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ACME Robotics Proposal - Perception

Overview

Technology

Our design uses monocular camera to detect humans and get their positions in the robot's reference frame. The module is developed in such a way that it detects humans ($N \geq 1$) and then creates bounding box around it. The distance of human is calculated from the pixel values of the bounding boxes.

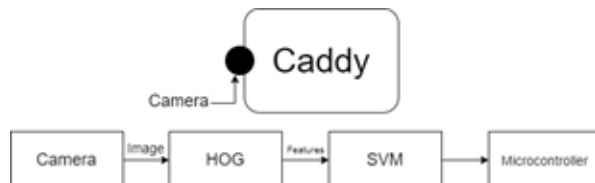
Process

The process to be followed will be based on an **AIP** mindset which uses **Scrum** as its framework. As with most AIP strategies, our implementation will take place in two sprints of one week each. The **total iteration capacity** for each sprint is $4 \times 7 \times 2 = 56$ hours/week.

Algorithm

The HOG descriptors convert image into a feature vector. The input image ($64 \times 128 \times 3$) is converted to a 3780-length vector. The SVM classifier is trained by fitting appropriate parameters to train whether image has human or not. Once it is trained, a sliding window is created of size 64×128 which creates different image patches each of length 3780 feature vector. The SVM is used on each of the feature vector to get whether human is found in that image or not. If it is found, then we store the coordinates to create the bounding boxes. In-order to solve the problem of multiple bounding boxes, we can use a non max suppression to remove overlapping boxes.

Basic block diagram



Cost Parity

Our product costs less computational power as opposed to its competitors like CNN and will provide a fairly accurate prediction. Our product will also make use of a monocular camera as opposed to the other expensive sensors in the market, for example, Depth Camera. Because of this, our product will work on the most basic of microprocessors and will eventually save costs and energy. This will prove to be vital, especially during the rush hours or busy days.

Schedule

10/06 - ACME Proposal
10/07 - Implementation using mock product backlog
10/07 - Sprint Meetings and Iterative backlog
10/14 - First Sprint review meeting and new backlog
10/15 - Second sprint based on new product log
10/16 - Rigorous testing setup using first implementation as reference for stub
10/16 - Adding regressive testing suite
10/18 - Code Inspection
10/23 - Final implementation due
10/24 - Testing and maintenance

Deliverables

- A module that is able to detect humans in front of the caddy.
- The module is able to determine the distance between the caddy and the human