Soil Moisture Sensing Robot: A Novel Agricultural Device

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With less farming space and water available globally, it is important to optimize the growth of crops in available farmland. Agricultural production, including the quality and quantity of produce, is highly dependent on soil moisture. If soil moisture is not accurately measured, wasted water, seeds, money, and space can lead to crop failure. Current methods to check moisture include inaccurate qualitative observations, inconvenient hand-held sensors, and expensive wireless systems not affordable by most. To make a cost efficient, accessible, and convenient device to maximize crop production for all farmers, a robot equipped with an Arduino powered soil moisture sensor was prototyped. The materials were selected for durability and cost efficiency. The Arduino components (servo motor, soil sensor) were programmed using C/C++ commands in the Arduino IDE. This radio-controlled robot can be driven to various locations, where a servo motor powered 3D printed arm can insert the moisture sensor into soil. The readings collected were logged through the program TeraTerm and imported into a color-coded spreadsheet, where users can easily see if plants are under or over-watered. The robot measured moisture levels of 3 soil samples (under-watered, normal, and over-watered) to test for all aspects of the engineering goals; all goals were successfully met. This easily maneuverable robot is also cost efficient ($869.80) compared to other products, making it readily accessible to farmers, agriculturists, gardeners, etc. This robot, with further improvement, has the potential to maximize agricultural production in many settings.