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Project in Artificial Intelligence - 5 ETCS

Trashy: The Intelligent Trashcan Robot

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Motivation

Humans consumption is still high[1], which leads to more trash getting thrown out. Even though there have been focus on setting up more trashcans there are still trash in the nature, streets and in-door environments, which then has to be cleaned manually.

We would like to make a prototype platform for a smart trashcan robot, based on a mobile robot. Mobile robots have become more common in commercial and industrial environments, and the idea of a mobile robot driving around has become a reality. The mobile robot platform should be able to intelligently recognize and localize a human voice, in order to drive from its starting position to the human. The human can then throw out the trash, and afterwards the robot will return to its base.

Project Description

The mobile robot must be able to detect if a person wants to interact with it, i.e. throw out trash. After the mobile robot has detected that a person wants to throw out trash, it must located that person roughly and drive towards it. Furthermore, when driving toward the person, the mobile robot shall avoid static obstacles and drive around them in a smoothly manner. Finally, the trash must be put in the correct bin.

The project can be split into four parts: Locating goal with sound, verifying the goal with vision, obstacle avoidance when navigating to the goal and back to the base, and sorting the trash into the correct bin.

The localization of the goal with sound is used when the robot is at its base position and cannot see the human. This is meant as a roughly localization method, and will be implemented with machine learning. When the robot drives towards the human it uses

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[1] https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials

artificial intelligence to learn to drive smoothly in an unknown environment, through the use of online machine learning. Moreover, the camera is used to verify the human location, and still avoid obstacles on its path. For detection and localization of the human with vision, deep learning methods will be investigated and implemented. When the robot is at the human the correct bin must be opened based on the trash, through the word of the human. An existing library, like Google Assistance or Amazon Alexa, will be used to recognize words. Lastly, the robot must be able to drive smoothly back to its base location.

The robots navigation will first be implemented and tested in a simulator before tested in the real environment. The simulation environment will be a simple environment, with simple static obstacles and predefined start and goal points. The test of human recognition, human localization as well as open the correct trashcan lid will be tested in the real world. The opening of a correct trashcan lid is simulated by turning on a colored led corresponding to the correct lid. The product must only be able to localize one human.

Timetable

Project in Artificial Intelligence - Ghantt chart

Start date: 21/09/2020

	Mathias	Mikkel	Mathias and Mikkel

39	40	41	42	43	44	45	46	47	48	49	50	51	52	53

Implmentation of simulation enviroment

Research sound localizetion methods, and test in simulation.

Research locating human and obstacle detection with vision, and test in simulation

Research smooth navigation via AI

Test smooth navigation in simulation

Test of sound localization

Test of vision localizetion

Test of obstacle avoidance

Test of open correct bin

Test of whole product

Write report and buffer