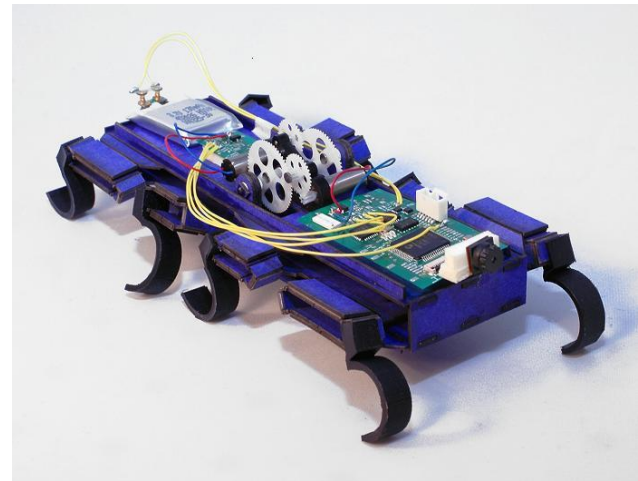


Visual and Thermal Person Recognition for OctoROaCH Platform

**C280: Computer Vision, Spring 2012
Austin Buchan and Ryan Julian**

Motivation

- Constrained robotic platform
- Search and rescue/surveillance tasks



Lateral Area 78cm²

Weight/Payload 45g/20g

Power 3.7V @ 300mAH

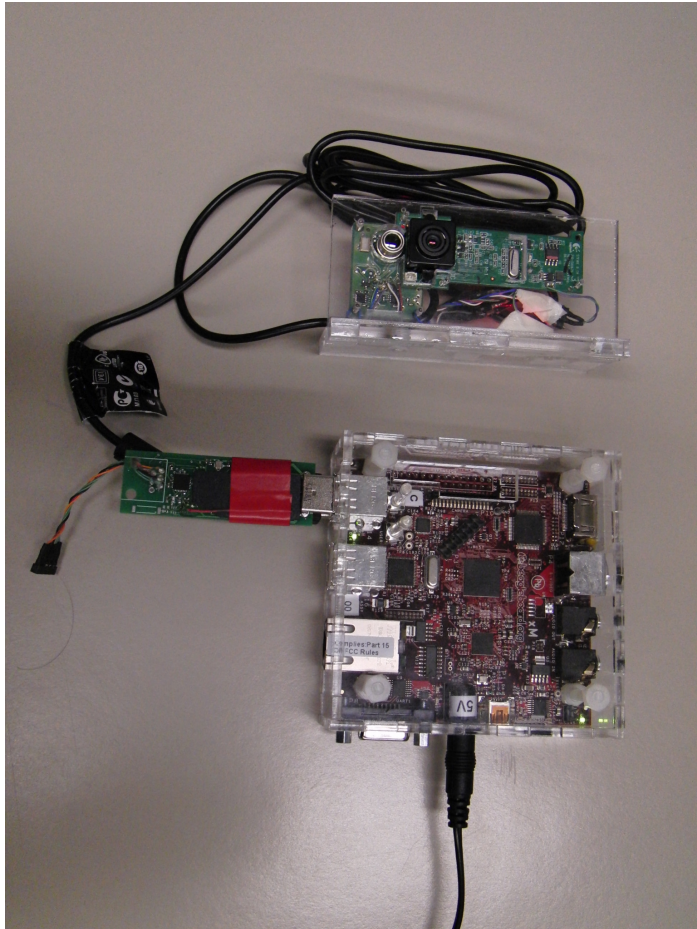
Computation 16bit, 40MHz, 30k RAM

Available I/O 16

Goals

- Real-time person recognition
- Complex environments
- Meet (slightly augmented) constraints of onboard computing for OctoROaCH platform
- Explore low-resolution thermal imaging

