Autonomous Aerial Assistance for Search and Rescue

Team F

Progress Review 7

February 1, 2017

Tasks

- Finalize plan for collection of data using NEA payload
- Initial experiments for signature detection on thermal images
- Initial evaluation of voice activity detection on sound samples
- Review human detection algorithms developed in the past, identify improvements and make modifications

Data collection plan

- Shared with the NEA Flight test team
- Has details about:
  - Flight areas and pattern
  - Locations of interest and human signatures at each of them
  - Flight scenario: ground speed, altitudes, route spacing, no. of passes
  - Google Earth snapshots

Explore Signature Detection On Thermal Images

Descriptor+Classifier

- HOG(Histogram of Oriented Gradient) or DPB(Deformable Part Based Model)+SVM
- Haar or LBP(Local Binary Pattern) + Adaboost(Cascaded Classifier)

Strategies to Improve Performance

- Background Subtraction
- Detection + Tracking

Experiments On Thermal Signature Detection

Methods

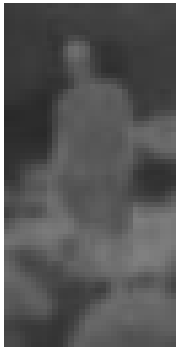
- Apply HOG+SVM on thermal images
- Create dataset through public thermal images benchmarks: OTCBVS Benchmark Dataset, Thermal Infrared Dataset

Results

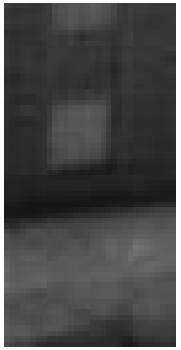
- Training Set: 4728 positive images, 5430 negative images
- Testing Set: 850 positive images, 1060 negative images
- Overall Accuracy: 89%
- Confusion Matrix:

```
confMat =

   922   138
    69   781
```

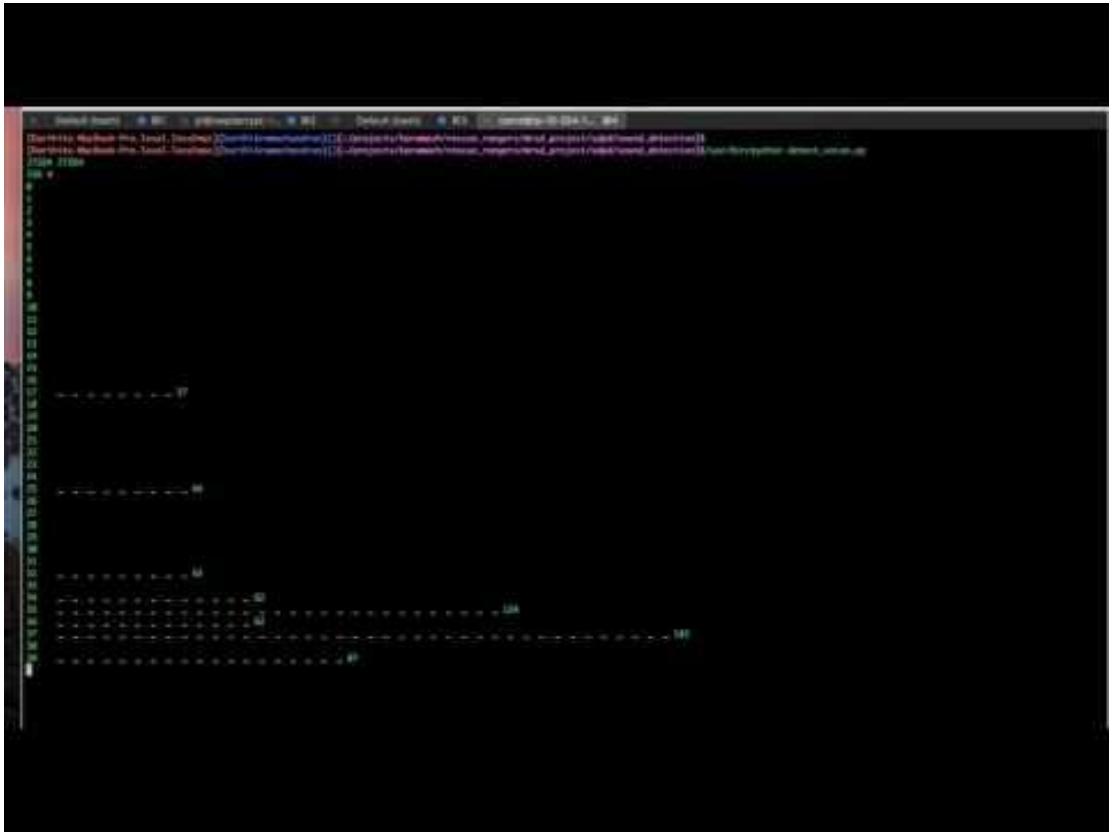


positive image(64x32)



negative image(64x32)

Sound signature detection



- Evaluating melody extraction technique for voice activity detection

- Possible improvements
  - Explore tuning parameters for eliminating false positives
  - Naive aggregation of melody strength along time

Review and Modification Human Detection algorithm on RGB images

Problem in previous human detection algorithm:

1. # of extracted features far more than trained images - outfitting problem
2. Many noisy pixels in one image

Improvement:

1. Downsample training and testing images
2. Enlarge training set
3. Decrease cell size of HOG extractor
4. Add image pre-processing
5. (Further improvement) F-Fold training strategy

Result: Accuracy: 84.04

	1	2
1	98	10
2	25	86

Accuracy: 86.30

1	2
96	12
18	93

Thanks!