35.744 -> Moisture:50%
23:30:37.752 -> Moisture:50%
23:30:39.729 -> Moisture:50%
23:30:41.718 -> Moisture:53%
23:30:43.719 -> Moisture:46%
23:30:45.736 -> Moisture:53%
23:30:47.719 -> Moisture:53%
23:30:49.720 -> Moisture:53%
23:30:51.741 -> Moisture:53%
23:31:05.754 -> Moisture:52%
23:31:07.723 -> Moisture:52%
23:31:09.763 -> Moisture:52%
23:31:11.760 -> Moisture:57%
23:31:13.750 -> Moisture:57%
23:31:15.724 -> Moisture:57%
23:31:17.724 -> Moisture:57%
23:31:19.765 -> Moisture:57%
23:31:21.725 -> Moisture:57%
23:31:23.754 -> Moisture:57%
23:31:25.728 -> Moisture:57%
23:31:27.770 -> Moisture:57%
23:31:29.757 -> Moisture:57%
23:31:31.743 -> Moisture:13%
23:31:33.734 -> Moisture:13%
23:31:35.749 -> Moisture:10%
23:31:37.753 -> Moisture:8%
23:31:39.728 -> Moisture:10%
23:31:41.772 -> Moisture:10%
23:31:43.757 -> Moisture:10%
23:31:45.759 -> Moisture:10%
23:31:47.761 -> Moisture:10%
23:31:49.729 -> Moisture:10%
23:31:51.730 -> Moisture:10%


COM8
Moisture
Interpolate
RUN
50
40
30
20
10
0
-10
-20
0
10
20
30
41
36
Moisture: 7
Type Message
SEND
New Line
9600 baud

- Hardware Requirements
  Up to date microcontrollers with wifi modules, programmable sensors, functioning water pumps, relay modules.

- Software Requirements
  Android/IOS enabled smartphones for mobile apps. Windows 10 and above/MAC OS/LINUX for programming and statistical analysis.

- Advantages of your system/future scopes:
  1. Automated control systems
  2. self-learning modules will be able to manipulate the system on its own to adjust to real-time on-field conditions
  3. Focuses on two major issues at hand: Water sustainability and healthy Plantation

12. Example/s especially in chemical and pharmaceutical inventions (few illustration are given at the back).