Field Yield Revealed: Creating a Radar-Based System for Pre-Harvest Potato Yield Mapping

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Potatoes require heavy watering and intensive fertilization in order to grow, which negatively impacts the environment. A system designed to mitigate these environmental impacts and improve farming efficiency would be beneficial for farmers. Precision agriculture techniques accomplish this by documenting and controlling spatial variability across and within fields. One key precision agriculture technique is yield mapping. Mapping yields throughout a field allows farmers to determine how various factors like water and fertilizer usage influence farming efficiency. Current methods of yield mapping potatoes occur during harvest and are not sufficiently accurate. To fix current yield mapping problems, we built a phenocart, a robot that determines the size of underground potatoes, out of steel tubing and used a radar system to allow for non-invasive, pre-harvest yield estimation of potatoes. In conjunction with a positioning system, this phenocart could allow farmers to forecast their yield earlier, more easily, and more accurately, increasing the yield and cost-efficiency of potato farming. Preliminary testing showed that this phenocart was able to detect underground potatoes and drive straight. Further testing showed that by using machine learning, the phenocart was able to determine whether or not an object was a potato with an accuracy of 93.11%. It was also able to predict the masses of the potatoes with an R^2 value of 0.4390. This work lays the foundation for a more accurate potato yield mapping system and has the potential to help farmers save money and reduce the environmental impacts of potato farming.

Awards Won: