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Lessons Learnt in Transferring Technologies to Industry

Dr Alex Zelinsky

Group Executive, Information Sciences

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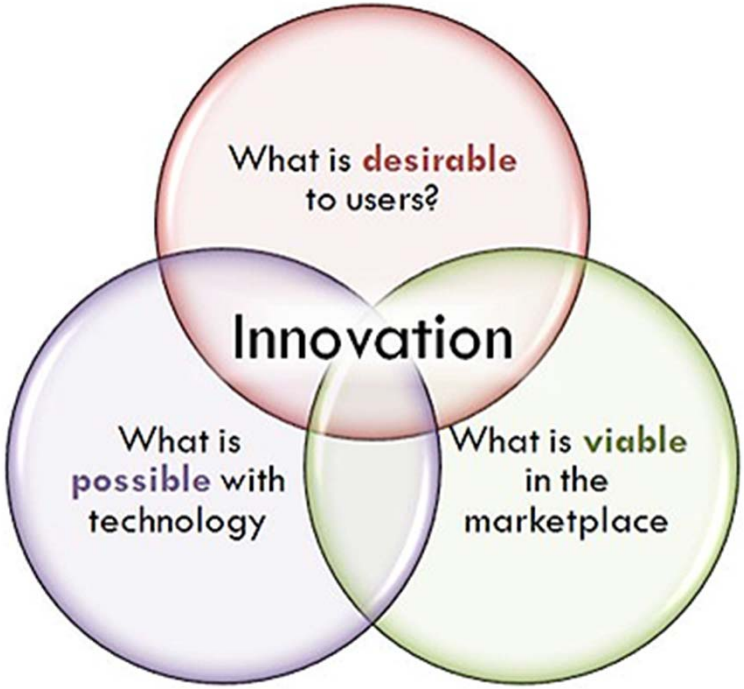
Making Innovation Happen

"Innovation turns ideas into successes"



Ideas - inventions and scientific discoveries

successes - creating beneficial or commercial value

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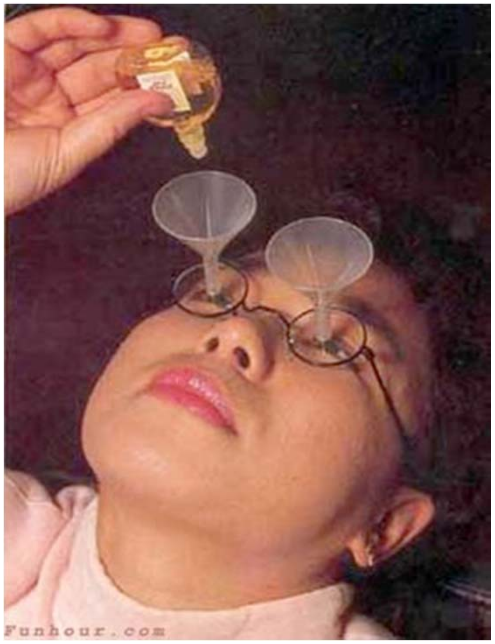
Making Innovation Happen



Addressing an unmet need that creates value

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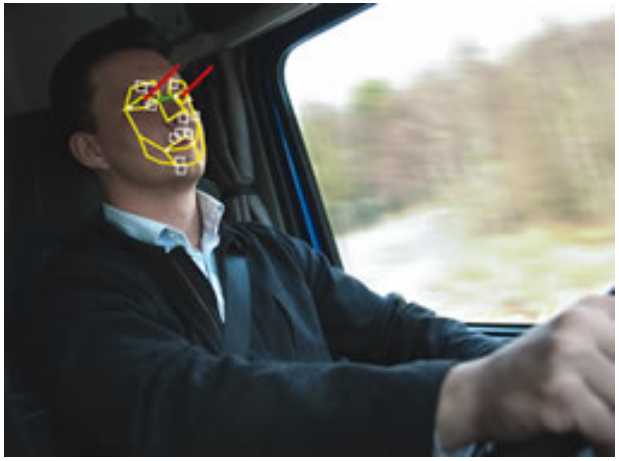
Seeing Machines – a personal perspective

Research started at ANU in 1996.
Project funded by Volvo in 1998.
Commercial spin-off from ANU July 2000
Listed London Stock Exchange December 2005



Outputs:

- Science: 8+ Research Papers
- Demonstrator: Instrumented Vehicle
- Patent for “Facial Image Processing System”
  - Provisional Filed July 2000
  - US Patent 7043056 Granted May 2006

seeingmachines

Outcomes

- Technology Adoption:
  - Spin-off company with market capital value of $10m
- Impact beyond ANU
  - Company profitable with market capital value of about $40m
  - Licensing deals to lap top (market size 200 million units pa)
  - New medical glaucoma diagnosis product (market size $2b pa)
  - 400+ Google citations on original research papers

Innovation Strategy

- No real strategy was envisaged or planned. The dream was spin-off a company

Learnt @ Seeing Machines

THE CHALLENGE

- **Create driver fatigue and distraction** product
- **Solution.** After market technology solution focused on high value users.
- **Business Model**. Use off-the shelf technologies integrated into existing driver management systems for high end market segment – mining. Product price $10k, instead of $250 for automotive retail markets.

DSS
Driver State Sensor

INNOVATION STRATEGY

- Develop product with minimalist features.
- Sponsored a 3rd party study that verified the product worked and reduced accidents.
- Demonstration of product with key stakeholder – in mine Health & Safety Officers.
- Result: Significant orders from leading Mining Companies across the world, including BHP-Billiton, Rio Tinto and Vale. Sales now over 2,000 units.

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Driver Safety System

Technology

- Camera based, non-contact, non-intrusive sensor observing the driver
- Audio & tactile feedback, GPS and back to base communications

Operation

- Fully automatic, no driver setup required
- No sensors to be attached, no interaction required
- Warnings issued to driver and fleet management system

