ENPM808X Mid-Term Proposal

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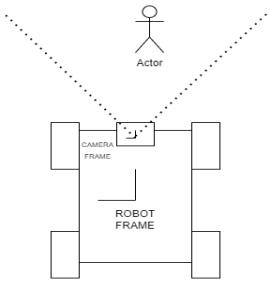
Introduction

ACME Robotics is planning to build an autonomous robot that can maneuver through a field. The robot has to detect humans as obstacles and make informative decisions to travel through the area without collision. This project's scope is to develop software for detecting humans and tracking them to integrate with the robot. The input stream of images will be using a monocular camera.



Implementation

The module will be integrated into the robot in such a way that it can provide the relative position of the human obstacle with respect to the robot's frame of reference. The camera is mounted to the front of the robot.

Development Process

We will be following the **Agile Iterative Process** along with **Test Driven Development**.
The team will work in weekly iterations and keep a track of the backlog in a backlog chart. The commits at the end of the day will be built overnight proceeded by a daily meeting to discuss the impediments, reflect on the previous build and decide future deadlines. We will be using Git Version Control to keep a track of the progress. The unit test will be created to check the functionality of the code. We will be using best practices from TDD to minimize the errors and best coding and documentation to provide documentation.

Resources

Algorithm YOLO OpenSource
Libraries OpenCV OpenSource
Programming Language C++
Build System Cmake

1 Algorithm

YOLO algorithm works by dividing the image into N number of grids and for each grid value, we have anchor boxes for detecting and localizing different objects in a single grid. Unlike most of the detectors, YOLO does not produce region proposals but comes up with a number of bounding boxes that can be later suppressed through a non-max suppression and using IOU thresholding. The probabilities for a particular class is included in the predictions along with the bounding boxes. This makes the detection fast and accurate as there is only a single stage involved in the process. There are different versions of this algorithm but for the project, we will be using the most basic one in order to detect the objects. Some more recent versions use a number of techniques for the same improving the accuracy as well as the inferencing speed but the underlying principle for it remains the same.

Risks and Mitigation

Risks

- Poor Quality video.
- Modeling Biases
- Ambient Light
- Incompatible processing and frame speed

Mitigation

- Get proper video quality
- Check for compatible processing
- Have a light setup to illuminate the area under observation
- Get a bigger data set.

Deliverable

We will provide a program that can provide the coordinates of a human obstacle with respect to a robot frame. These coordinates will be based on few assumption defined in the proposal and should be considered as estimates. Precise outcomes can be obtained by changing these assumptions to actual real time parameters.