PILOTING A PRECISION LANDSCAPE IRRIGATION ADVISORY SYSTEM - NETZERO

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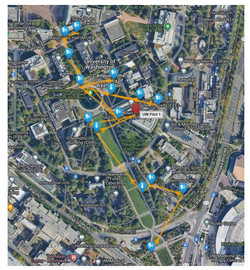
The Problems

- Billions of gallons of water are used to irrigate aesthetic high-value landscapes
- Satellite-only irrigation advisory systems (NASA JPL/SAWSE) not precise enough to advise high-value landscapes

A Solution

- Augment the satellite-only advisory systems, with network of local soil moisture, relative humidity, and ambient temperature measurements
- Local sensors improve accuracy and add additional metrics (local temperature and humidity)

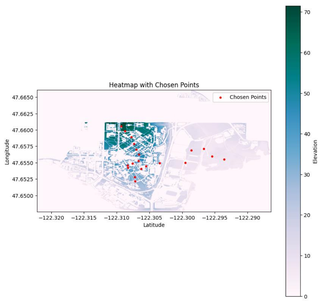


Sensor Features

- Developed by OnsetComp
- Measure a variety of parameters (soil moisture, relative humidity, temperature, etc.)
- Operate as networks transmitting data through each other and back to a centralized hub
- The hub connects to a central database through cel networks
- Operates under the sub-gigahertz range to reduce energy consumption
- Solar-powered
- Operate for up to 10 years with minimal intervention

Sensor Placement Automation

- Variety of variables impact maximize connectivity and quality of data
- reduce error associated with random and arbitrary placement
- Reconstruction based on the elevation and location of obstacles within a desired area.
- does not determine locations with 100% accuracy
- Site visits needed to determine final location

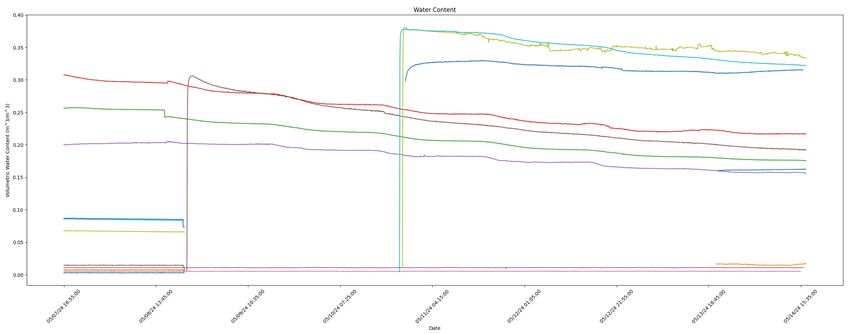


Sensor Deployment Pilot

- 55-acre test area of the University of Washington, Seattle Campus
- Coordinated with many stakeholders to determine sensors' placement and mounting
- Complete all necessary training to use ladders, shovels, and excavation and return of soil with minimal disruption
- Developed protocol guidebook for final location of sensors and methods of placement and mounting of sensors
- minimal disruptions to existing landscapes
- many hours carefully deploying sensors and testing connectivity

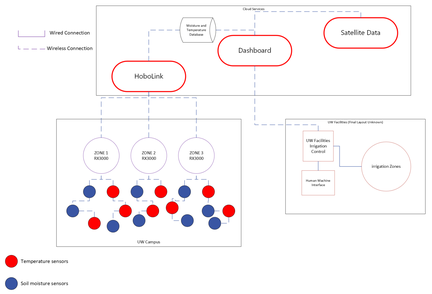
Sensor Data

- Sensor collects data for soil moisture, soil temperature, relative humidity, and ambient temperature
- calculate irrigation needs in conjunction with the satellite system
- Local sensors verify and calibrate satellite data



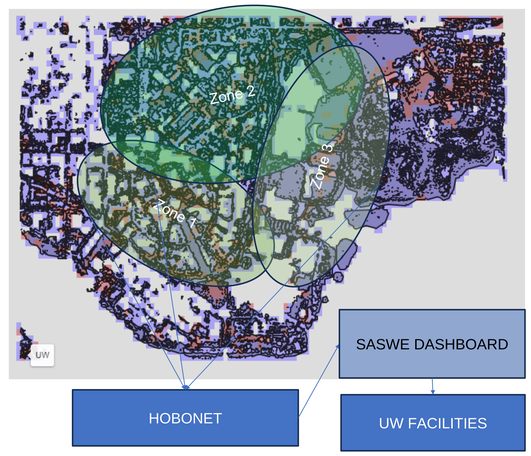
System Layout

- 3 main components: physical sensors, online database, online dashboard
- Data collected by local sensor network and JPL satellite system
- SASWE dashboard calculates irrigation needs for desired locations
- UW Facilities tailor irrigations to optimal levels with dashboard



Final System Planning

- Final deployment will utilize multi-sensor zones to collect data
- The final system will be scalable to any desired landscape with a cell signal



Final Dashboard

- Developed by Shahzaib Khan of the SASWE Group
- Takes satellite and local sensor data to visualize irrigation needs
- Will provide UW facilities with method of verifying and monitoring irrigation demand per week

Future Work, References, and Acknowledgments

- Integration of automated sensor placement into the satellite dashboard
- Utilizing Machine Learning to automatically place sensor locations through constraints and number of sensors
- Whole Campus deployment of sensor system.

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Undergraduate Students: Nathan Holterhoff, Andrew Line, Vincent Kwok

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