The Current Status of Construction Informatics Research in Australia

Professor Xiangyu Wang, Ph.D.

3rd August 2012

Range of professional experiences

- project management,
- quantity surveying,
- construction management,
- building surveying,
- contract administrators,
- facilities management.

Faculty Member

- 1 John Curtin Distinguished Professorship,
- 2 Industrial Chair Professorship,
- 1 Personal Chair Professorship,
- 3 Associate Professors,
- 6 Lecturer/Senior Lecturer,
- 3 Adjunct Professors.
- Research focus on Oil/Gas, Mining, and Infrastructure sectors, sponsored by Australian Research Council, and numerous industrial partners.

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Undergraduate Program

- Bachelor of Construction Management and Economics
- 4-year accredited degree
- 497u/g students

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Graduate Program

- MS and PhD degrees
- Master of Science (Project Management)
- 150 Master students
- 11 PhD students

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Research Capability

- Building Information Modelling
- Visualization
- Cost management

- Risk management
- Procurement
- Performance measurement

How to improve the performance and productivity of construction?

Design Management | **Project Management**

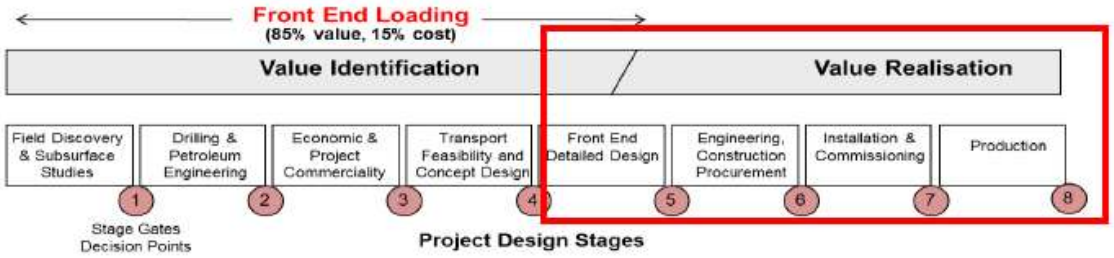
Sustainability

Construction Management | **Construction Engineering**

- Occupational heal and safety
- Lean construction
- Process improvement

- Planning and Scheduling
- Construction equipment and methods

New methods, techniques and processes



Life cycle integration

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Australasian Joint Research Centre of Building Information Modelling Curtin/HUST

Co-Director:
Professor Xiangyu Wang,
Acting Woodside Chair Professor for LNG (Liquefied Natural Gas) Construction
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Aim of the BIM Centre

- The Australasian Joint BIM Centre focuses on developing world class research that will improve the performance and productivity throughout a project's life-cycle. The Joint Centre acts as an allied international platform for creating and sharing knowledge among worldwide community which will enhance policy development and enable key industry stakeholders to ameliorate their informed decision-making throughout a project's life cycle.

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BIM Centre Team

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Professor Xiangyu Wang, Co-director of the BIM Cenre
John Curtin Distinguished Professor Peter Love
Professor Peter Davis, Head of the school
Distinguished Prof. Kok Lay Teo, mathematics
Professor Geoff West, spatial science A/Prof. Tele Tan Computer science
Stuart Porter, Computer Engineer (RFID + 4D CAD)
Matt Lavender, Augmented Reality Engineer
Ying Wang, Augmented Reality Expert
Lei Hou, Augmented Reality Expert
Jingyang Zhou, Post-doc in optimization

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Computer Devices

Device
PC
Laptop
PC tablet
iPhone
iPad
Goggles
RFID equipment
Large Screen

Technologies

Technology	Functionality
4D	4D modelling functionality
	4D playback in time
	Automatic link between 4D & P6
RFID	RFID recognition
	Barcode / QR recognition
	RFID tracking short distance
	RFID tracking long distance
	RFID to 4D linkage
	RFID write back to tag
	RFID to 4D automatic progress updating
	Microzoning
AR	Barcode/QR to single object
	Barcode/QR to single object + functions
	Barcode/QR to multiple objects
	Barcode/QR to 3D model
	Barcode/QR to 4D model software
	Barcode/QR to 3D model walkthrough
	QR to 3D model walkthrough over plotplan
ND	Cubing functionality in iPad or tablet
	Automatic 'cubing' from 3D model
	Automatic object creation from 3D

Effectiveness and Adoption

- From the user's point of view, the important question is how to get to …

  "the most relevant information with the least effort and how to minimize information overload."