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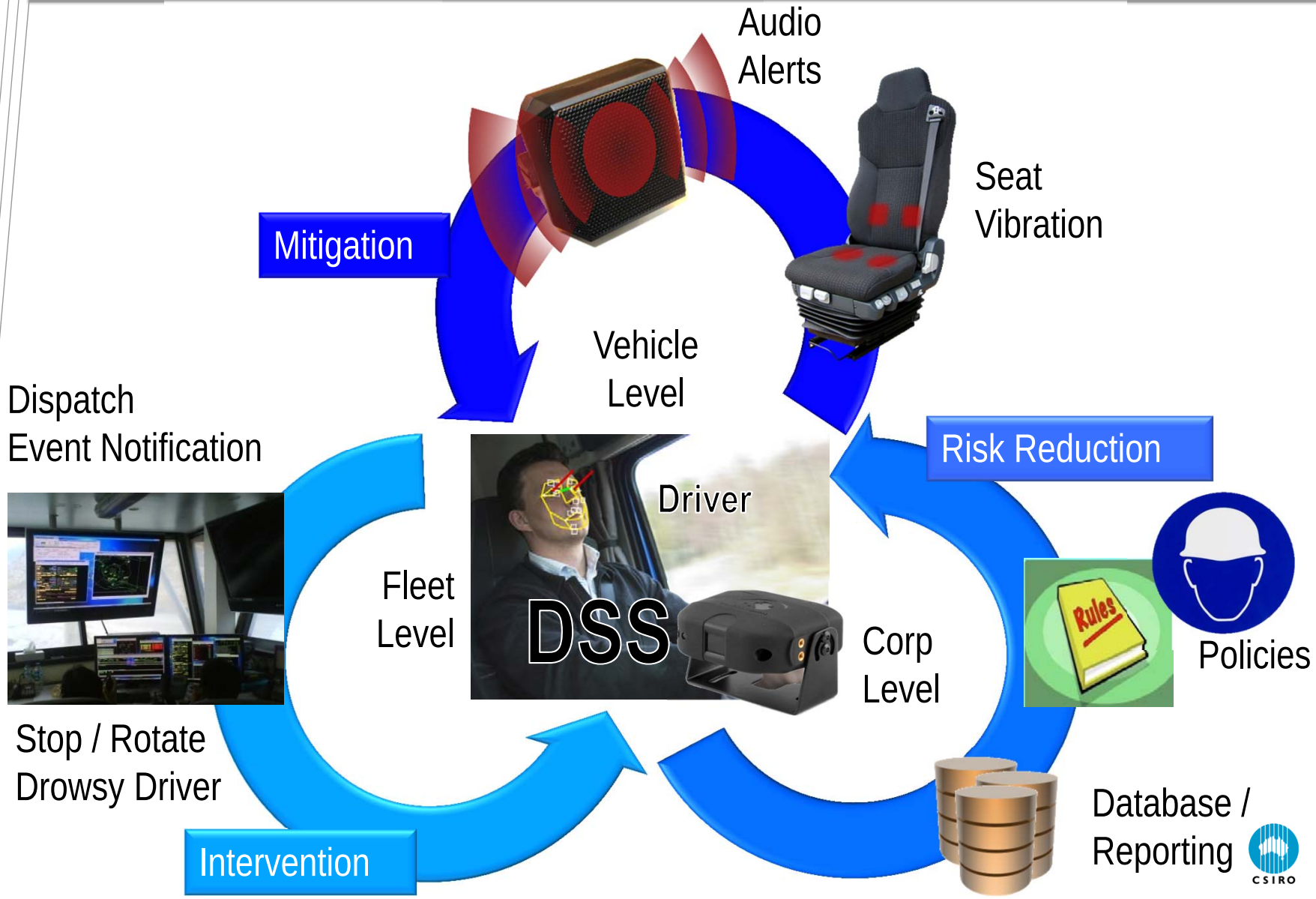
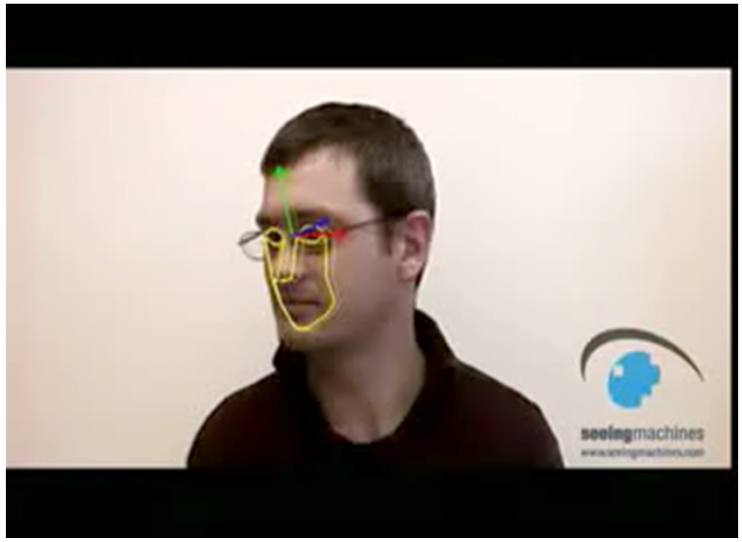
Integration Modes



faceAPI – Facial Tracking Plug-in



faceAPI

Lip and Eyebrow Tracking

faceAPI

High Speed Head Motions

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faceAPI – consumer products pathway

Technology

- faceAPI ported PC laptops, ipads
- Using GPU, ARM processors

Applications

- 3D gaming
- 3D visualisation
- Teleconferencing
- Natural Human Machine Interfaces

Products

- August 2011, Toshiba released world's first glasses free 3D laptop. Market size +10-20m
- Plans for 3D glasses free televisions

Technology Transfer

- faceAPI developers licence
- Non-exclusive volume based licensing

faceAPI

View Dependent Rendering from a Webcam

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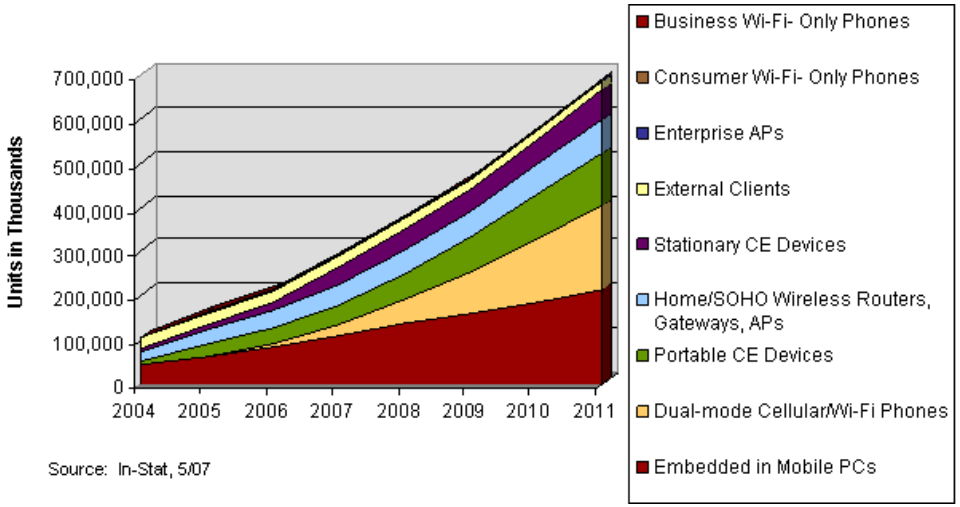
CSIRO and Wireless LAN