Prototype Hardware

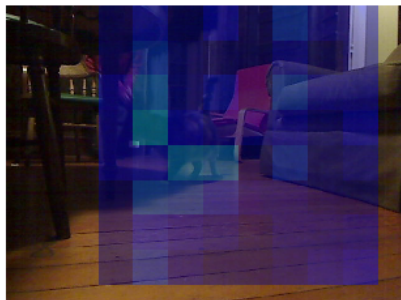
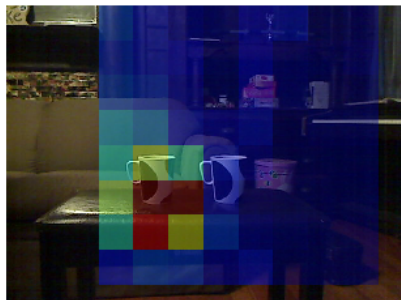
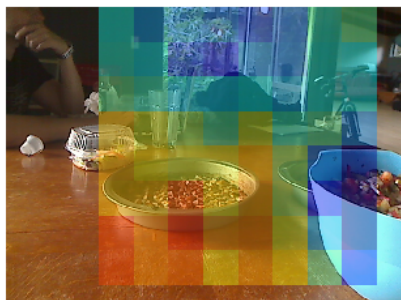
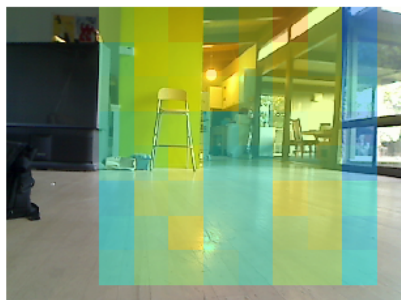
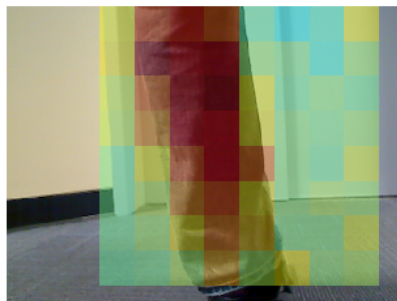
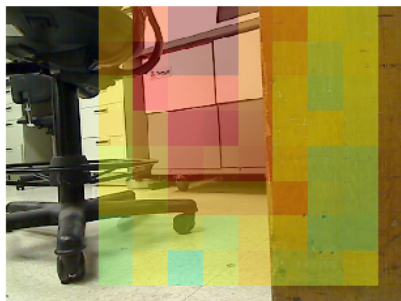


- Thermal Camera
 - 8x8 pixel
 - Absolute Temperature
 - 60Hz
- Webcam
 - 640x480 pixel
- BeagleBoard
 - ARM Cortex-A8 1GHz
 - C64x+ DSP core
 - 512MB RAM

