There are currently no fruit picking robots on the market that pick individual, tree grown fruit. During the harvesting season, orchards can require about seven times the amount of workers than they need during the rest of the year. This is incredibly costly, and there aren’t always enough workers to fill the required positions.

Over the past few years, interest in automated farming has been growing. Machines have been created to aid workers, such as autonomous tree sprayers and crop storage bins, but none have been created to help pick fruit.

Our goal is to design and build a robotic arm that is able to recognize, reach and pick apples without causing damage to the tree or the fruit.

Our Mission

Deliver Fruit
Pick Fruit

Our Specifications

Our Mission

Identify Fruit

Vision System

Manipulator

Fruit Receptacle

Plan Picking Motion

Set motor speeds and gripper compliance

A major concern of orchard owners was apple bruising. In order to address this concern a stereo camera is used to accurately identify apples, and force sensors were placed in the fingers to prevent harmful handling.

Identify Fruit

Set motor speeds and gripper compliance

Plan Picking Motion

The parameters to the left show the requirements we used to design the arm, such as the required torque at each joint. The average weight of an apple is about 150g, which was doubled to help ensure the arm’s capability of lifting the apple.

The link: The night before our final demonstration the base linkage snapped in half. We replaced it with a better, stronger, aluminum linkage.

The motors: At first, the voltage wasn’t high enough for the motors to provide sufficient torque. Later, one motor broke itself (a known issue with this model) and took out our major base motor—meaning the entire arm fell.

The control: Due to inaccuracies in the arm control and calculated coordinates, getting the manipulator around an apple was very challenging.

Results

After having two new motors rush-delivered, we were able to get the robot back up and running, now stronger than ever before. We were able to successfully simulate picking multiple apples and gently deposit them in the fruit receptacle. We were easily able to reach our goal of successfully picking three apples within a five minute period!

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