Research started at CSIRO in 1990 received targeted priority funding in 1991.
Spin-off from Macquarie University and CSIRO in Feb 1998
Radiata acquired by CISCO for $297m 2001
CSIRO enforces IP in US courts for $265m+ in 2009

Outputs:

- Science: 6-10 Research Papers
- Demonstrator: Built 1996
- Patent for “"Wireless LAN"
  - Provisional Filed November 1992
  - US patent 5,487,069, granted 1996



Outcomes

- Technology Adoption:
  - Non-exclusive license to Radiata
- Impact beyond CSIRO
  - Widespread adoption of WiFi over 1B devices shipped
  - 50+ Google citations on original research papers

Innovation Strategy

- Worked with IBM on a feasibility study on WLAN using OFDM
- IEEE 802.11a standard 1997-1999
- Tight control of IP and non-exclusive licensing model
- Working with earlier adopter - Radiata - 1st IEEE802.11a chipset
- Business strategy to legally enforce IP ownership that was resourcing for success.

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15 years in Mining Robotics / Automation

Dragline Swing Automation

Shovel Automation

Traffic Management

LHD Automation (CAT MineGem)

Explosive Loading (ORICA)

Longwall Automation

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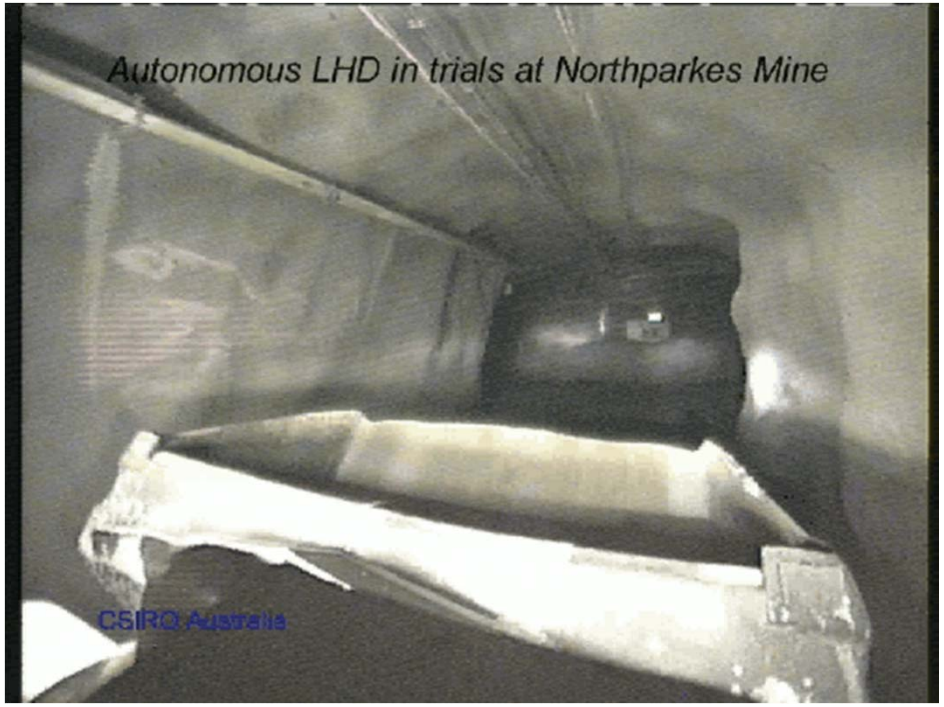
Mining Robotics – Start with Easier tasks

- A automated Load Haul Dump (LHD) vehicle was developed in 1999-2001 for the underground metaliferous mining industry - CSIRO and Caterpillar
- Commercial reality through exclusive licensing



CAT® Underground Mining

Work by Graeme Winstanley, Ellitot Duff, Jonathan Roberts, Peter Corke and Jock Cunningham