High-fidelity OctoRoACH Perspective Simulator



Dataset

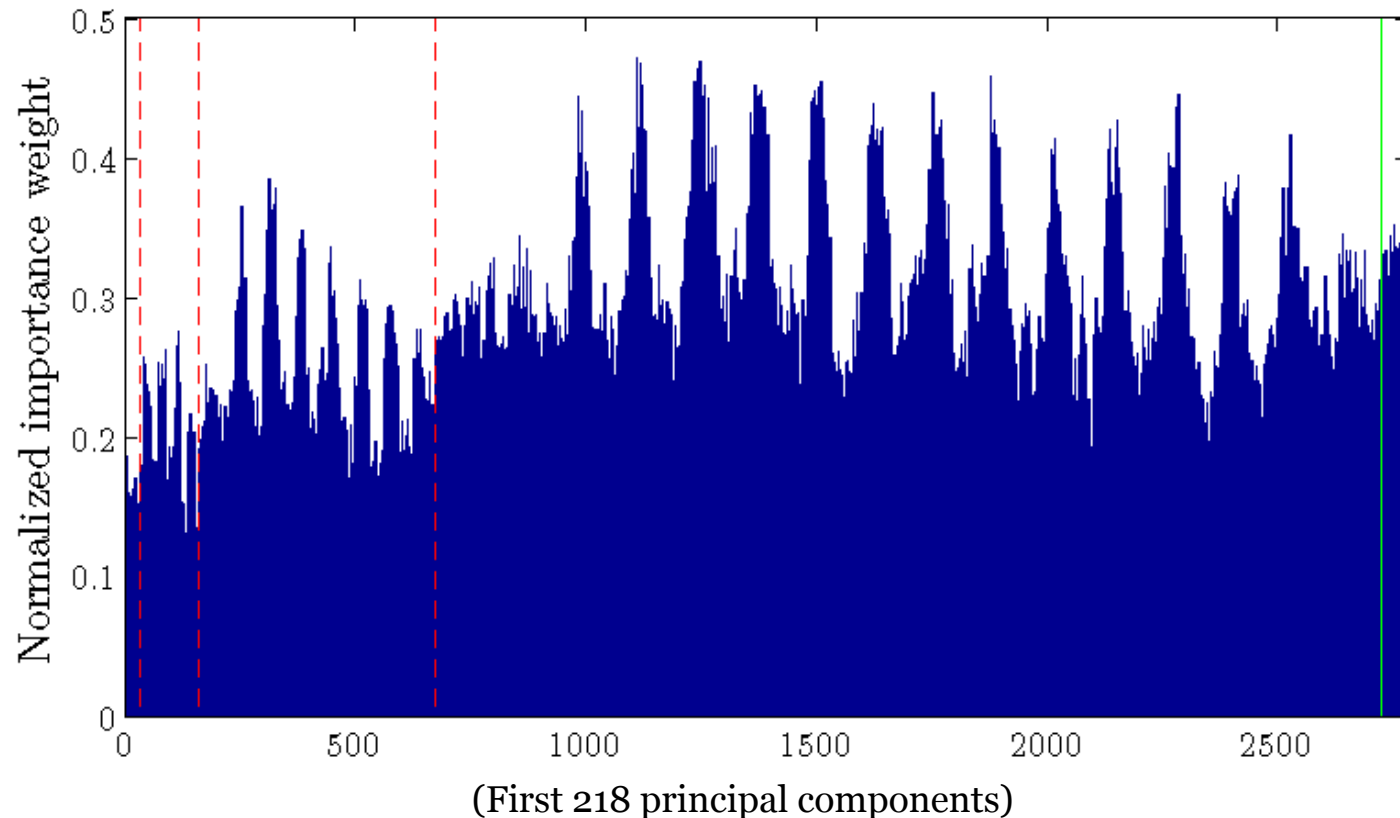


Feature Extraction, Classification

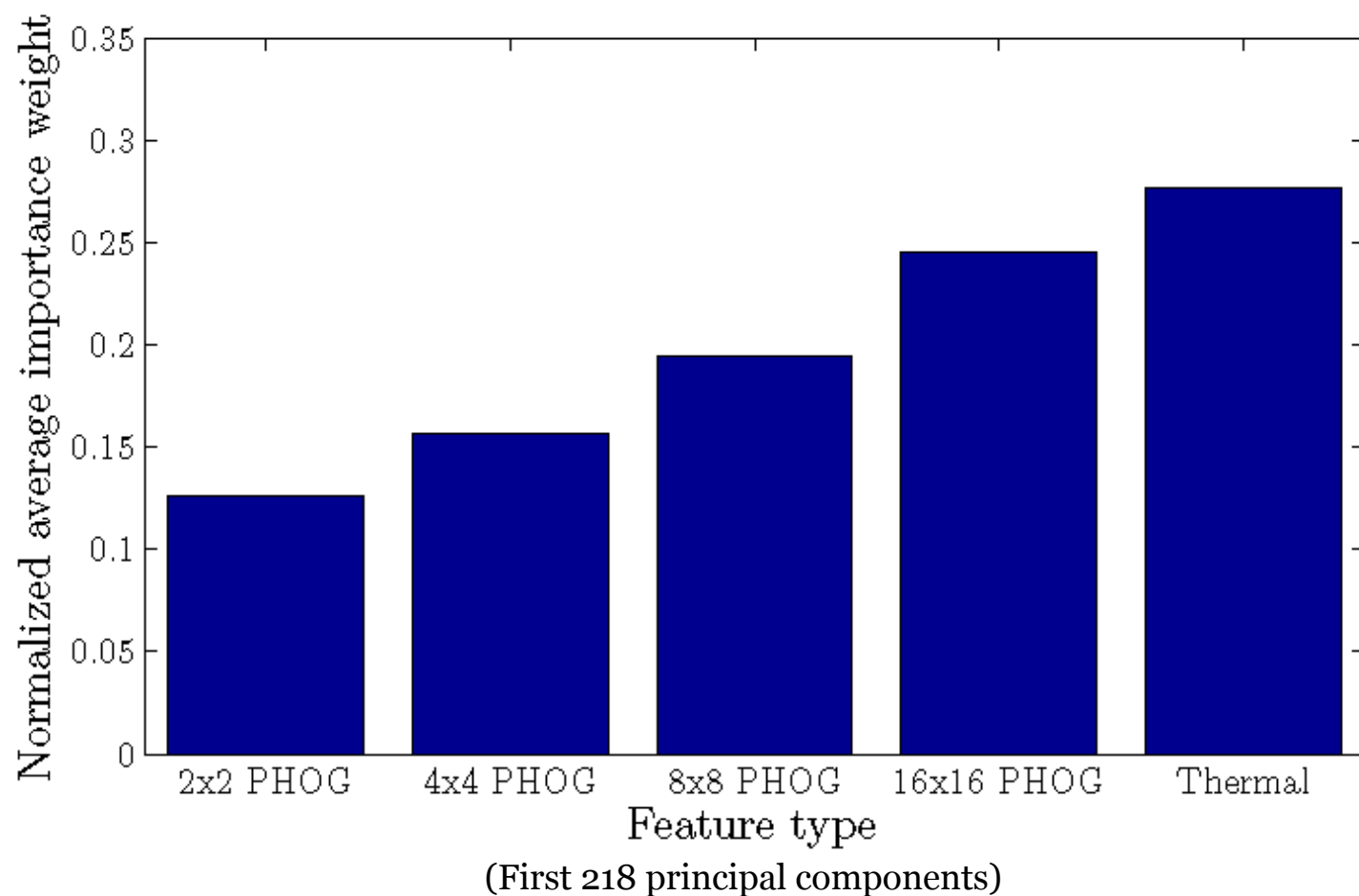
- Visual pHOG
 - Grayscale
 - Clip to 448x448 window
 - 2,4,8,16 subdivision
 - Magnitude weighted
 - Histogram normalized
- Thermal pixel values
 - Scaled to $[0,1]$ per frame
- Linear SVM
 - 10% Train, 90% Test
 - Soft Margin 1

Results

- 90% accuracy - All features
 - 78% Thermal Only



Grouped Importance



Future Work

- Error analysis
- More specific dataset
- Clever Filters
 - Ordered thermal regions
 - pHOG weighted by temperature
- Online classifier implementation