Less Water – More Food?: Real-Time Three-Dimensional Imaging of Soil Moisture Distribution for Intelligent Irrigation

Tremsin, Vasily

Hunger, one of the most prominent problems in the world today, is primarily caused by a shortage of fresh water. Significant optimization of water use can be achieved by knowing the time and amount of watering, as well as the specific location of soil that requires irrigation. However, most existing techniques of soil moisture measurement can only provide results at one point in the soil, require frequent calibration, and remain very costly. I created a novel system capable of real time assessment of soil moisture content, which consists of a self-sustained data acquisition device, three-dimensional data analysis algorithm, and real time visualization. The system is very low cost compared to analogous instruments (can be under 15 dollars), is capable of wireless data transmission, is solar-powered, features one-button calibration, provides accurate time and location from the GPS signal, and can store historical data over long periods of time. It is based on using simultaneous measurements of resistance between two arrays of electrodes (up to 48 electrodes). After the data is digitized, coupled with GPS information and stored on a local SD card, it is sent via a wireless connection. An algorithm uses resistance values to construct a three-dimensional image of relative soil moisture content, which is visualized in real-time. By significantly increasing the efficiency of agricultural irrigation, this unique system can help to preserve precious freshwater resources and potentially alleviate the problem of hunger all around the world.

Awards Won:
Arizona State University: Arizona State University Intel ISEF Scholarship