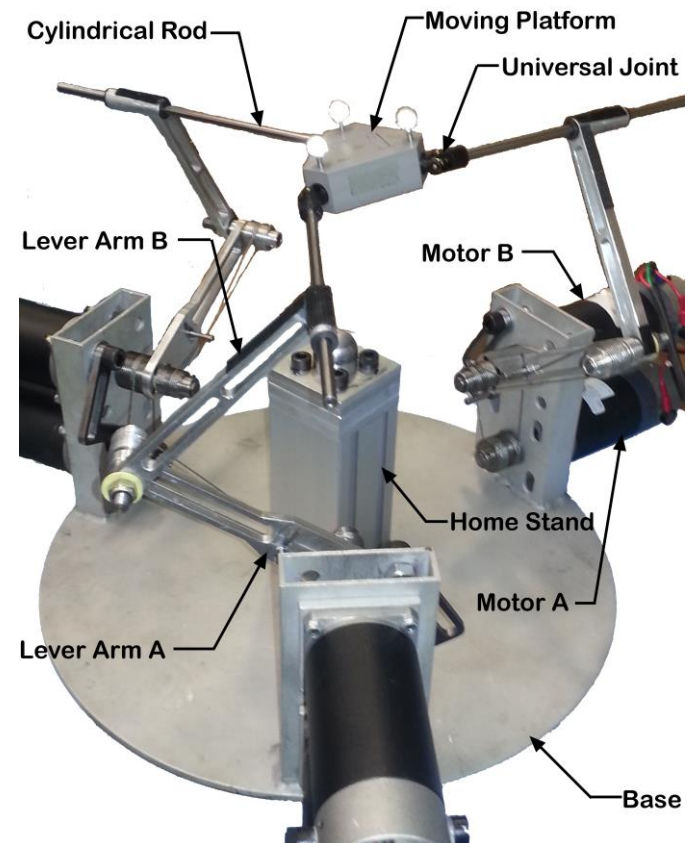


# Laboratory of Motion Generation and Analysis

## Monash Epicyclic Parallel Manipulator

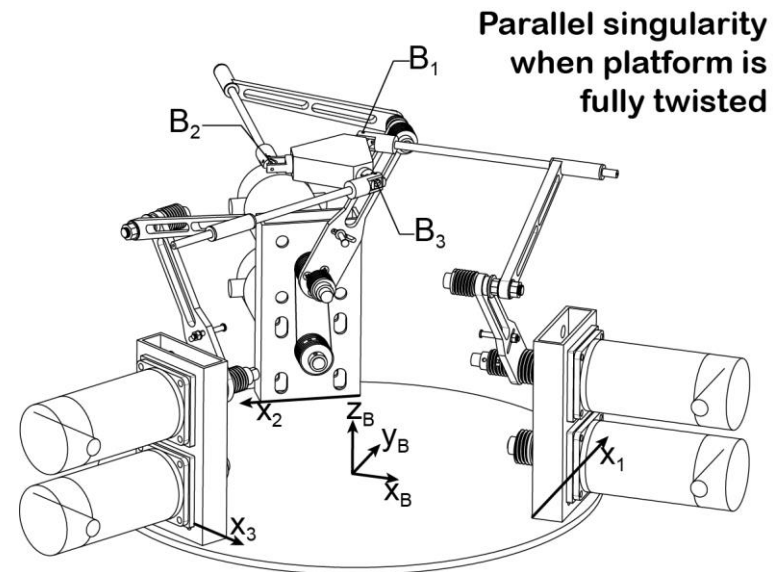
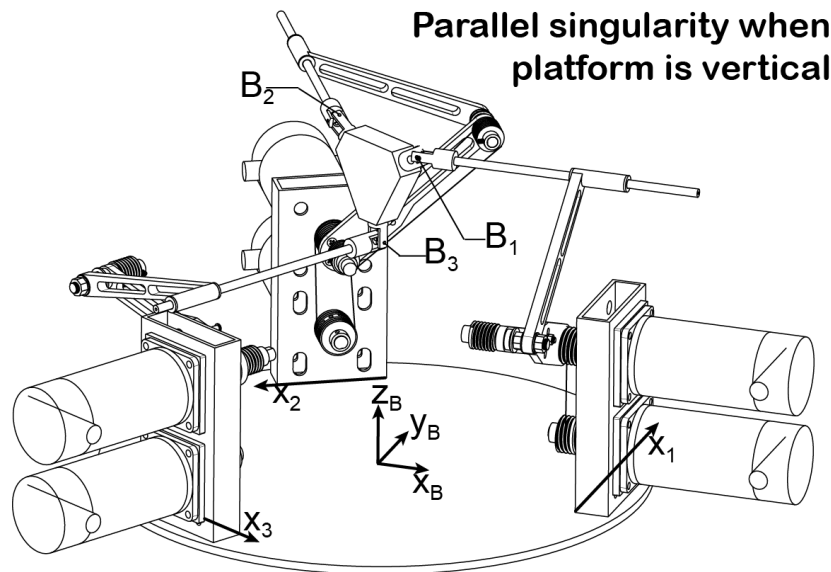
- Three-legged six-degree-of-freedom parallel mechanism
  - Three RRCU serial chains connect to common moving platform
  - Cable-pulley transmission
  - Base mounted actuation
  - Small moving mass and inertia
- Simpler geometric and dynamic models compared to other six-dof parallel mechanisms



