Anti-Anti-Masker

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Abstract
Anti-Anti-Masker is a drone that will roam in city crowded areas and search for people who are not wearing masks and breaking covid protocols. This project can have many other applications, such as security and surveillance. We will be using CAD tools to design the drone and then generate its URDF. We will be using ROS to design the robot's environment and physics and simulate the robot. This drone will have a camera that will have a face recognition system to detect faces without a mask. This project aims to model and simulate a drone and design an AI face recognition algorithm that can be implemented in the UAV. The simulation can be done on ROS and for face recognition, OpenCV MTCNN can be used. This project will be an inter-sig project.

Literature Survey
Drones are extremely versatile and robust robots. They can easily access remote locations and can be used for surveillance and pick-and-drop operations. In surveillance applications, a typical situation is that a fleet of drones, carrying some specific sensors such as ground-facing cameras, monitors some ground objects for surveillance. The cameras can see a disc on the ground, and the altitude of the drone, as well as the visibility angle, have significant impacts on this visible region. In this kind of application, a significant technical problem is to deploy the minimum number of drones to cover a given area of the ground completely. This important problem attracts both researchers and industry practitioners since this number is closely related to the system's total cost(Asymptotically Optimal Deployment of Drones for Surveillance and Monitoring).
Target detection and UAVs cooperation have been studied by many different viewpoints. Reviewing the corresponding scientific literature, one could divide the research contributions into two main groups. The former includes papers that are related to the computation of an optimal trajectory, along which a number of tasks must be carried out; the latter includes works where UAVs are used to maximize the coverage of either an area or specific targets. (https://doi.org/10.1007/s11590-015-0932-1)
Vitarana drone repository, which was used during e-YRC 2021 will serve as a template for the robot model and changes will be made as per the requirements of the project.
MTCNN computer vision model will be used for image recognition with changes made for recognizing unmasked faces.

Objectives
- To design a 3D CAD model for a drone
- To simulate a drone with an autonomous navigation system
- To implement face object recognition in real-time.

Scope
- We plan to develop a complete open-source software framework for a drone that can be utilized in the future by anyone.
- These ROS packages can be utilized to create a hardware model of the drone and apply navigation.

Timeframe

Approx time of review	Expected Status
Phase One (Oct end)	Give juniors a view of drone dynamics for the modelling and simulation of drones along with some basic software packages in ROS to provide an idea of coding and developing ROS packages.
Phase Two (Nov mid)	Start working on the CAD model of the drone for URDF generation and exporting to ROS. Juniors will be given an overview of CAD modelling software like Fusion360 and the basics of working with URDF in ROS. Plugins to facilitate the movement of the drone in ROS will also be written in C++
Phase Three (Jan mid)	The juniors will model a face object recognition algorithm with MTCNN using OpenCV. Alternatively, juniors can also make a model using TensorFlow CNN.
Phase Four (Feb mid)	OpenCV model will be integrated with the drone in the Gazebo environment using either stereo or depth camera plugins in ROS, and the navigation stack will be integrated with the help of appropriate range sensors.
Phase Five (Mar mid)	Putting everything together to make sure everything works in a random Gazebo world without any major errors.

Project Budget

None, if the college remains online. This project will be completely simulation-based.

References

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3) Casado, R., & Bermúdez, A. (2020). A Simulation Framework for Developing Autonomous Drone Navigation Systems. Electronics, 10, 7.
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5) https://github.com/ipazc/mtcnn