

# ILR 07

2/16/2017

Karthik Ramachandran

Team: Sumit Saxena, Juncheng Zhang, Xiaoyan Wang

Project : Autonomous System for Aerial Search and Rescue

# Individual Progress

This review cycle was mostly spent on validating voice activity detection with the microphone, evaluating various mechanisms for microphone mounting, and initial exploration for using Convolutional networks for rgb detection

## Voice activity detection on microphone

Previously, some preliminary results were obtained applying melody extraction based voice activity detection on sound samples obtained using an iphone. This week, the tascam microphone was used to validate the same hypothesis. One of the things being tested was, the ability of the microphone to cancel out background noise and retain sound coming from the front of the microphone. A simple experiment was done by placing a fan right behind the microphone and placing a sound source 5 feet in front of the microphone and analyzing the output. The sound from the source was very clear and the background noise was suppressed as expected. This can be seen in the video in Figure 1 below.

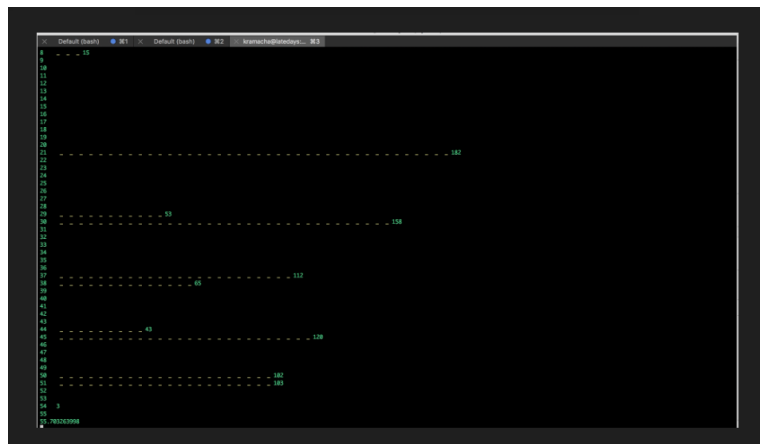


Figure 1 [Demo of VAD with microphone](#)

## Microphone mounting mechanisms

One other task that was taken up this week was to explore various mechanisms to mount the microphone. The initial design for using the microphone was to suspend it from the drone with a 10 feet cable. This was acceptable when the plan was to use the Matrice 600 drone from the sponsor. Since the gimbal on the sponsor's drone was controllable, the plan was to figure out a configuration that would ensure that the microphone doesn't come in the way of the cameras. But last week the decision was made to go with our own drone and camera. This makes it necessary to come up with a solution to the problem of the microphone blocking the camera view. Three options are being explored namely: 1. Have separate flights to capture

RGB/Thermal and sound data and have the microphone only when collecting sound data. 2. Come up with a way to fix the images by removing the microphone overlay on the images, 3. Explore winch mechanisms that could lower the microphone when needed and pull it back up. For the third mechanism, we explored a few options and are considering buying the 3Racing electric winch shown in Figure 2 below. While being cheap, it is also very light weight and might work for us.



Figure 2. 3Racing electric winch

## Convolutional Neural Networks for RGB

Some time was spent this week ramping up on convolutional neural networks and implementing a basic CNN for image classification. Implemented a CNN using tensor flow based on the standard Lenet architecture with 2 convolutional layers, 2 sampling layers and 2 fully connected layers. As a familiarization task, ran the CNN for a couple of classic image detection problems like handwriting detection and traffic sign detection. The plan this week is to train the CNN on aerial image datasets that we collected for detecting humans

## Team Progress

The team was finally able to secure NREC as the place for conducting tests and for the final SVE with help from Dr Dimi. The team also narrowed in on the Flir DUO-R thermal/RGB camera and the sponsor has agreed to buy it for us.

Juncheng continued exploring other options for thermal signature detection using Haar+Adaboost and other segmentation based techniques.

Xiaoyang explored using a Feed Forward Neural Network with Har features and concluded that the improvement in accuracy was not as much.

Sumit tried out a much larger neural network on tensor flow and compared it with a simple logistic classifier and found the results to be very similar. He plans to try out the neural network on much larger data sets.

# Challenges

For my individual tasks, the key challenge this week was to implement the convolutional neural network in a short time frame so that it can be run on our aerial dataset.

For the team, the key challenge was to narrow down on a site for doing our experiments and for the SVE and were finally successful in that endeavour.

# Goals for next ILR

Goal for next ILR is to finish the work on using Convolutional Neural Network for classifying aerial images. I also plan to start working on some changes needed to log the (timestamp, GPS) information from the flight system so that it can be used to map images collected by the sensor to specific locations in the flight.