

NAECON 2010 Grand Challenge- The Smart Vest for Detector Dogs

Description: The smart vest that houses computing, storage and communications resources is the target goal. The smart vest is envisioned to be composed of a lightweight mesh that serves as a medium for integrating electronic modules with flexible interconnections. **Requirements:** Minimum payload with the maximum comfort possible for detector dogs working in extreme heat. The vest should allow a dog handler to have real-time optical capabilities, as well as a means for bi-directional communications.

System Specifications

I. System Core Components

Microprocessor

- Handle all of the communications, data logging, and calculations.

Data logger flash memory

- Store video for later retrieval.
- Store sensor data for later retrieval.

Sensor Inputs

- See Below

Communication System

- See Below

Actuation Outputs

- See Below

Base Station Receiver

- Receive data from remote dog
- Send data to remote dog
- Interface with software

Local Handler Control Pod

- Communicate with system on vest
- Communicate through vest to base station
- Short range wireless communication like Bluetooth
- Might be a cell phone

Vest

- Material? Fit?
- Dogs roll around on the ground, go through thickets, and jump in rivers.

Power Source

- Waterproof!

II. Sensors

Airflow vector

- Speed and direction
- At dog's level

Air temperature

- At dog's level

Compass Heading

GPS and accuracy

- GPS accuracy is subject to problems in buildings or in dense forest.

Accelerometers

- The accelerometers could assist in determining the dog's position.

Dog Behavior (is the dog in scent?)

- The dog might be trained to trigger a mechanical sensor.
- Or, the accelerometers might be able to detect special behavior when the Dog detects scent.

Microphone

- Audio input

Video Camera

- There may not be enough communications bandwidth to support live video.
- There should be enough bandwidth to send still photographs.

Dog Health Monitoring

- Make sure the dog is staying healthy with external sensors.

III. Communications

Amateur Radio

- Packet HAM radio for data
- FM transmission for voice
- APRS protocol
- Probably not fast enough, but works in remote areas.

Cell Phone Networks

- Use cell network when available, also for triangulating position.
- Consider using Google Android OS, GSM cellular network.

Bluetooth

- A nearby handler can communicate wirelessly with the system using Bluetooth.
- Flag special events.
- Interact with the other system capabilities.
- Short range.

Actuation Outputs

Audio/Voice Outputs

- Ham Radio could be used to give the dog audible commands.
- Recorded tones?
- Recorded voice?
- Live voice?

Electrical/Vibration Outputs

- Small shocks on specific locations of the dog's body.
- Vibration on certain locations of the dog's body.

IV. Software

Record sensor data

Flag significant events

Give directions to dog

Control position of the dog using a feedback loop

Display information in a useful way

V. Background Reference Material

TinyTrax

- APRS (ham radio based) GPS reporting system.

<http://www.byonics.com/pockettracker/>

Cell phones

- Loss leader cell phones include power efficient microprocessors, GPS, java programming, and cellular data.

- Google Android phones

GIS Software

- Open source Geographic Information System:

<http://www.mapwindow.org/>