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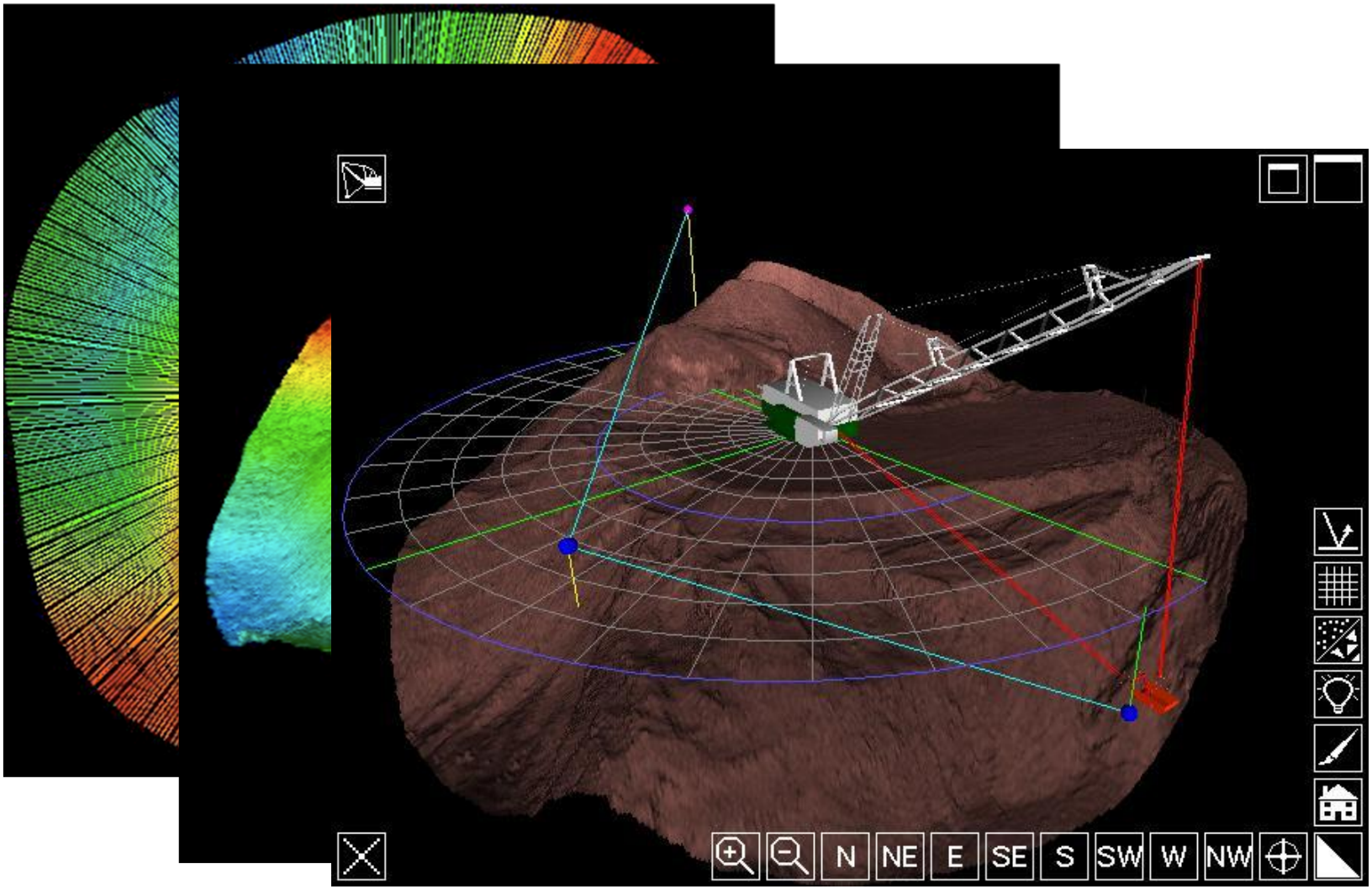
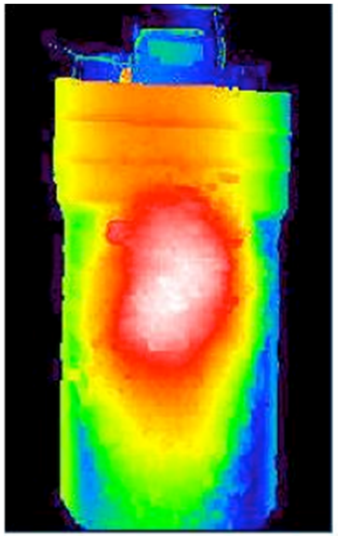
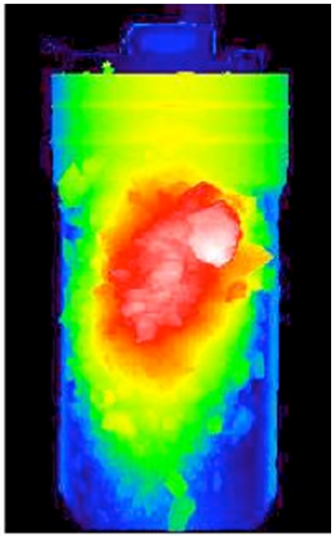
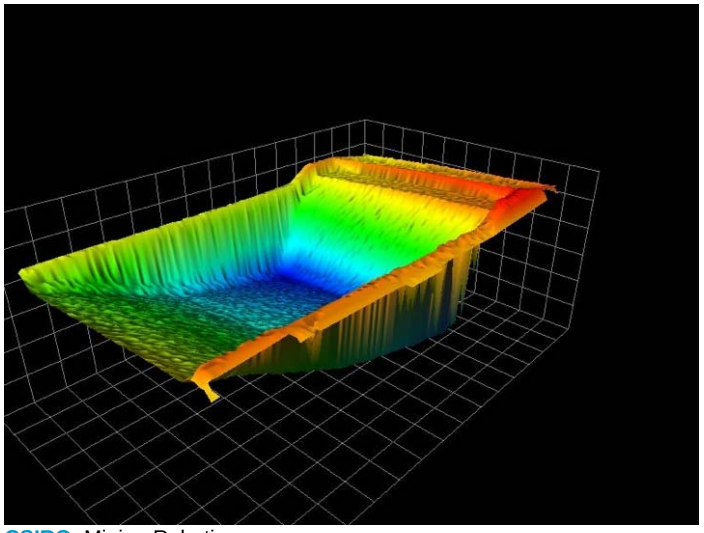
Digital Terrain Mapping

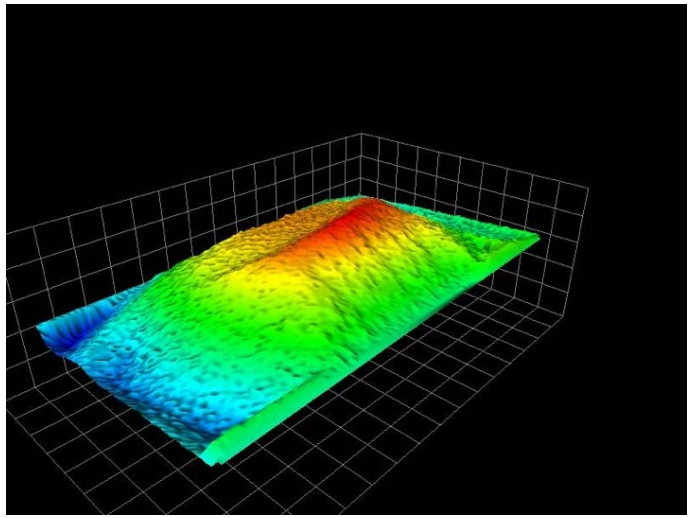


Trayscan









Mobile Mapping Solutions: What's available now?

- Currently a large commercial market
- Rooftop-mounted sensors
  - 2D LIDAR with high-end GPS/INS
  - Location of LIDAR returns straightforward if accurate position is known at all times
- High quality maps
- Limitations
  - Cost: $200k-$300k
  - Reliance on GPS
    - Issues: urban canyons, underground, near large infrastructure, forests, planetary

