

Welcome to Monitor, the data acquisition and control newsletter. Data acquisition doesn't just cover the measurement of physical parameters like temperature or pressure, it is wide ranging with new applications emerging all the time. This month we discuss the technical challenges of human sensing. The Excel corner is on its holidays in Ireland, but will be back next month.

I hope you find the newsletter useful, but should you wish to remove yourself from our mailing list, go to

http://www.windmillsoft.com/daqshop/Monitor_Newsletter.html

You can download Monitor as a pdf file from

<http://www.windmill.co.uk/monitor/monitor205.pdf>.



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Solving the 5 Challenges of Human Sensing

Web link: <http://www.windmill.co.uk/human-sensing.html>

Researchers have identified five technology challenges in human sensing systems.

Thiago Teixeira, Gershon Dublon and Andreas Savvide of Yale University and Massachusetts Institute of Technology addressed the increasingly common requirement of computer systems to extract information about the people present in an environment. They pin-pointed five requirements that the most accurate systems need to meet.

Human sensing covers not just whether any people are present, but how many and where they are.

There are several methods of human sensing, including those using infra-red sensors, cameras, pressure mats, break beams, movement sensors or turnstiles.

1. Environmental Variations

Unexpected or sudden changes in environmental conditions are common sources of errors in some real-world scenarios. Radar signals, for instance, can be dampened by rain or fog. Passive infra-red sensors are often triggered by heat currents flowing through HVAC (heating, ventilation and air conditioning) systems. A large portion of the computer vision literature is aimed at dealing with variations in lighting, shadows and so forth.

Some of the most accurate human sensing systems are those employing video technology with software algorithms to differentiate people from the background. Users can configure the software for each individual sensing

station: adjusting for dark shadows and changes in lighting. Tests show that video technology achieves over 98% accuracy in human sensing.

2. Similarity to Background Signal

Clearly, separating a person from the background signal is a core requirement for human-sensing the scientists write. The latest video people sensing systems freeze the background at the moment a person enters and easily distinguishes the moving person from her surroundings. Users can set in software how long a person can stand perfectly still before the system sees them as part of the background.

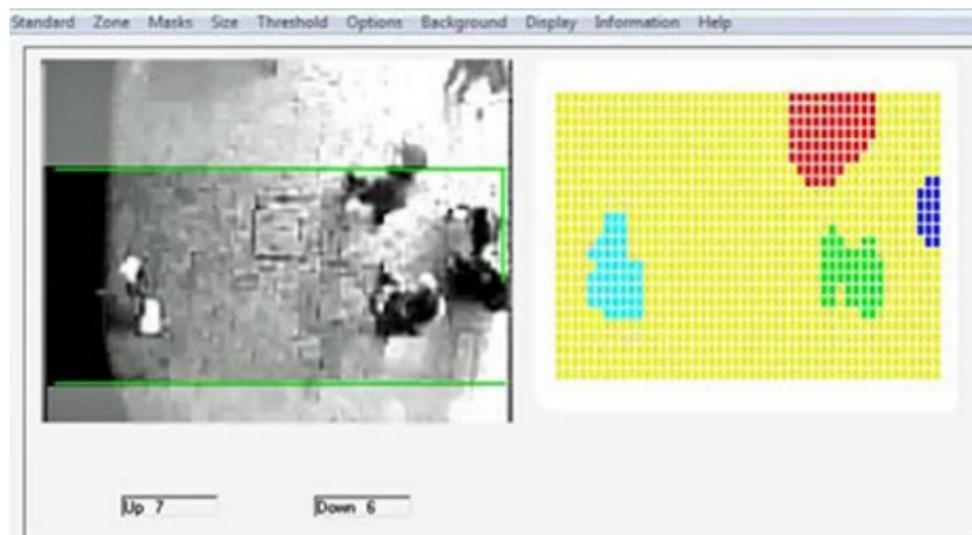
. In other domains, such as with ranging sensors (radars, sonars), the presence of unwanted signals with the correct frequency spectrum or timing characteristics can often fool the system into producing phantom detections.

Passive thermal sensors have problems differentiating people in warm environments. The sensor works by monitoring the temperature difference between a person and the background. If the temperature of the background and the person are similar then the sensor doesn't "see" the person. Also, if a person stands still she becomes part of the background.

3. Appearance variability and unpredictability

People look different and wear a vast assortment of different types of clothes and hats, they push trolleys and pushchairs, and carry back-packs and hand-bags.

This at first looks like a problem for video systems, but is solved by the software converting an individual to a "blob".



In a tricky situation - outdoors with people pushing prams - the computer vision system simplifies the picture and accurately distinguishes people, converting them to "blobs". Screen shot courtesy [Retail Sensing](#)

4. Similarity to Other People

Some tracking systems use identifying features of a person to track them - presenting a challenge if people are all wearing similar clothes or uniforms. Video sensing technology follows the "blob" that has been identified as a person so it doesn't matter if everyone looks alike. Each blob is seen as unique and distinguished from the others, even in crowded situations.

5. Active Deception

The researchers' final point is when a human sensing system may be deliberately debilitated, perhaps by people walking slowly to fool motion

sensors, covering a break beam with their hands or turning the lights off to fool the cameras. A cctv system lets users remotely play back the video over the internet to see why counting has suddenly stopped and rectify the problem.

The researchers conclude that the best system is computer vision, saying "*Computer vision is far ahead from other instrumented modalities not only with respect to spatial-resolution and precision metrics, but also in terms of having the most field-tested solutions*".

