Human Detection “in the wild”

Research Objective

• Achieve robust human detection with minimal training.
• Benefits:
  – Planning and navigation of autonomous systems in the presence of humans. Facilitating human-robot teaming efforts.
  – Preprocessing for further exploitation (activity recognition, IFF, etc).

Challenges

• Current pedestrian detectors are all supervised learning techniques
  – Require large and diverse training datasets.
  – Require long training time.
• Operational environments may be diverse and exhibit large variations
  – Extensive training data may not be available (especially for military scenarios).
  – Detrimental to the robustness of supervised techniques.
• Perform unsupervised pedestrian detection
  – Detect humans in an image as anomalies, while modeling the rest of the image as normalcy class using Support Vector Data Description (SVDD) method.
• Reduce the number of false alarms by evaluating and improving the features used in the algorithm.
• Extend the algorithm for pose-independent human detection and early action assessment.

ARL Facilities and Capabilities Available to Support Collaborative Research

• A variety of sensors available for data collection including visible, LWIR, and hyperspectral VNIR/SWIR cameras.
• Various custom-built computing platforms and software packages to support experimentation.

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

• Internships and Post-doctoral positions available for candidates with expertise in machine learning for computer vision, specifically
  – Development of classification and detection algorithms.
  – Extraction of relevant features to improve detection performance and reduce false alarm rate.
  – Optimization and fast implementation of computer vision algorithms.
• New datasets collected in scenarios exhibiting large variations to test the human detection algorithm.

Block Diagram

At each scale $i$

Input image

Input image at scale $i$

Extraction of HOG features using sliding windows

Extraction of distance feature vectors for sliding windows

Average human HOG template

SVDD normalcy class modeling

Detection of anomalies (windows with humans)

Non-maximal suppression to obtain final detections

Input image

Magnitude Phase

Detection of anomalies (windows with humans)

Non-maximal suppression to obtain final detections

Magnitude Phase