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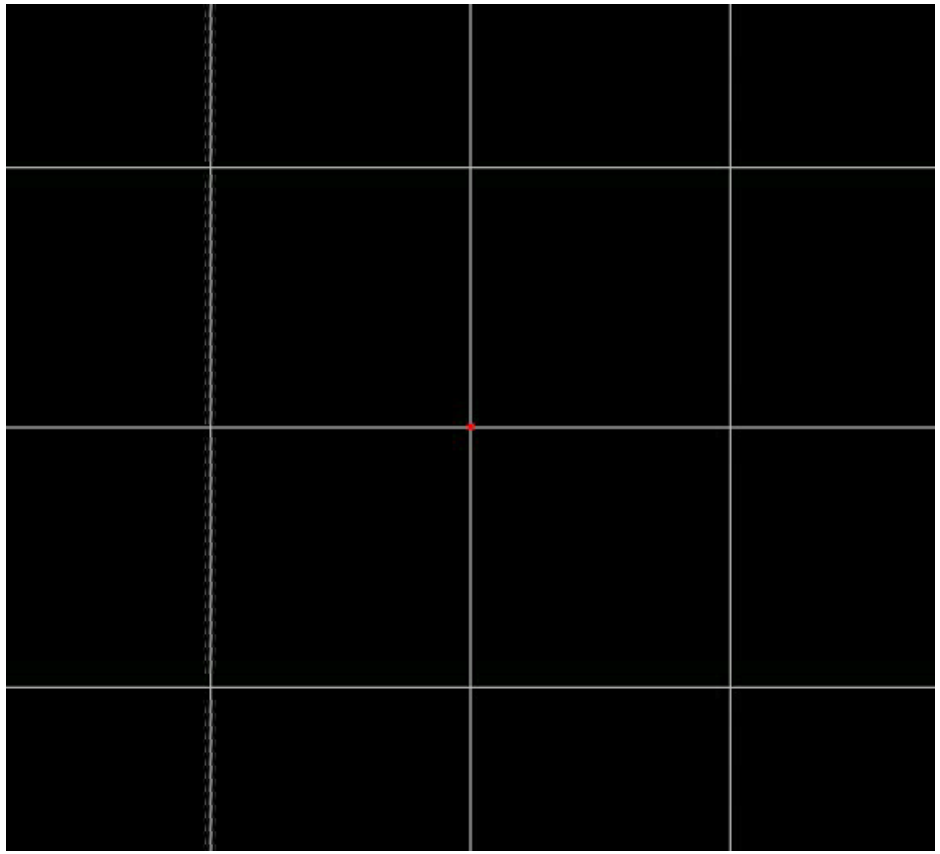
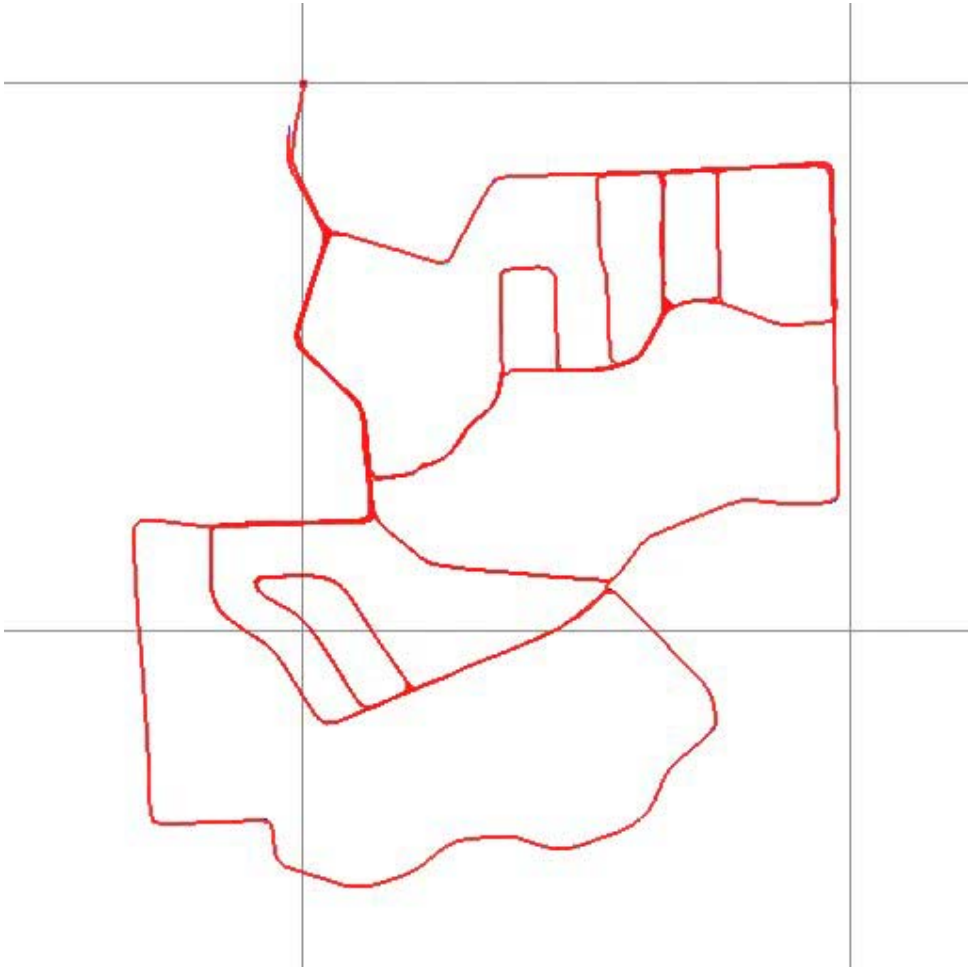
2D Street Localisation and Mapping



