Automated Gardening System

Garden Gnome Kit

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Problem & Solution

Our group wanted to make an autonomous irrigation system for tending to plants. The idea was first introduced by Alyssa who was concerned about her grandfather’s ability to take care of his garden. This idea led to us to decide to build a user-controlled system for taking care of plants autonomously. In order to achieve this goal, our kit will include:

- Water plants when needed
- Monitor soil moisture
- Monitor ambient temperature/humidity
- Monitor water level in reservoir
- Control lighting based on plant's needs
- An app to allow user control via Wi-Fi
Automated Irrigation System
Components

- **Moisture Sensor**
  - Dual Output Mode
  - Nickel Plated (prevent rust/improve conductivity)

- **Water Pump**
  - Submersible
  - 3VDC
  - 100 mA draw
  - ~1 gal/min

- **Temp/Humidity Sensor**
  - Hum Range 20–95%, ±5%
  - Temp Range 32–122ºF, ±3º
  - 8-bit digital output

- **Level Detector**
  - Submersible
  - Reed Switch
  - Polypropylene (acid/alkaline resistance)

- **2 Channel Relay**
  - Light Bulb / Water Pump
  - Trigger Voltage: 2.5–5V
Developmental Designs

Component Layout

Garden Gnome App
Arduino UNO Wi-Fi Rev 2

- Very compatible open-source microcomputer
- Offers 20 separate input/output pins (digital and analog)
- New ATmega4809 microchip to perform high speed analog to digital conversions
- Built-in Wi-Fi and Bluetooth connectivity thanks to the NINA-W10 chip
- Includes the ECC608 crypto chip creating secure wireless communication because of its cryptographic processor
Firebase

Garden Gnome Kit

Garden Gnome App
After using the water pump, our water reservoir is low and now the Garden Gnome App is warning us that the water reservoir needs to be refilled. Thanks to the built-in float sensor incorporated into the reservoir lid, the user will be warned if the water level runs low. By simply filling up the reservoir with water, the float sensor will inform the user that the water reservoir is full.
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Name</th>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>1</td>
<td>Housing Structure</td>
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<td>Relay Module</td>
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<td>Water Flow Tubing</td>
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<td>Submersible Water Pump</td>
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<td>6.3 QT</td>
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<td>Wires/Jumpers</td>
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**Estimated Total** 530.36
Possible Extensions

If the “Garden Gnome” project is granted the CSUB Student Research Scholars Program, we can expand our project by:

- controlling more plants or ideally an entire garden of various types of plants
- including a more sophisticated system that would specify each plant’s needs without the use of programming
- potential Bluetooth capability for local operation control
- using a cloud-based system for user control anywhere there is an internet connection
- allowing the user to control multiple facilities at one time
Acknowledgments

• Special thanks Professor Mostafa Abdelrehim for guiding our group through our project and providing insightful ideas to this build.

• Special thanks to Cal-State Bakersfield and their incredible staff and faculty for giving us the resources to achieve our goals.

• Special thanks to Best Cabinets for building our Garden Gnome Kit housing.