Dylan Clements

Soil Moisture Based Auto-Watering with Reservoir Alerts

SPOTLIGHT

Jimmy

Dad who loves house plants, but struggles to keep them happy and healthy.

Jimmy is a house plant enthusiast with a 9-5 and kids. He cannot work from home and when he is off work he is driving his kids to sports and running errands, leaving little to no time to water his plants. On top of this, with a thousand things going on in his head he sometimes just forgets. This upsets him as his house plants make him happy, bringing the peace of nature into his home.

Who cares?

The 66% of American households that own at least one houseplant.

(https://www.nybg.org/planttalk/if-youre-a-plant-person-youre-not-alone/)

24% of Americans say they can't keep a houseplant alive for six months from a YouGov poll. According to a survey by Trees.com, 33% of American plant owners reported under watering as a reason their plants died. It is evident that people want to own house plants and keep them alive, but underwatering is a barrier they face.

The Problem: Under Watering

Jimmy cannot work from home and when he is off work he is driving his kids to sports and doing errands, leaving little to no time to water his plants. On top of this, with a thousand things going on in his head he sometimes just forgets.

What have others done?

HOW THE STAKES WORK

- The terracotta stake delivers water gradually from bottle reservoir to the roots of the plants
- The larger the reservoir for water, the longer your plants are kept watered

Auto-watering devices

One way people have attempted to solve this issue is similar systems that monitor soil moisture and water to the desired level like this. The issue here is that there is no way of knowing if the water reservoir has run out, making the system useless until Jimmy remembers to check. Another is lack of networking, not allowing users to check the reservoir and their soil moisture whenever they want.

Fake Plants

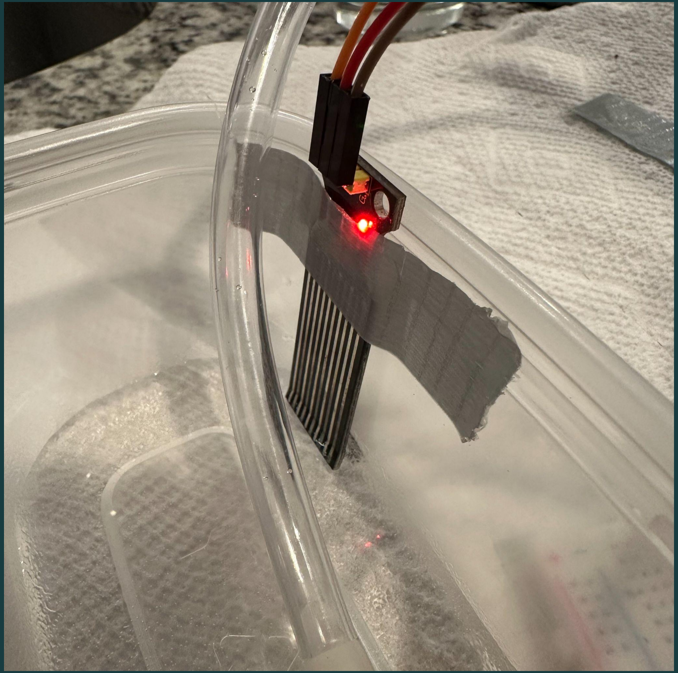
Another solution is fake plants, which of course do not require watering at all. Jimmy does not like fake plants as he finds the real nature therapeutic and enjoys the improved air quality they bring.

Self-watering Spikes

Self-watering spikes like this one release water from a reservoir slowly, but do not stop when the correct soil moisture is hit, may not water quickly enough, and do not alert the user when they need more water.

The Solution

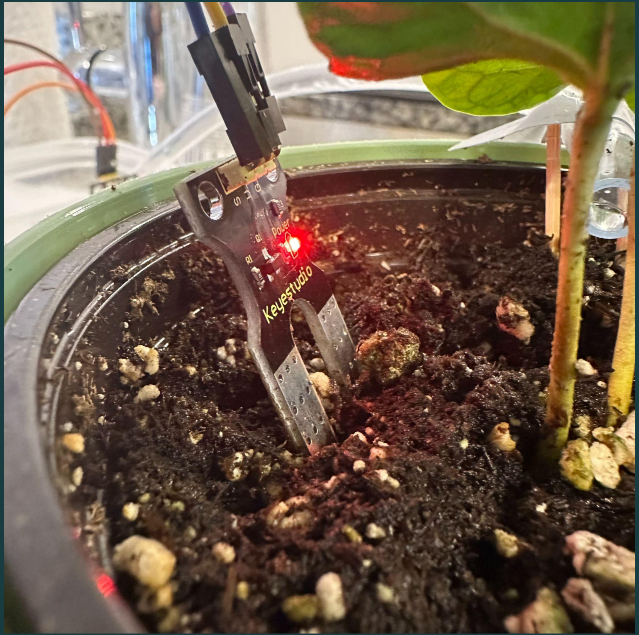
I designed a networked plant auto-waterer with water-source emptiness detection. My system will monitor soil moisture, delivering water with a pump if the soil is dry, and also monitor the water level of whatever reservoir the user is using, if it gets too low to water it will use a LED to alert the user to fill it. Users can check the soil moisture and water level at any time on an app/website.