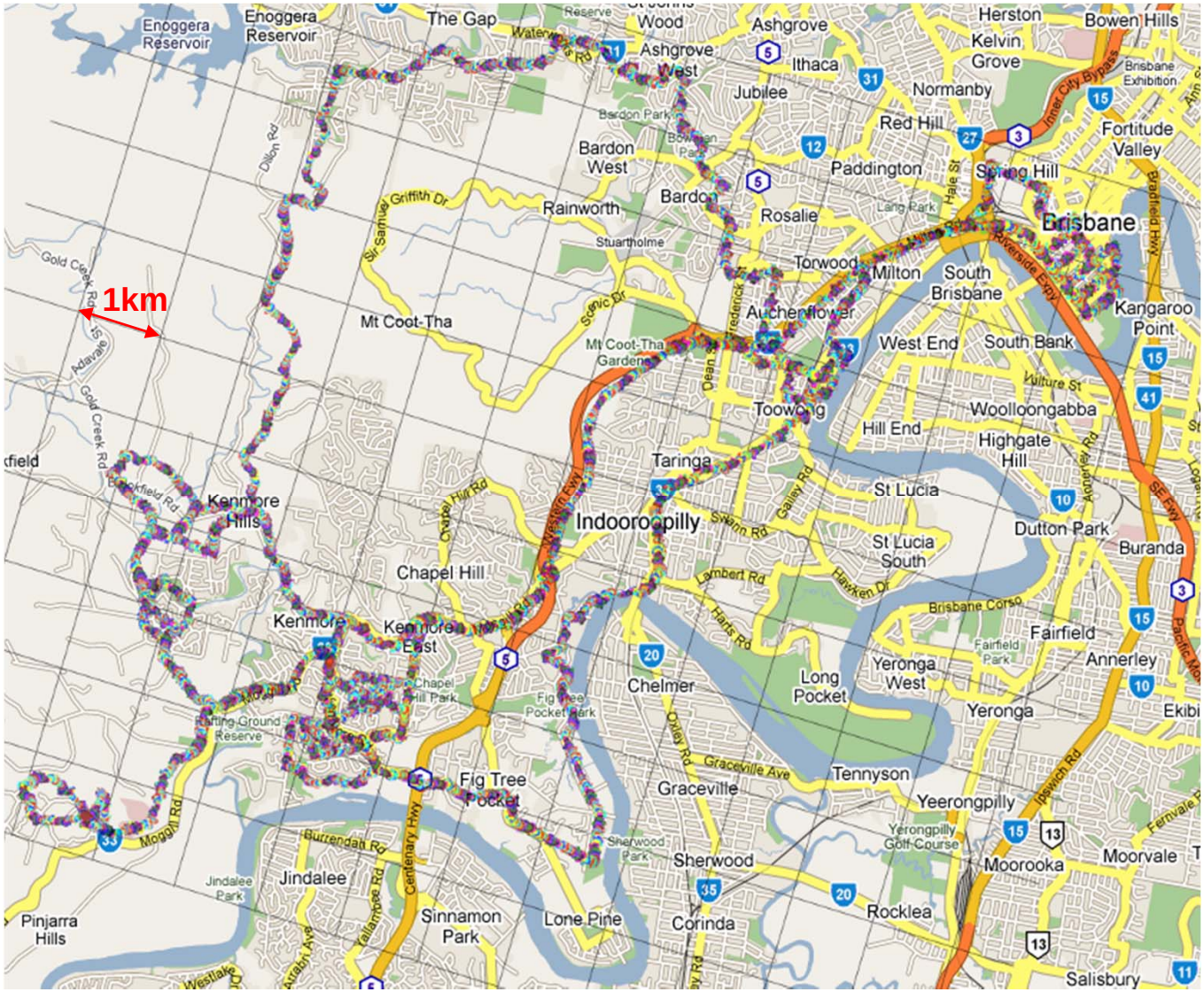
Work of Mike Bosse and Rob Zlot

2D Street Localisation and Mapping



Work of Mike Bosse and Rob Zlot

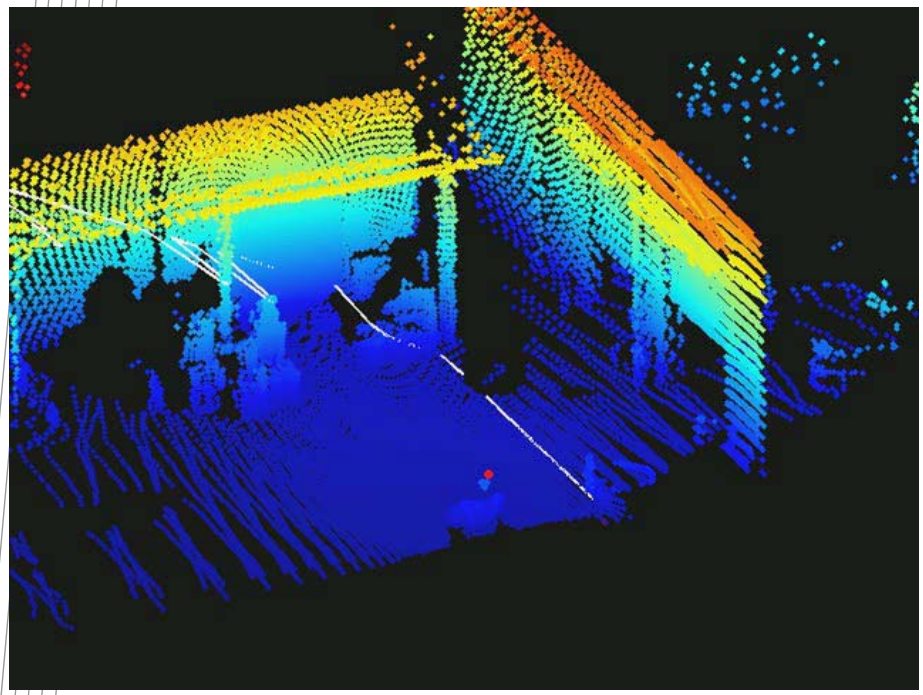
Brisbane Map

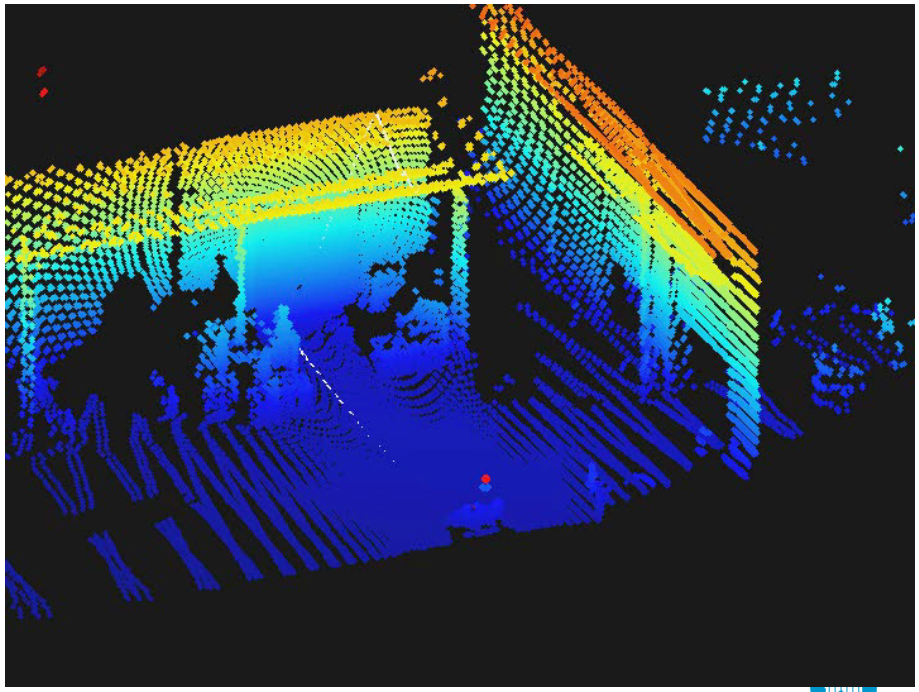


Spinning Laser – creates 3D Mapping

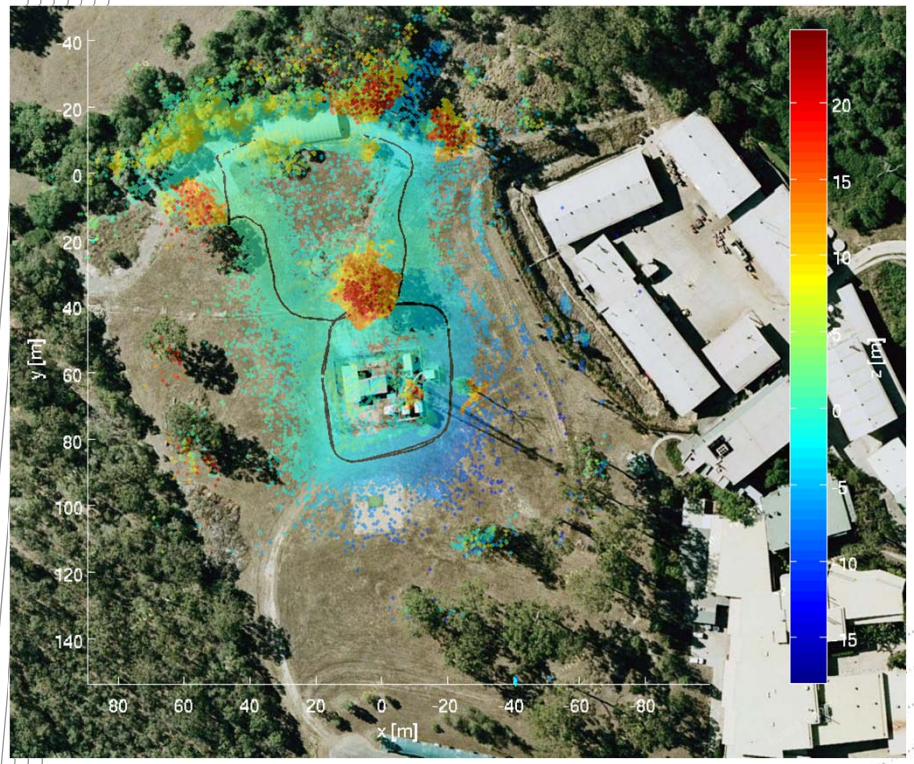
- Rotating platform sweeps the laser outside of the standard 2D scan plane
- Produces 3D hemispherical field of view

