Smart Sprinkler System

Abstract

Hunter Head sprinklers are a common necessity in residential and commercial irrigation systems throughout the country. Even with their widespread use however, little has been done to build on the traditional mechanical design using modern electronics and embedded systems.
This project documents the design process, electronic system layout, and the first complete prototype for the Smart Sprinkler electronic range adjusting and wirelessly controlled hunter head sprinkler.

Purpose

- Conserve water by adjusting radius to match arbitrary lawn contours.
- Simplify system control through wireless communication and eventual smart phone integration.

Objectives

- Design a sprinkler that can adjust to only spray over the area of the lawn.
- Design a sprinkler that can communicate with a Base Station via wireless connection.
- Design a Graphical User Interface that will allow a user to set the area that the sprinkler will spray over.
- Create a device that will be low cost, low maintenance, and high durability.

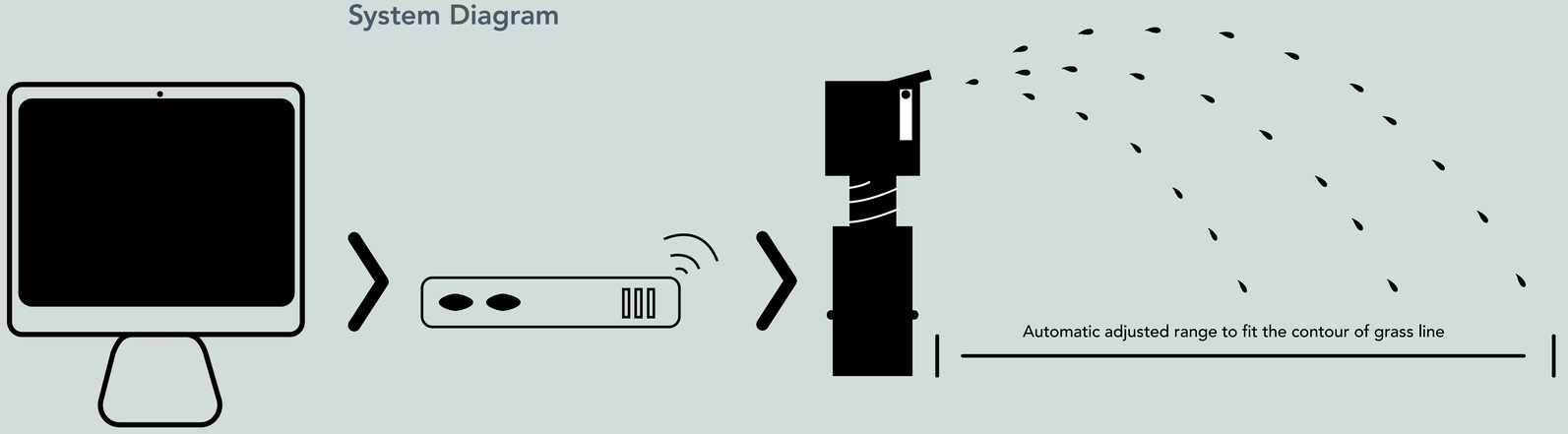
Design

Design Graphical User Interface: Gives the user an easy way to program the area that the sprinkler will spray over. It also provides timing options for when the sprinkler will turn on and off.

Base Station: Receives the information from the Graphical User Interface and sends all calibration information to the Smart Sprinkler. Uses the timing information to tell the sprinkler to either turn on or off.

Smart Sprinkler: A sprinkler designed to water lawns. Stores information about the lawn so that it will only spray over the area of the lawn.

System Diagram



Graphical User Interface

Allows the user to easily program the sprinkler by using a computer. The user can set the area that the sprinkler will cover as well as when the sprinkler will turn on or off.

Base Station Networking and Communication

Responsible for keeping track of time as well as sending all information to the sprinkler. This information includes the area that it will spray as well as when to turn on or off.

Head Networking and Communication

Receives all information from the Base Station and performs the task that needs to be done.

Lookup Table Generation and Network Receiver Converter

Stores the necessary information into a Lookup Table about the area that the sprinkler will spray over. This information can then be accessed by the control system.

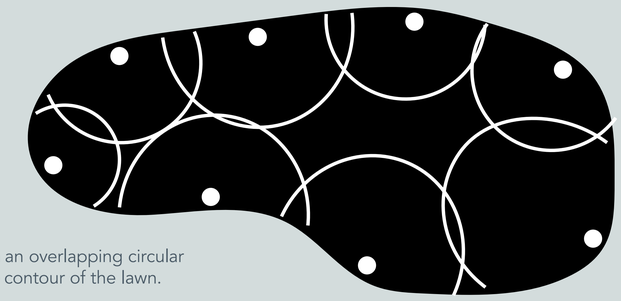
Control System

Adjusts the sprinkler motors so that it sprays over the correct area that has been defined within the Lookup Table.

Mechanical System

Designs a sprinkler that will be able to spray water as well as be able to house all of the electrical gear that is required.

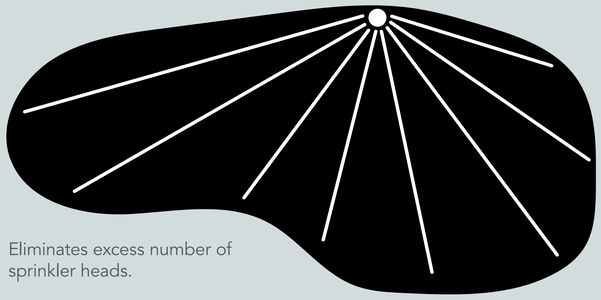
Current Sprinkler Systems



Use multiple heads in an overlapping circular pattern to imitate the contour of the lawn.

Contours and sharp corners can lead to overspray or missed spots on the lawn.

Smart Sprinkler System



Eliminates excess number of sprinkler heads.

Overspray and missed areas are eliminated due to the Smart Sprinkler head's ability to adjust its range automatically.

Benefits

- Streamlining irrigation control systems.
- Contour of the sprinkler can be set to the exact contour of the yard.
- Fixes the problem of overspray and overlap of water.
- Reduces water waste and lowers water bill.
- Minimizes sprinkler heads needed.
- Automatically change range and turn off individual sprinkler heads via wireless connection.

Conclusion

It is becoming increasingly popular for companies to create "smart" devices focused on the residential market that provide home owners with more functionality and control over their homes. A few examples include: smart phone controlled thermostats, lighting systems, and appliances. The Smart Sprinkler project team has worked towards another "smart" device that will give the user better control over irrigation. The resulting prototype is able to be accessed remotely through WiFi as well as save water due to its contour matching ability.

Future Work

- Multiple Sprinkler Communication and Programming
- Sprinkler programming accessible across the internet
- Graphical User Interface accessible across many platforms (i.e. Desktop, Smartphone)
- Power Generation for motors (i.e. water turbine, solar)
- Licensing with a corporation that has satellite imagery software (i.e. Google Earth)

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