Automatic Irrigation System (AIS)

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Introduction

Traditional methods of watering plants based on timers have been shown to be wasteful when compared to sensor based watering [1]. While sensor based irrigation systems do exist, current implementations are both costly and needlessly complex. Our goal was to design an irrigation sensor system is cheap, easy to implement, and saves more water than traditional watering systems.

Our System

Each moisture node, made up of an Arduino Nano attached with a moisture sensor and a RF radio module, is planted in the soil of the plant, where it can analyze the moisture levels, and convert it into readable data. That data is then relayed through a radio frequency to other moisture nodes until the data reaches the main hub. This hub, consisting of an Arduino Uno attached with a bluetooth module and radio frequency module, receives the data transmitted from each existing node and sends it to be displayed on our phone-based application.

The app is programmed for Android devices using the programming language Kotlin and interacts with the main hub node through an established Bluetooth connection. This allows for the data to be transmitted by the hub and received by the nearby in-app phone, which has been design with a simple, clear and interactive UI. With this data, the user can learn more about the moisture levels on their plants, and the hub will adjust the water pump accordingly.

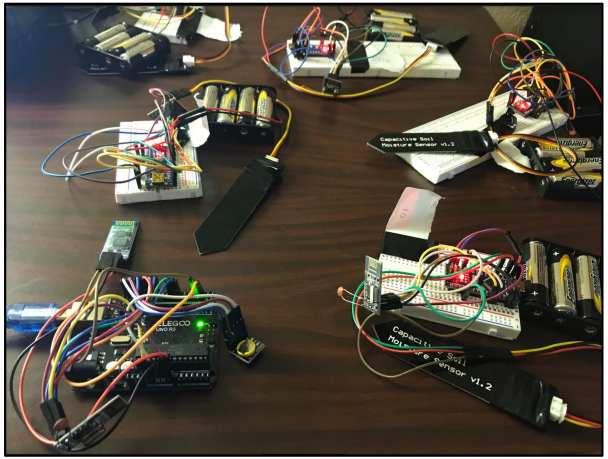


Fig 1. Sensor node and main hub hardware

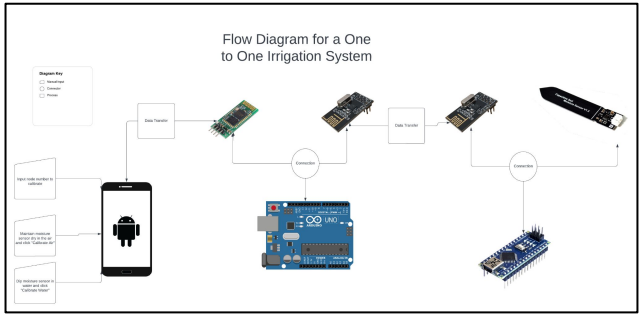


Fig 2. System foundation for our system

Graphs

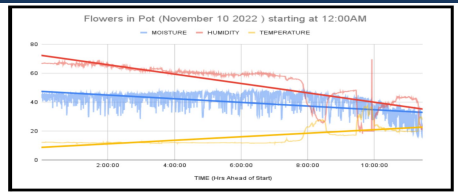
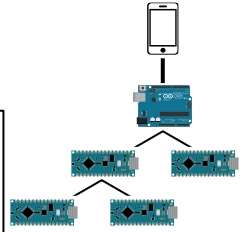


Fig 3. Sensor variable graph for a node planted on a pot of soil

Network Topology



We have designed our network in a tree-like format in order to be able to spread our sensors over a large area. Each node can connect to six other nodes at the same and can be up to 100 meters apart. When data needs to be sent from a specific node (or vice versa) adjacent nodes relay the data until it reaches the target destination.

[1] madrimasd, “Golf course irrigation: Save up to 25% of water using wireless sensors,” *ScienceDaily*, 23-Apr-2009. [Online]. Available: https://www.sciencedaily.com/releases/2009/04/090416185724.htm. [Accessed: 04-Nov-2022].

[2] American Society for Horticultural Science, “Sensors allow for efficient irrigation, more control over plant growth,” *ScienceDaily*, 16-Sep-2013. [Online]. Available: https://www.sciencedaily.com/releases/2013/09/130916122129.htm. [Accessed: 04-Nov-2022].