Main Research Streams in Construction Informatics in Australia

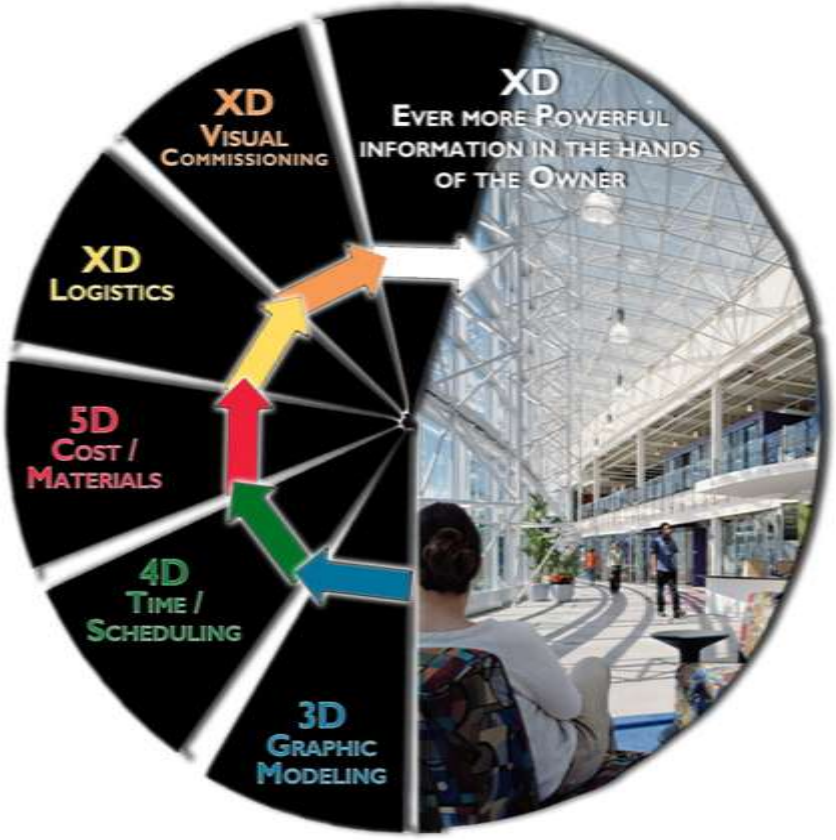
- Building Information Modelling (BIM)
- Augmented Reality

