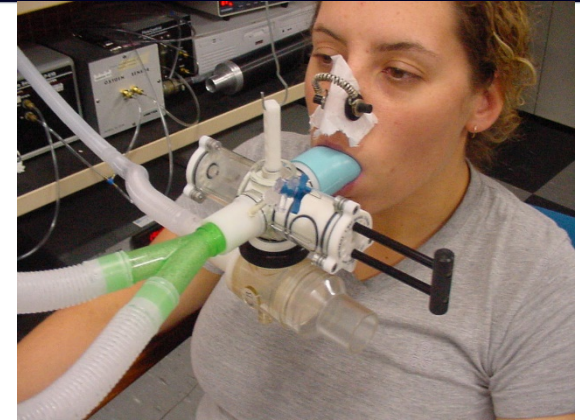




Testbed for Wearable Sensors (IGNSS 2016 – UNSW)

Overview

- Who/what is the AIS
- Approach to research
- Our measurement interests
- Sensor challenges



www.ausport.gov.au

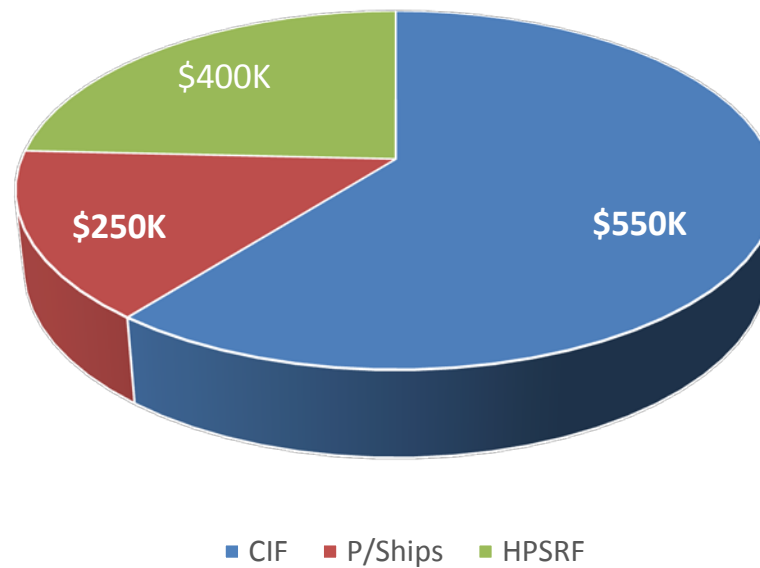
- Established in 1980
- Australian Sports Commission Act of 1989:
 - *To initiate, encourage and facilitate research and development in relation to sport;*
 - *To undertake research and development in related to sports science and sports medicine*
- 8 sports science and sports medicine disciplines



Research at the AIS

- It is a collaborative venture
- Cohort of approximately 25 Post Doc and 25 PhD scholar researchers
- Currently involved in 2 ARC linkage grants
- Partnership agreements with 3 universities (Deakin University, Victoria University, University of Canberra)
- Industry collaboration

AIS R&D Funding



Typical measurements made at AIS

Blood work

Haemacrits

Lactate

Sugar

Oxygen

Cortisol

And the list goes on

Physiological

Acceleration

EMG

EEG

ECG

Core temperature

Heart rate

Biomechanical

Acceleration (one limb relative to another)

Joint forces (inferred indirectly from other measurements)

Impact forces (measured directly using force plates)

Applied

GNSS

Precise Location (+/-10cm)

Acceleration

Velocity profiling

Distance travelled

Route travelled

Performance analysis

FROM HEAD TO TOE WEARABLE TECHNOLOGY

SHIRT

Conductive thread means a computer is literally built into the fabric of the shirt, providing the processing power for all the other wearable gadgets.

WRISTBAND

A sensor that tracks movement to determine the number of steps taken through the day – 10,000 is ideal – and how much sleep the wearer gets at night.

TROUSERS

Also made with conductive thread, the trousers take the energy generated by movement and use it to power the other gadgets.



GLASSES

Overlays navigation directions and information about points of interest directly on to the wearer's field of vision.

WRISTWATCH

Vibrates when a message arrives and displays it on the watch face. Tells the time too.

HAND

Embedded under the skin is a chip containing medical records, passport data and credit records. Information is transferred by waving the hand over a suitable scanner.

SHOES

GPS chip provides directions using LED lights in each shoe: the left shoe indicates direction, while the right shows distance.



GRAPHIC: JOHN BRADLEY

<https://people.rit.edu>

The myth of the origins of milk a.k.a (GPS)



GPS Wearables: Challenges

- Is it working?
- What are the error bounds?
- Low sampling rates (1 – 10 Hz)!
- Impact of environment on accuracy
- Typically using consumer grade GPS chipsets

The Choice Magazine of Wearables: STEP 1 (GNSS – end of 2017)

- Ability to create repeatable test scenarios
- A tool for the sports scientist
- Ability to advise sports scientists, coaches and athletes
- Education
- Precision GPS research (partnerships required)



The Choice Magazine of Wearables: STEP 2 (Inertial – end of 2018)

- Ability to create repeatable test scenarios
- A tool for the sports scientist (?)
- Ability to validate inertial sensor specifications



The Choice Magazine of Wearables: STEP 3 (other – 2018 onwards)

- Heart rate
- Temperature
- Altitude (pressure)
- Electromyography
- Blood oxygen saturation
- and ...

Thank you for your
attention.

