

# Real-Time Computer Vision Processing on a Wearable System

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  - Wearable Simultaneous Localization and Mapping (SLAM)

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- What if a system provided context-sensitive information *before* the request is made?
- Could a context-sensitive wearable system help the blind?

# Purpose

- The proposed project involves the development of a wearable system that is capable of processing visual imagery from a camera in real-time and providing the user with actionable information.
- The system will be evaluated based on the image processing frame rate and its ability to detect obstacles.

# Non-Visual Feedback Systems

- SWAN: System for Wearable Audio Navigation
- Navigation via auditory tones
- Should we interfere with a blind person's acute hearing?



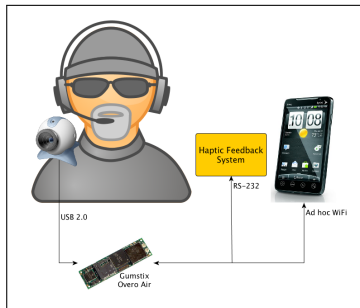
# Wearable Simultaneous Localization and Mapping (SLAM)

- Probabilistic method of estimating location
- Motion model and estimation of sensor noise
- Explored in ground and aerial robotics
- Wearable SLAM less explored



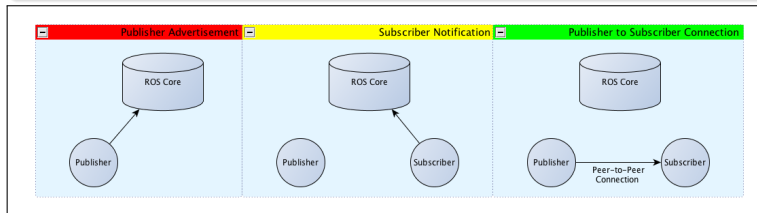
# Hardware Architecture

- Gumstix Overo Air COM
  - ARM Cortex-A8
  - OMAP3530
  - 802.11g
  - Bluetooth
- USB 2.0 Webcam
- Haptic Feedback Vest
- EVO 4G Android

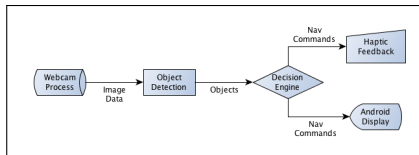


# Publish and Subscribe

## The Robot Operating System (ROS)



# Software Architecture



- Scale-invariant feature transform (SIFT) via OpenCV
- Android Display for Debugging
- Decision Engine will require tuning



# Evaluation

- Its ability to detect and notify the user of upcoming obstacles
- The frame rate at which the system can process images and extract features
- Final Demo: navigation of artificially visually-impaired user through hallway with obstacles

# Deliverables

- Final Report
- Image processing source code
- Wearable System User Manual
- Project Presentation

# Schedule

Date	Milestone
9/24	Complete study of Monocular SLAM techniques
10/7	Complete bootable Gumstix SD card image
10/21	Perform basic SIFT feature extraction with webcam attached to Gumstix
10/28	Interface Gumstix with Android smartphone using ROS
11/4	Complete construction of wearable webcam harness
11/11	Complete construction of wearable haptic navigation vest
11/18	Finish interfacing Gumstix to haptic vest
11/19	Begin final testing of entire system
11/28	Begin final report and presentation
12/5	Final report complete and project demonstration

# Possible Work

- Wearable Simultaneous Localization and Mapping (SLAM)
- Facial Recognition
- Computer Simulation

# Questions

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