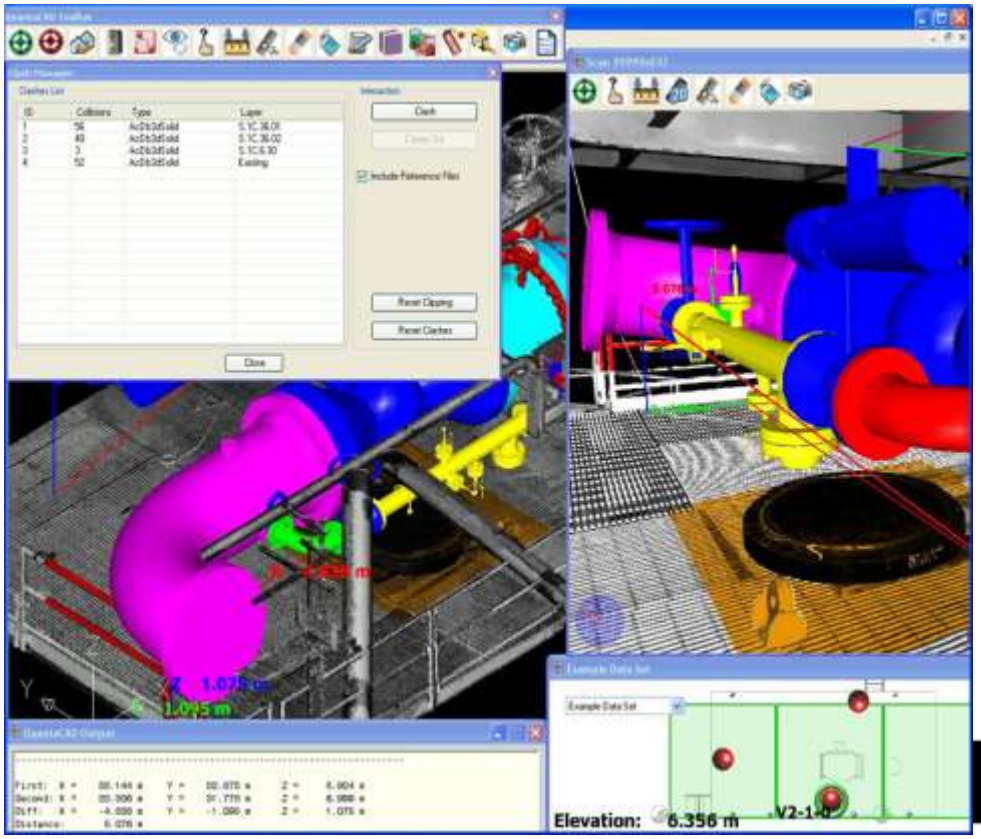
BIM use

- Representation
- Simulation
- Collaboration
- Realization

BIM: From 3D to Beyond

Building Information Modelling is "a methodology to manage the essential design and project data in digital format throughout the assets life cycle"





Technologies are there….to work with BIM

- mobile computing (UMPC: Ultra Mobile PC)
- wearable display
- wearable computing
- tracking and sensing (Barcoding, RFID, GPS, NFS, LTF, UWB, laser scanning, photo/videogrammetry, Pseudolite, sensors, etc.)
- GIS
- user interaction
- user interfaces
- groupware/social networking tools (Twitter, Facebook, Secondlife)
- Augmented Reality
- Virtual Reality/game engine
- cloud computing
- data storage and access technology
- semantics
- ……

Real-time Dynamic Planning

RFID

Barcode

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Example: What can Augmented Reality do for ductwork installation?

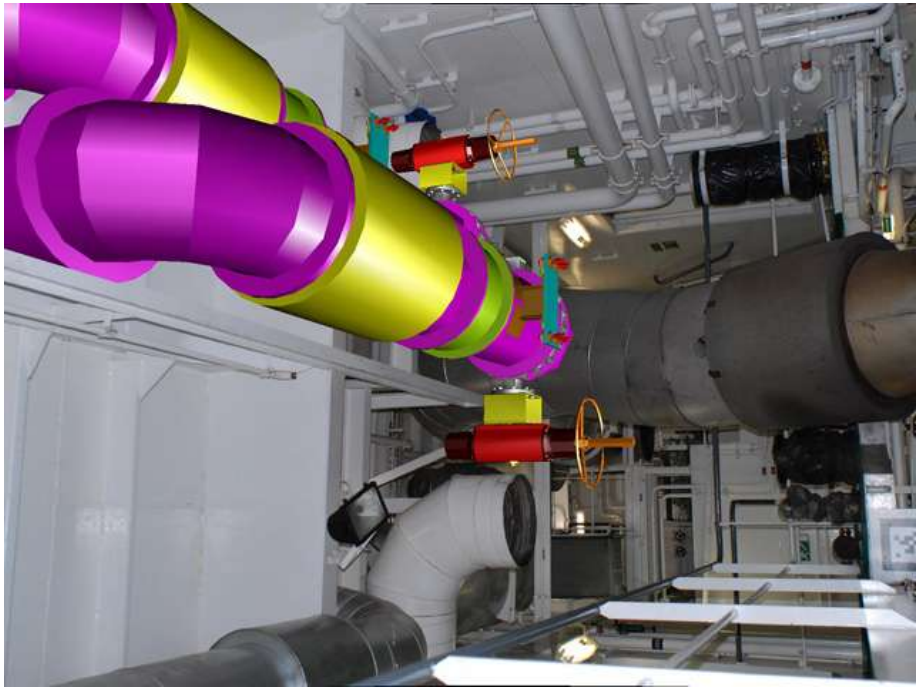

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Image source: Metaio Augmented Reality

