Agrobotics: An Autonomous Arduino Uno/Due Computer Vision Based Raspberry Pi High Throughput Plant Phenotyping Precision Agriculture Robot Using Dual Linear Mechanisms

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There are millions of people in foreign regions that are suffering from famine while the U.S. contains over 40% of food waste. Atop of this, there is an anticipated burgeoning population that will reach around 9 billion people by the year 2050, and the current food production pace will be insufficient in satisfying their needs. As a new approach to this issue, this project was centered on a versatile prototype that can operate in three different ways --autonomously, with a joystick, or through a developed mobile app-- to maneuver around the field and perform agriculture tasks. This prototype was constructed with a flexible chassis and smart sensors to avoid obstacles and accommodate for harsh terrain. Equipped on the chassis are two linear motion devices that were designed to sow seeds in a faster and productive manner. Additionally, this prototype has the capability to optimize food quality through the implementation of High Throughput Plant Phenotyping, a form of precision agriculture that utilizes a combination of genetics and robotics, through the use of Raspberry Pi, a low-cost microcontroller and camera, alongside PlantCV. After the completion of the prototype, it underwent a testing process that consisted of 250 trials in two different environments: a greenhouse and a field. Data collection visually demonstrated that there were no breaks in continuity and provided evidence that the prototype's functionality was consistent and precise. Therefore, this prototype has the potential to advance food production, reduce food waste, and regulate the welfare of crops.

Awards Won:

Second Award of $1,500