Abstract
The Auto/Manual Sprinkling System was designed to be put in vineyards to evaluate moisture levels in the soil and water the vineyard accordingly. It has an automatic control which allows moisture sensors to control water flow, rather than a user. This is designed so the user can water with optimal efficiency. The manual control saves the user time because they can control the sprinklers from their computer instead of going out to the fields to turn on the sprinklers. This will also save the user money because water will be used more efficiently.

Methods and Materials
- 16 MHz Clock
- U.A.R.T. with 9600 Baud Rate Communication
- Programmable First In First Out Buffers
- 12 Analog To Digital Converters, Currently 4 Are Being Used
- 12 Bit Precision Analog To Digital Converter
- 2.4 GHz Frequency
- DigiMesh Communication
- Data Rate 250 kbps
- Depth of Detection 37 mm
- Low Power Consumption
- 0 – 3.6 Volts Output Voltage
- Waterproof
- Big Enough To House All The Necessary Components

Introduction

![A.M.E.S. System Diagram](image)

Figure 1. A complete system diagram.

Figure 3. TM4C123GXL microcontroller.

Figure 4. XBee pro series 1.

Figure 5. High sensitivity moisture sensor.

Figure 6. Waterproof enclosure.

Figure 2. The finished product.

Results

![Graph showing starvation vs. field capacity](image)

Figure 7. Graph showing starvation vs. field capacity.

Experiment -> Leave the soil for a week without watering and test the moisture sensors.

After leaving the soil with no water for one week the moisture sensors read around 0.72 volts. Knowing that dry soil still reads around 0.72 volts when dry I can set the starvation voltage at 0.72 volts. Using manual control I left the water on for 5 minutes and took note of the voltage readings. When the moisture sensors started to remain constant at 2.88 volts I considered that field capacity.

If the system was in automatic mode it would turn on at a 0.72 volt reading and stay on until it reads a 2.88 volt reading. It won’t turn on again until it reads 0.72 volts.

This test also allowed me to test the manual portion which relies on wireless communication.

Important to Note: This test was done in a small pot. Had this been done in an actual vineyard the time would be longer than 5 minutes.

Conclusion
The Auto/Manual Sprinkling System is an ideal solution for an optimized vineyard. It can be used in Manual Mode with the user at the helm or the system can be left to rely on the moisture sensor reading.

The manual control was designed so the user can control the water flow when they want to water with a specific goal in mind.

The automatic control was designed to give peace of mind to the farmer when they need time to do other things.

Overall for a more efficient vineyard the Auto/Manual Sprinkling System is the perfect resource.

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