Previous AR Projects of Prof. Wang

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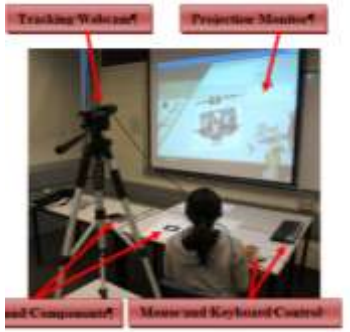
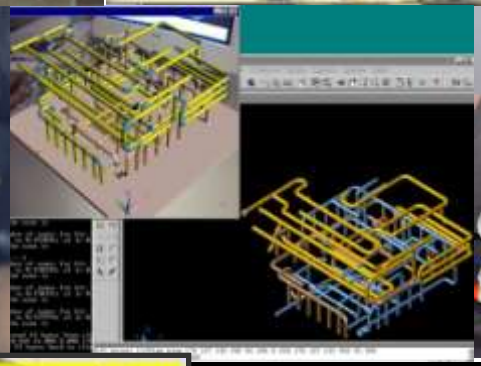
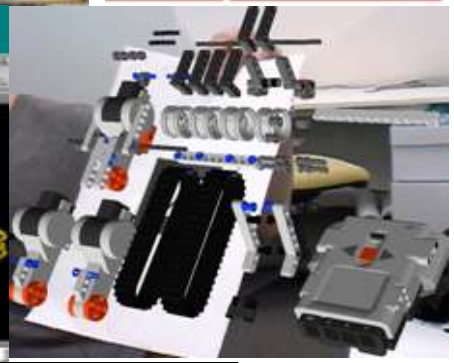
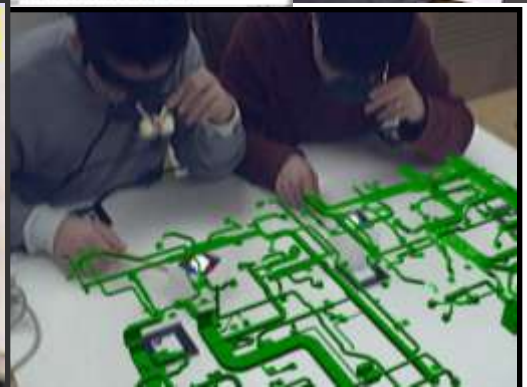
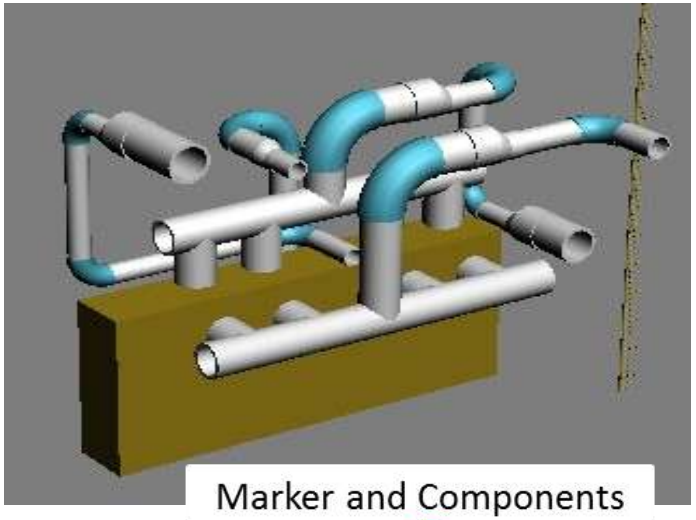