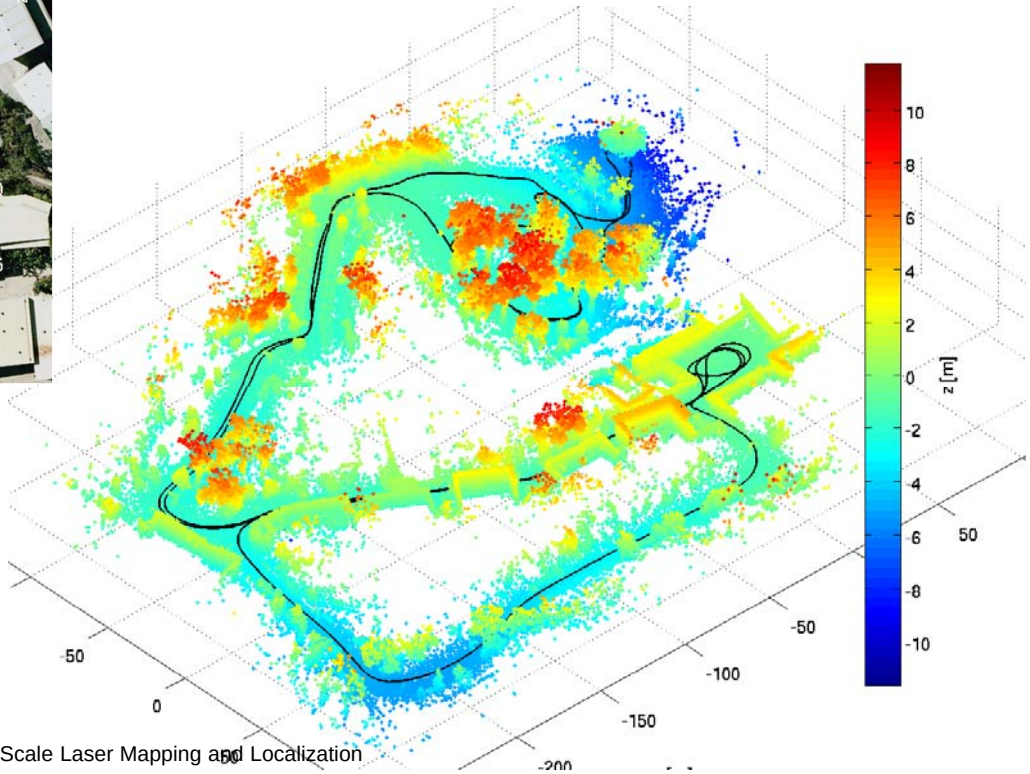
Continuous 3D Mapping



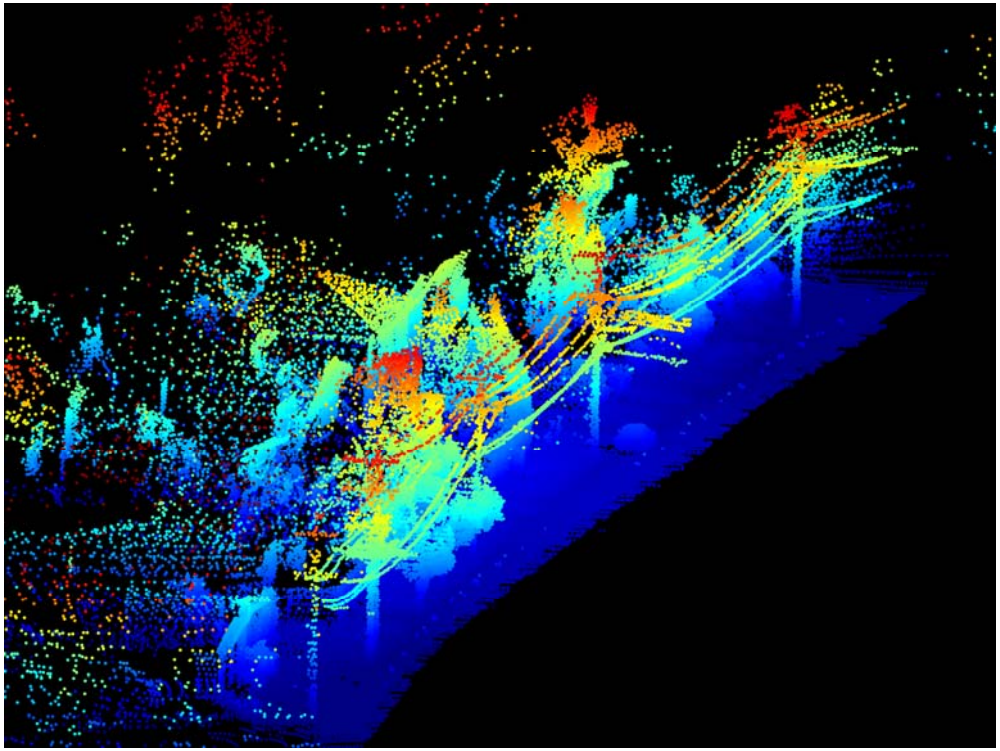


Offroad with Loop Closure

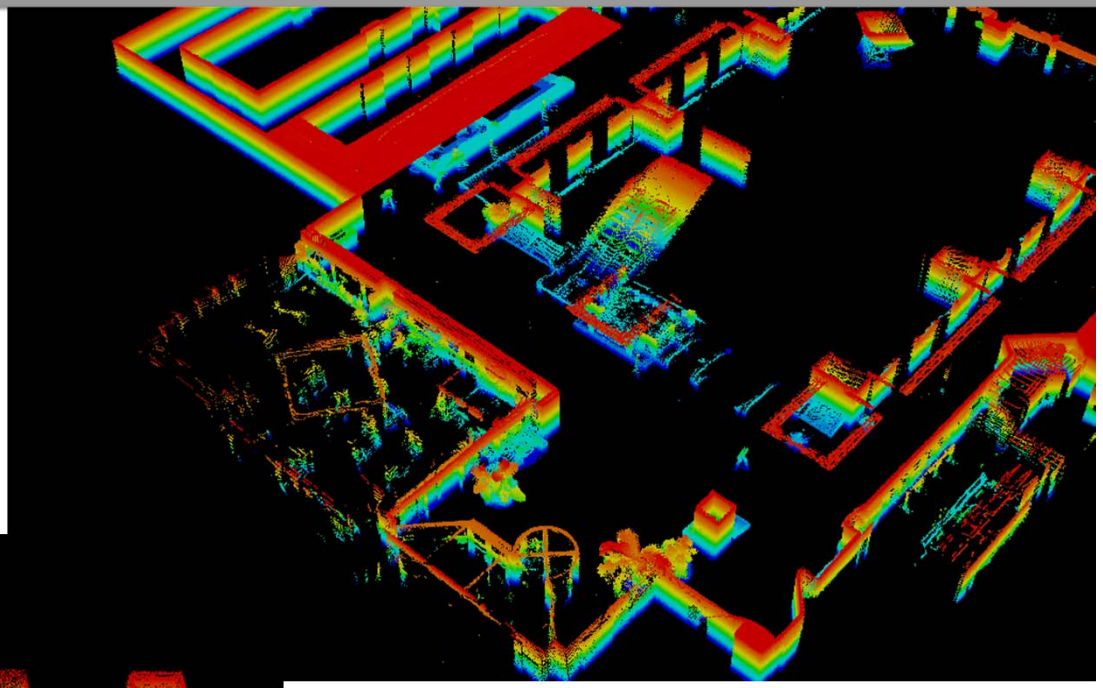


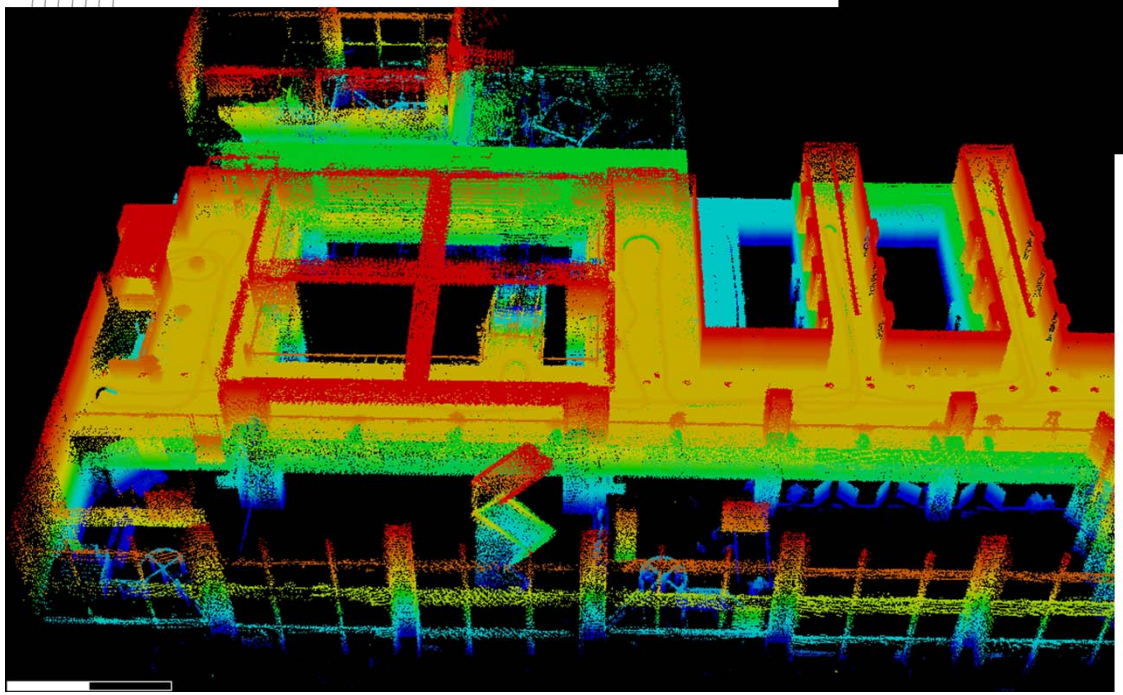


3D Street Mapping



3D Indoor Mapping





- Commercialized through Applanix (Trimble)
- Used for offices, hotels, public transport infrastructure, prisons, military facilities, *etc*

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Zebedee


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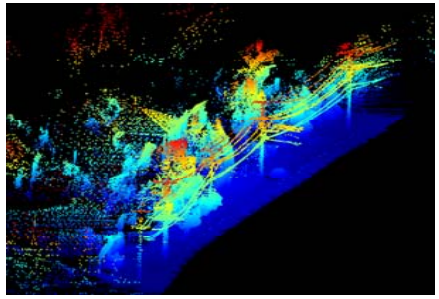
J843 - CSIRO ICT CENTRE
Zebedee Mobile Mapping Device
Release R1.00 | April 2011

Zebedee - Summary

- Zebedee design provides a simple, lightweight, inexpensive means to collect 3D data
- Input device for 3D mapping systems
- Patent application
- Non exclusive licensing agreements with mapping companies; Applanix, Mintek, Boeing and others
- Not a spin-off company opportunity

Technology Transfer Lessons

1. It's all about the people and building the best teams
2. Great outcomes start with excellent focused science and technology
3. Strong unencumbered and sufficiently mature IP builds advantage
4. Working with standards organisations e.g. IEEE and ISO where possible
5. Be resourced for success with smart money and realistic market valuation
6. Orchestrating collaboration with innovation and industry partners
7. Know your global competitive advantage and how to maintain it
8. A living business plan that captures your winning strategy
9. Brilliant execution of great plans is mandatory
10. Embracing risk and not fearing failure with a "whatever it takes" attitude



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Alex Zelinsky
Group Executive
Information Sciences

Phone: +61 2 9490 5620
Email: Alex.Zelinsky@csiro.au

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Thank you and Questions

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