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Bunny Bot V2.0

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Introduction

Robotics is an area of engineering that is driven by extensive research and development. Robots are very effective at accomplishing specific tasks they are programmed to execute.

A Turtlebot platform is being used for a robotics and computer vision research project at Boise State University. Turtlebot is an open-source robotics platform controlled by the Robotic Operating System framework. Bunny Bot V2.0 is a community outreach event that will participate in the annual Boise State Easter Egg Hunt.

Objectives

- Develop more effective method for detection of eggs
- Improve the mechanism for egg collection
- Improve the navigation of the Bunny Bot V2.0
- Complete all objectives for the Easter Egg hunt on the blue turf (April 15,2017)

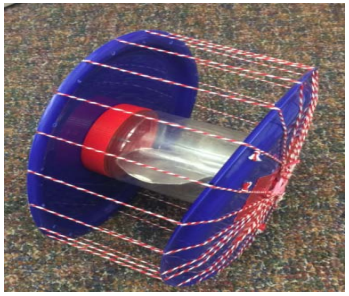
Methods

Project Components

To accomplish the task of finding and retrieving an egg, several different aspects of design were incorporated into the project:

- A mechanical gatherer that allows the Turtlebot to collect eggs while in motion
- Turtlebot's vision hardware to identify and locate eggs on the blue turf.
- Navigate to and pick up the egg. Then return to a home location

To create a mechanical gatherer, the team used 3D printing. The final version of mechanical gatherer was achieved after performing various test.

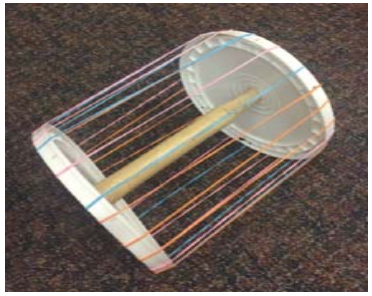


Model 1
Utilized thread

Model 3
Made with 3D printing

Egg Detection and Retrieval

For the Turtlebot to identify what is an egg and what is not an egg, the vision capabilities of the Kinect senor were integrated with OpenCV. Simple Blob Detection, image thresholding and filtering were all used by the Turtlebot to identify the egg. The final aspect was navigation. In order for the Turtlebot to return to its original location, it needed to know where it started and where it currently was at any given time. This meant the robot could locate an egg and return it to the predetermined "Home" location.



Model 2
Utilized rubber bands

After multiple tests for the mechanical grabber, model 3 was chosen as the mechanical grabber for the Bunny Bot 2.0

Testing Criteria

- Model 3 collects the most eggs
- Model 3 allows the Bunny Bot V2.0 to turn easily

Results

- Bunny Bot V2.0 can successfully detect eggs within one and half meter
- Bunny Bot V2.0 can gather the eggs using the mechanical grabber
- Mechanical grabber has been designed to be more efficient
- The turn angle pf the Bunny Bot V2.0 has been calibrated to turn accurately on the blue turf

Model 3
Attached to the Turtlebot

Visual of Egg Detector
The red circle indicated that the object has been detected

Future Work

- Improve the navigation and variable distance from the Bunny Bot
- Include a child detection feature
- Bunny Bot will retrieve eggs in a methodical process dependent on the egg's distance from the robot
- Design programming for Bunny Bot to handle various terrains (carpet, grass, blue turf)