CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

J0917

Project Title

Water Saver: Moisture Detection for Sprinkler Control

Abstract

Objectives/Goals

Most California households use simple sprinkler controllers to help water their lawns and trees. These controllers use timers for fixed duration watering and often perform watering even after there has been rainfall. The project objective was to design a circuit that could use moisture sensing to prevent sprinkler operation when the soil was moist. The circuit should be able to work with the simple sprinkler controllers present in most homes. There are sensors on the market that can detect soil moisture, but they are expensive and often require specialized controllers, which are also expensive. The project goal was to design a circuit that would work with cheap sprinkler controllers that are in most houses.

Methods/Materials

Two metal electrodes were inserted in the soil and a digital multimeter was used to make measurements of soil resistance as a function of amount of rainfall. Measured amounts of water were poured over the ground to simulate rainwater. These measurements showed that soil resistance decreased with increasing rainfall. The variable resistance between the electrodes was used as an input to a digital logic circuit containing a NAND gate. The circuit was designed so that the NAND gate would provide an output signal that could be used to turn power to the sprinkler controller on or off based on the moisture content in the soil. A relay connected to the output of the NAND gate allows it to deliver or disconnect power to the sprinkler controller. Materials used to build the circuit include batteries, a circuit board, a relay and a NAND gate

Results

The circuit is able to detect moisture in the soil and use the relay to turn power to the sprinkler on or off To reduce risk, the relay output is used to turn a LED on and off rather than an actual sprinkler controller operating at 120V.

Conclusions/Discussion

Change in soil resistance due to addition of moisture causes the circuit to deliver or disconnect power to a sprinkler controller. This provides water savings by avoiding lawn watering after there has been rainfall. The circuit costs less than a tenth of the electronic moisture sensors available on the market and avoids the need for expensive sprinkler controllers that can be connected to a moisture sensor.

Summary Statement

My project is about designing and constructing an electronic system that can sense moisture content in the soil and automatically prevent sprinklers from operating when the soil is moist.

Help Received

My dad who is an engineering professor helped guide my studies of electronic circuitry.