Further Reading

You can read the research at [A Survey of Human-Sensing: Methods for Detecting Presence, Count, Location, Track, and Identity](#) T TEIXEIRA, G DUBLON, A SAVVIDES ENALAB technical report

[How a CCTV People Counting System Works](#), Retail Sensing

Controlling Temperature

Web link:

Question

Dear Sirs,

After taking a look at Your products for data acquisition and control (<http://www.windmillsoft.com/>), I have been really impressed by the potentialities of these devices as well as by the fact that many of them are provided with a control software included in the price.

I was wondering whether one of such devices might fit my needs (as further described below):

I need to control the temperature on a small solid surface (2 cm x 2 cm) heated by a Peltier.

There will be a thermocouple measuring the temperature at the surface and a power supply (12V) providing voltage/current to the Peltier.

I was wondering whether your device (and related software) may be used to create "a control loop", I mean use it to adjust the voltage (or cut it temporarily) according to the temperature measured by the thermocouple, on the basis of the following scheme:

Temperature larger than a desired value -> cut or decrease voltage,
Temperature smaller than the desired value -> enable or increase voltage.

Please let me know whether this would be feasible and the most relevant device among those described at the http address reported above.

Thanking in advance

Answer

Yes, one of our systems will fit your needs. Which one depends on how you are controlling your power supply. If by an analogue input then a Microlink 752 might fit the bill, together with a 593 thermocouple

connection box. To create the control loop you would need the Windmill Test Sequence software. This lets you, for example, check if a condition is true before doing something - eg if a temperature is greater than 20 oC then switch off the heater.

If the power supply was otherwise controlled a different set up might be more appropriate, but still with the Test Sequence software to create the control loop.

These web pages give more details

windmillsoft.com/daqshop/test-control.html

windmillsoft.com/daqshop/temperature-measurement.html

windmillsoft.com/daqshop/resistance.html

Any questions on using Windmill you'd like to see answered here, just ask: monitor@windmillsoft.com.

DAQ News Round-up

Welcome to our round-up of the data acquisition and control news. If you would like to receive more timely DAQ news updates then follow us on [Twitter](#) - [@DataAcquisition](#) - or grab our [rss feed](#).

Global pressure sensor market to grow by 5%

A pressure sensor converts changes in the pressure of a gas or a liquid into an electrical signal. It then generates an analogue output proportional to the pressure, or switches a digital output when a particular pressure level is reached. Pressure sensors are used for controlling and monitoring thousands of applications. The global pressure sensor market is expected to reach USD 9.48 billion by 2020, according to Research and Markets. The primary driving force is the automotive industry's increased demand for pressure sensors.

Source: Research and Markets

<http://www.researchandmarkets.com/>

Robots to measure marine wildlife

Two robotic vehicles will work together over the next three weeks to investigate why the deep area of the Celtic sea (between Ireland, UK and France) is particularly attractive to marine predators like dolphins and whales.

Source: SCUBA News

<http://news.scubatravel.co.uk/>



Sensor mimics bats to detect dangerous structural cracks

An ultrasound sensor for detecting dangerous cracks in structures such as aircraft engines, oil and gas pipelines and nuclear plants, has been developed by researchers at the University of Strathclyde – with inspiration from the natural world.

Source: University of Strathclyde Glasgow University

strath.ac.uk

Piezo sensor predicts wind farm failure

Engineers have developed a novel technique to predict when bearings inside wind turbines will fail. The method uses ultrasonic waves to measure the load transmitted through a ball bearing in a wind turbine. The stress on wind turbine is recorded and then engineers can forecast its remaining service life. A custom-built piezoelectric sensor is mounted in the bearing to measure the time of flight of an ultrasound wave and determine the load.

Source: The University of Sheffield

sheffield.ac.uk

Robot whiskers sense their environment

Robotic whisker detects air currents and builds two-dimensional images of what it senses using tomography, an imaging technique commonly implemented in MRI or CT scans.

Source: Science

<http://news.sciencemag.org/>

Data Acquisition Exhibitions and Conferences

The quarterly update of data acquisition and control exhibitions around the world.

Automation

14-18 September 2015

Brno Czech Republic

Industrial automation, measuring and control equipment.

bvvcz.cz

Automotive Testing Expo 2015 China

15-17 September 2015

Shanghai China

Data acquisition, engine and emissions analysis, materials testing, sensors, transducers, quality testing, environmental testing - meet test equipment manufacturers and test service providers.

testing-expo.com/china/

SPIE Remote Sensing 2015

21-24 September 2015

Paris France

For engineers, scientists and researchers to gain access to the most recent satellite-based imaging systems and the data generated by them.

testing-expo.com/usa/

Sensors and Instrumentation

30 September - 1 October 2015

Birmingham UK

For test, measurement and control.

sensorsandinstrumentation.co.uk

ATX

13-14 October 2015

Texas USA

Automation technology, including control hardware and software.

atxtexas.designnews.com

Testing Expo 2015 North America

20-22 October 2015

Novi MI USA

Latest technologies and services to ensure that the highest standards are met in terms of product quality, reliability, durability and safety providers.

testing-expo.com/usa/

Automation

21-23 October 2015

Saint Petersburg Russia

Exhibition on industrial automation - software and hardware automation tools, control and communication systems.

en.farexpo.ru

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For previous issues by subject see

<http://www.windmill.co.uk/monitorindex.html>

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