Sensor #1

Water Sensor

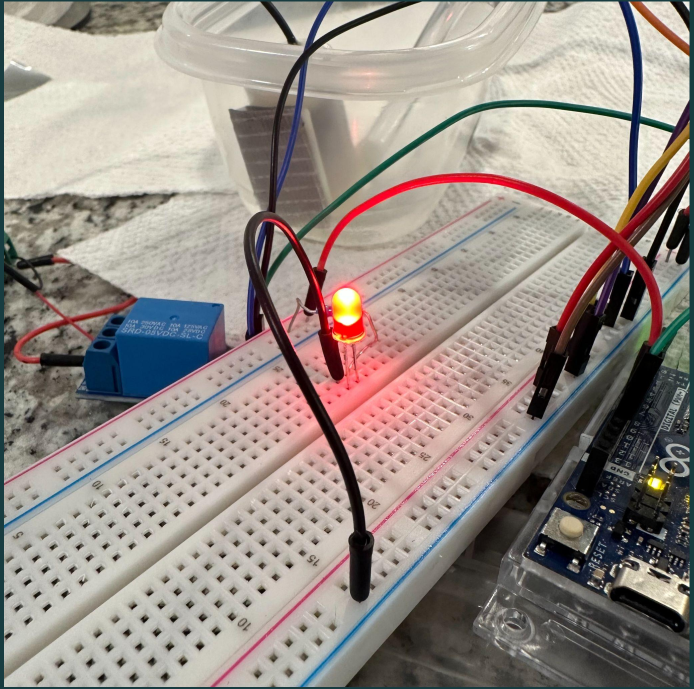
The water level sensor is waterproof, when it is called to read it returns an integer 0-1023, with 0 being no water detected and 1023 fully submerged.



Sensor #2

Soil Humidity Sensor

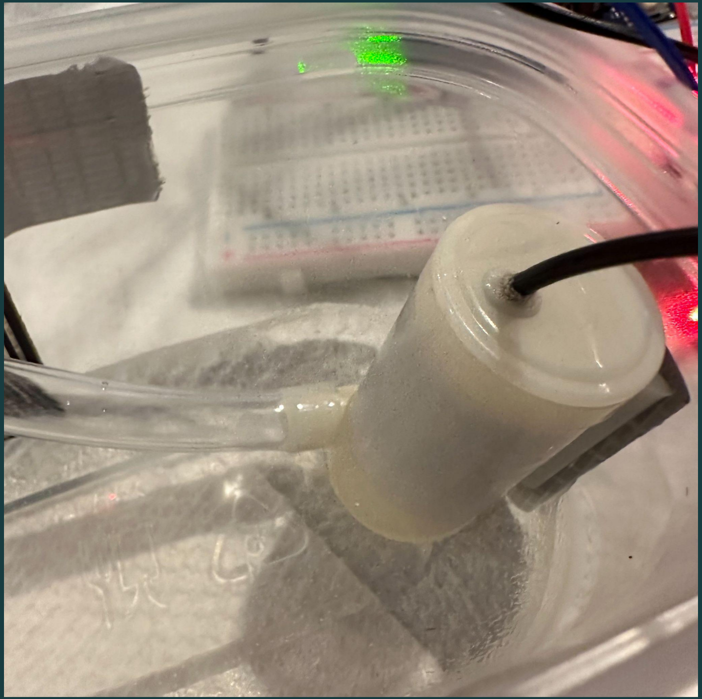
The soil humidity sensor can be inserted into soil, it returns an integer 0-950 when it is called to read, 0-300 is dry soil, 300-700 is humid soil, and 700-950 is in water.



Actuator #1

Red LED

The LED can be turned on and off with digitalwrite high and low respectively.

