

Project Design Specification

The “Smart Irrigator”

Authors: Jakob White, Nathan Paul, Ahmad Alothaimin, James Ross



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Concept of Operations

- **Need Statement**

Today, work occupies a majority of an individual's time. Sometimes, a person might not be able to take care of their plants due to distractions. Being out of town for a period of time could also result in a house plant dying from lack of water. An irregular watering schedule for your plants could also lead to problems for the plants. Therefore, it is desirable to have an automated system to care for the plants.

- **Objective Statement**

What is our solution? The Smart Irrigator system can be a new addition to smart home devices in a society where home automation is taking off. It is an auto-irrigation system intended for small-scale indoor plants that automatically hydrates the soil depending on the current moisture level in the soil. Therefore, rather than worrying about whether or not you watered your plants, the Smart Irrigator will automatically do it for you.

- **Who Uses It? Why?**

This watering system can be used by horticulturalists, hobbyists, or anyone who owns a small-scale indoor plant. To use this system, the user will first set up their chosen plant with the Smart Irrigator (including a water reservoir of their choice). They will then use our app on their laptop to customize their plant-watering preferences, which will include options for either a timer-based watering schedule or fully-automated, sensor-based watering.

Market Analysis

This product is intended for anyone with an interest in growing small-scale indoor plants, but does not want to spend too much time tending to them. This device will particularly be directed towards people in the age range of 20-35 years old who own house plants. As for competition, there are a few products that are similar to ours. One competitor is the MAYiT Garden Automatic Drip watering system, which uses a timer to water the plants. Many other competitors also have timers, and some must even be plugged into an outlet. Our product will be different because it will use a moisture sensor that will detect when the plant needs to be watered, which will then activate a pump. Our device will be powered by batteries and will also notify the user when more water needs to be added to the reservoir. Given the materials we expect to use, the unique features of our product, and the widespread interest in having indoor plants among various demographics (coupled with a disinterest in maintaining them), we expect to sell our product at around \$50.

Requirements

- **Functionality**

- The product *must* sense moisture level in the soil of small-scale potted plants.
- The product *must* receive user input to establish a watering schedule.
- The product *must* sense the water level in the water reservoir.
- The product *must* process input from the moisture sensor to determine whether the plant needs to be watered.

- The product *must* process input from the water-level sensor to determine whether or not the water reservoir is empty.
 - When the plant needs water, the product *must* actuate a water pump to water the plant.
 - When the reservoir is empty, the product *must not* actuate the water pump.
 - The product *should* notify the user if the water reservoir is empty.
 - The product *may* notify the user if batteries are low.
 - The product *may* monitor the plant's exposure to natural sunlight to provide artificial sunlight if the plant is not properly exposed.
 - The product *must* employ Wi-Fi to enable the user to change his watering preferences.
 - The product *should* operate using an Arduino program.
- **Energy**
 - The product *should* be battery operated.
 - The product *should* have a battery life of at least one month.
 - The product *may* be solar powered.
- **Operational**
 - The product *should* be adaptable to any small-scale potted plant.
- **Maintainability**
 - The product *should* notify the user when an error occurs in the system.

System Architecture

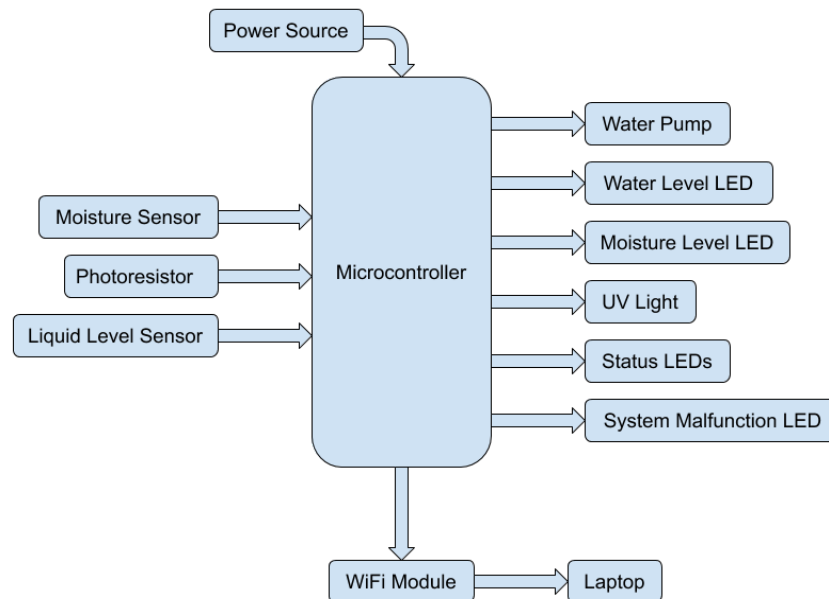


Figure I: Level I diagram of the Smart Irrigator

Design Specification

- **Sensors**
 - Non-contact Digital Water/Liquid Level Sensor
 - Analog Capacitive Soil Moisture Sensor
- **Processor**
 - Esp8266 nodemcu
- **Actuator**
 - Water Pump
 - Multicolor LEDs
- **Power**
 - 3.3V voltage regulator
 - 3.7V lithium ion polymer battery
- **Development Environment**
 - Arduino IDE