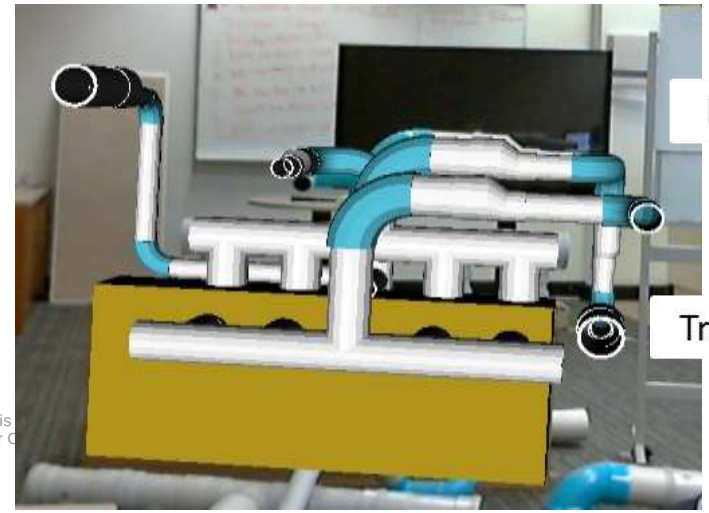




Augmented Reality for On-site Pipe Assembly and Training

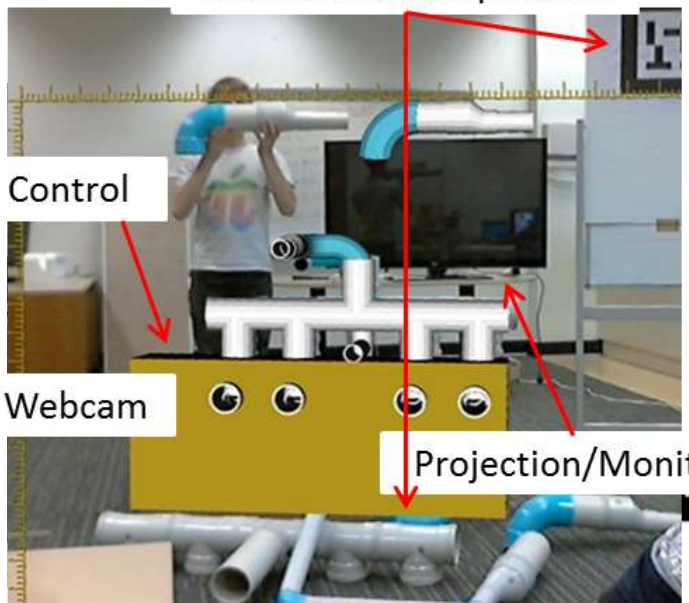


Marker and Components

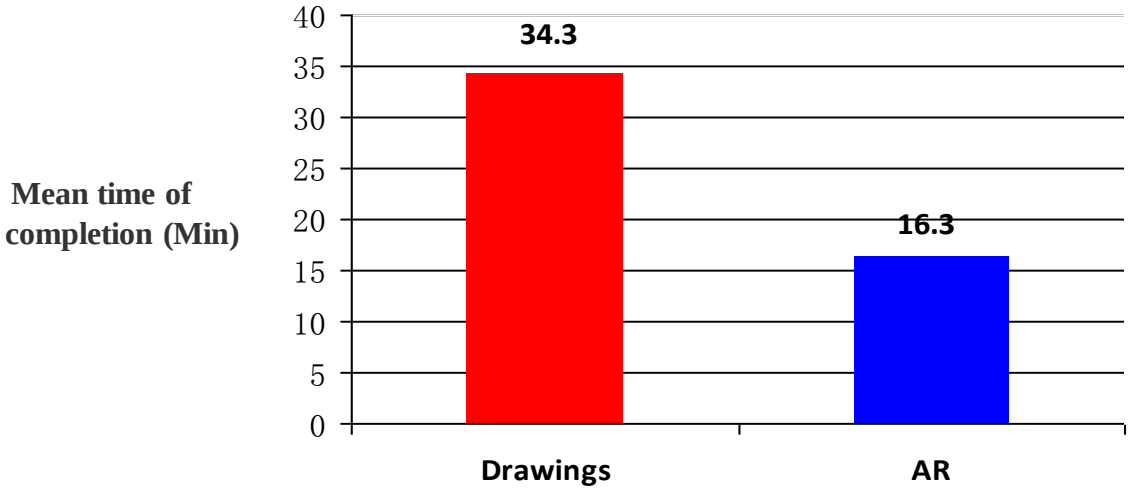


Mouse Control

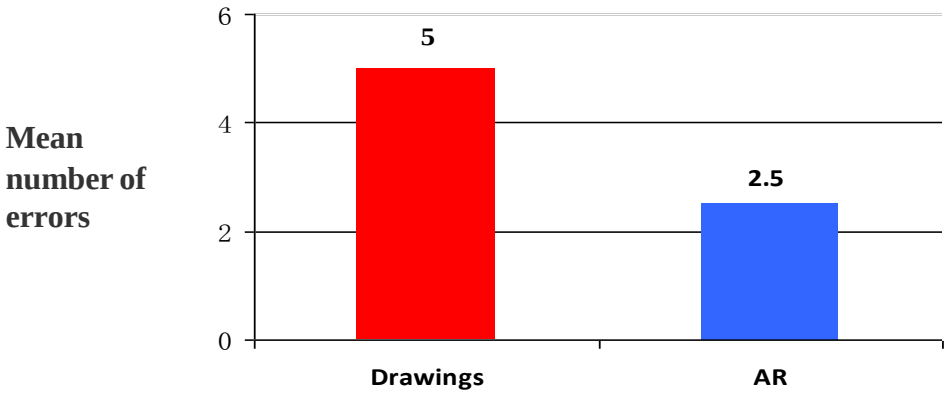
Tracking Webcam



Projection/Monitor



Average Time of Completing Pipeline Assembly



Average Number of Overall Errors in Pipeline Assembly

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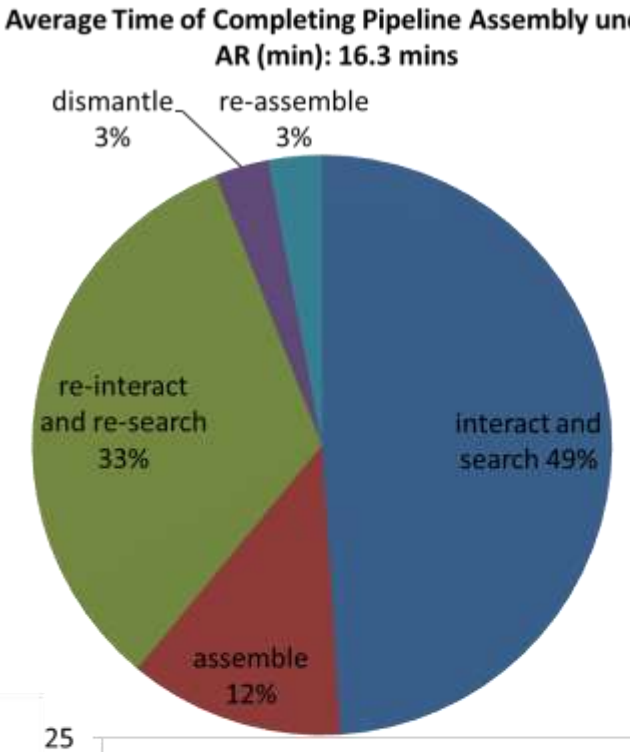