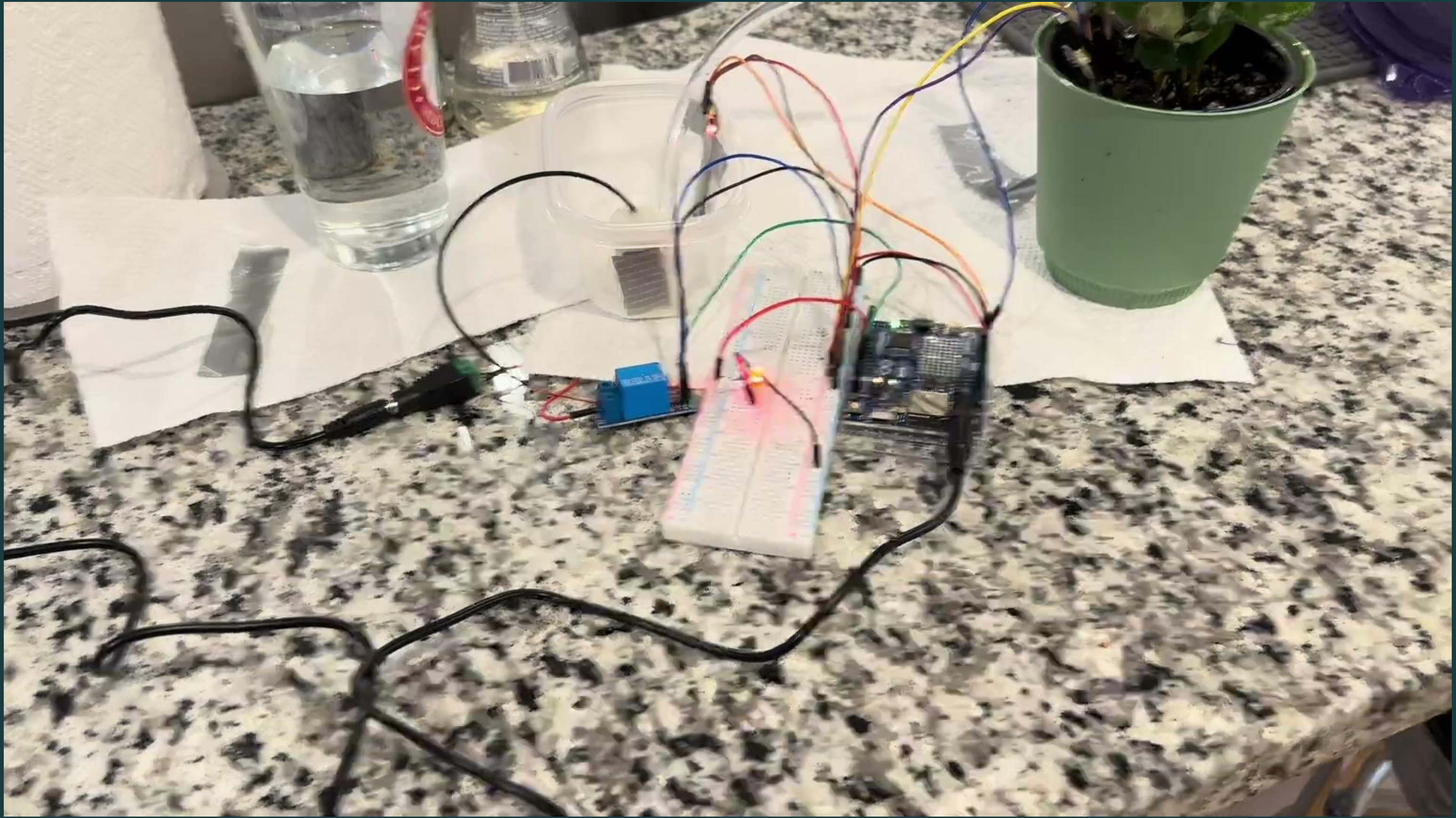


Actuator #2

5v DC Water Pump

The 5v water pump is an affordable submersible pump that pulls in water and pushes it out an output that fits vinyl tubing. This tubing can be cut to the right length for any pot.

Demo



Impact / Future Work

The impact is saving Jimmy time and stress by watering his plants the correct amount automatically and alerting him when the reservoir needs a top up. Jimmy can enjoy his house plants without adding more to his hectic schedule, improving his mood and taking something off his plate.

A simple change from this prototype will be a much larger reservoir, I was limited by the size of my water sensor. This will allow even more time before needing refilling, increasing the benefit for users like Jimmy.

I am going to set this up in my parent's house over break to get some user feedback from them about improvements to be made or additional features to add in the future.