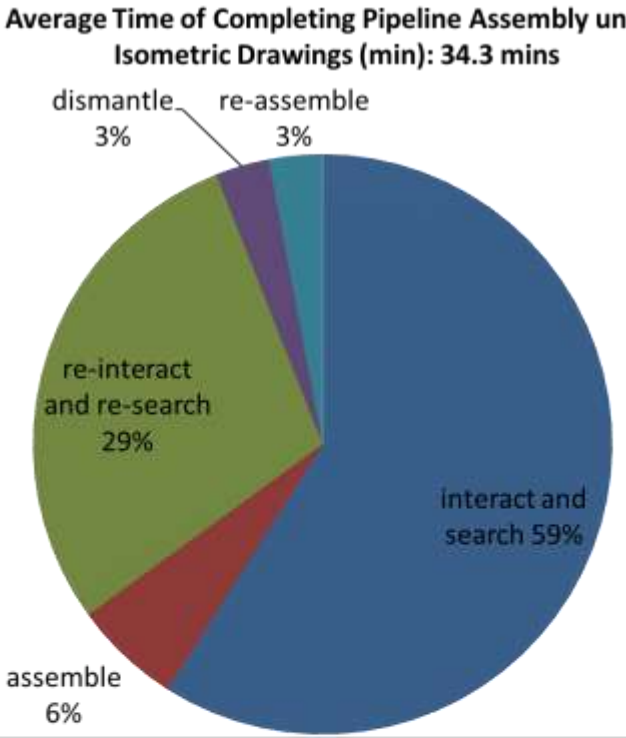

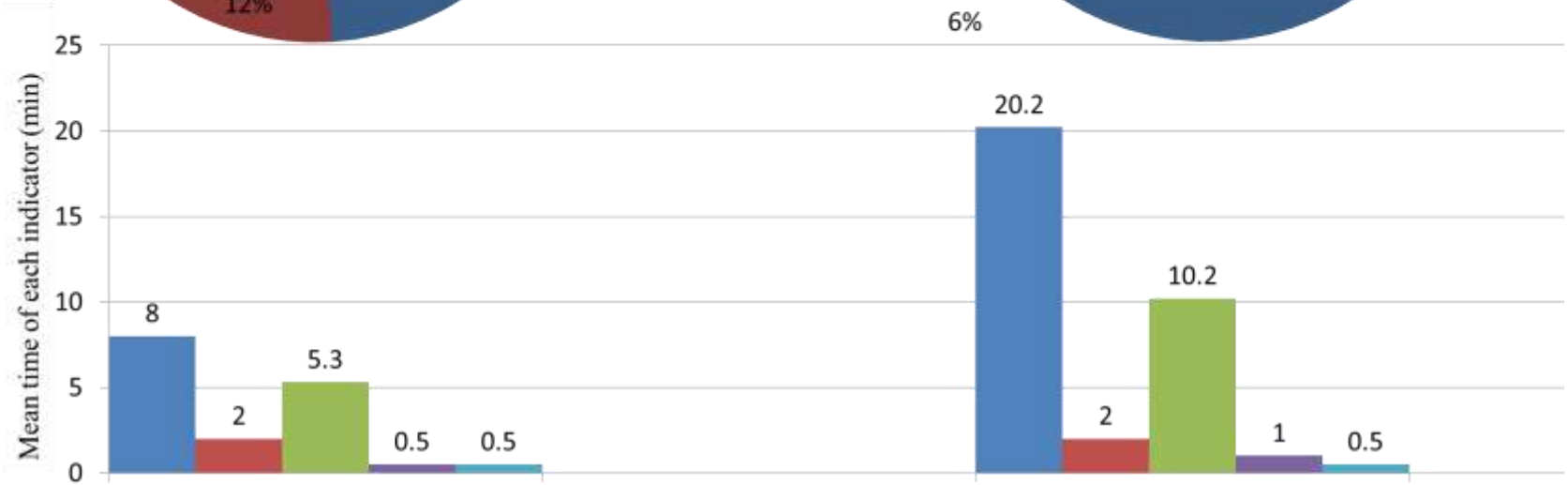

Individual Time Indicator Relative to Average Overall Time under Each Treatment

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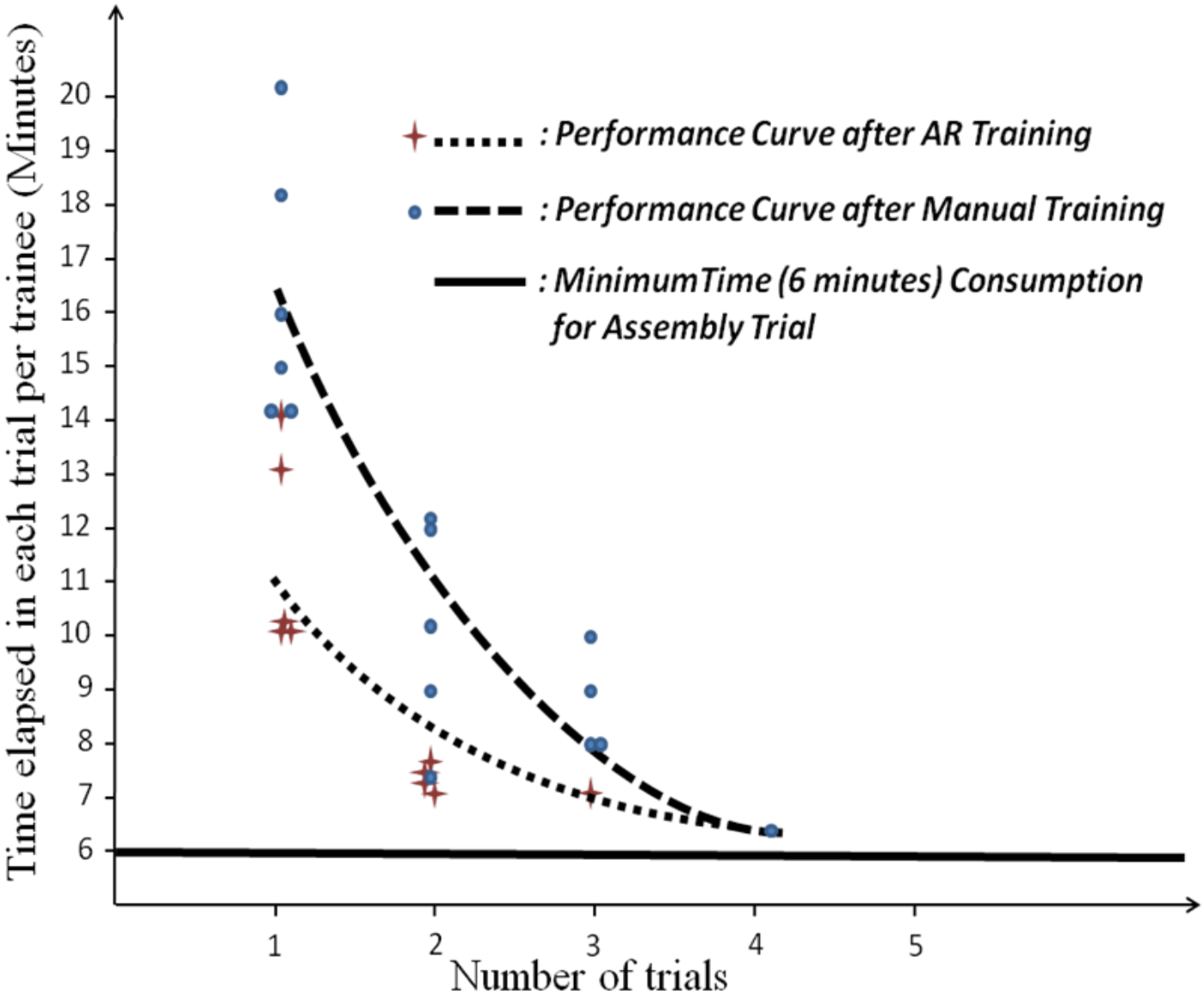

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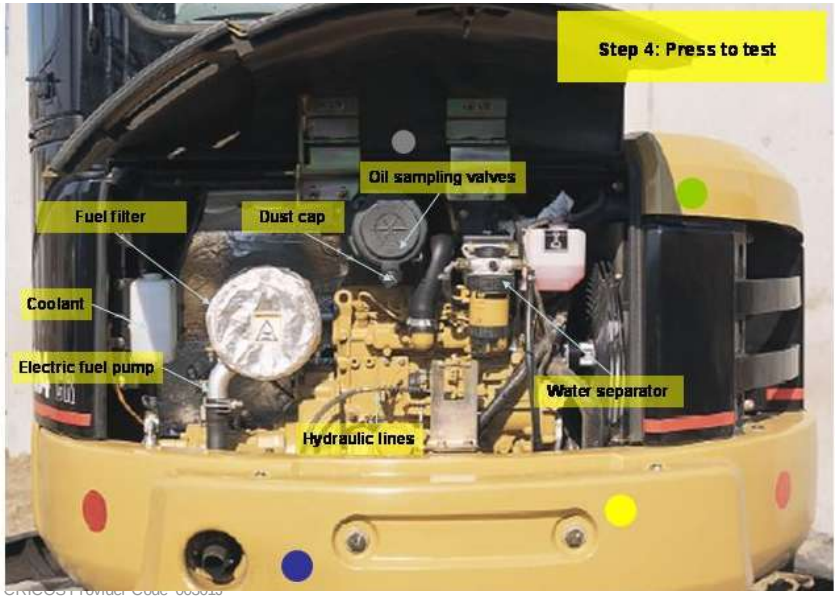
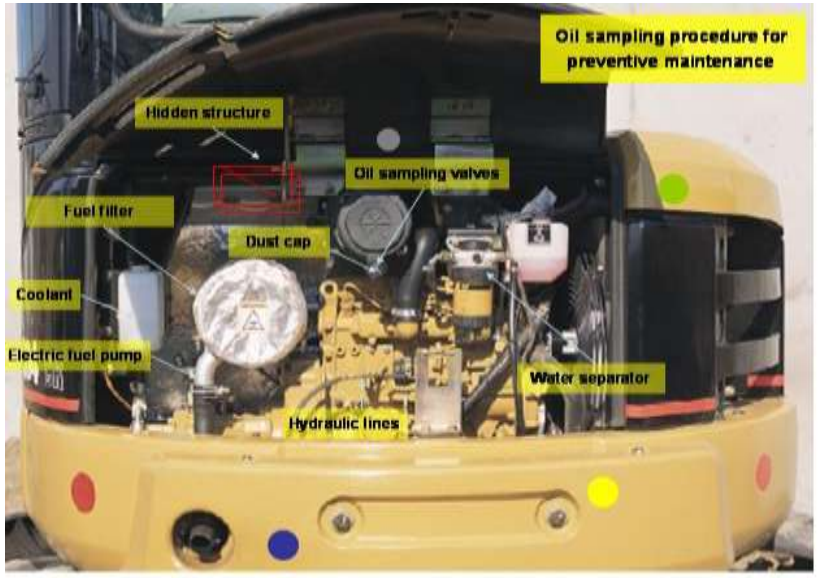
AR for Equipment Maintenance

entification of engine access panel

Recognition of open panel causes identification of components and instruction to remove cap



Recognition of cap removal causes new instruction to press test button.



Additional information about position of occluded filter bypass structure in response to user's query

What is happening?

- Australasian Research Centre for BIM at Curtin (Joint Research Centre with the BIM Centre at Huazhong University of Science and Technology (HUST))
- Joint technology, safety and productivity based research projects with:

  BIM Centre, National Taiwan University,

  Centre for Sustainable Healthy Buildings at Kyung Hee University, Korea

  Defect Reduction Project, Chung An University, Korea.
- Industry Workshop “Integration of Lean Construction and BIM” , Perth, Australia, twice a year, normally in July and February.
- Australasian ‘Conference on Innovative Technologies in Construction’, Wuhan, China, in 4-5, December 2012

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