# Laboratory of Motion Generation and Analysis

## Monash Epicyclic Parallel Manipulator

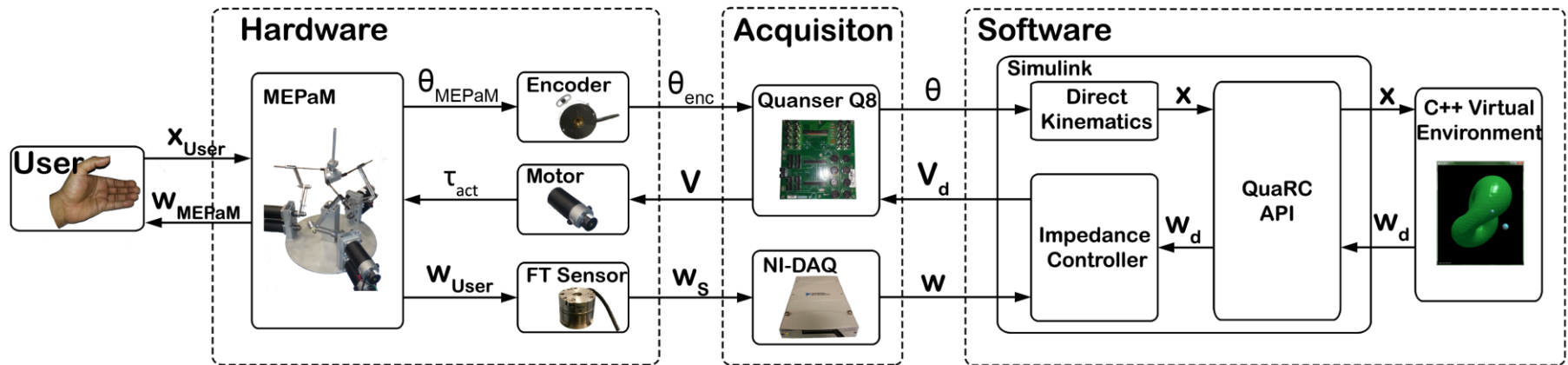
- Parallel singularities wholly dependent on orientation variables
  - Positional workspace has no interior singular regions
- Grassmann-Cayley Algebra used to obtain geometric insight into parallel singularities



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## Monash Epicyclic Parallel Manipulator

- Shown promise as a force-feedback haptic device
  - User controls position, device reflects forces to the user
  - Superior maximum rendered stiffness compared to two commercial six-dof haptic devices; comparable to another
  - Improvements required such that user perceives minimal device dynamics, i.e. to improve ‘transparency’



# Laboratory of Motion Generation and Analysis

## Monash Epicyclic Parallel Manipulator

### Students

- Mr T. Gayral, M. Eng, Graduated in 2012, IRCCyN, Nantes
- Dr S. Abeywardena, PhD, Graduated in 2014, MAE, Monash

### Collaborations

- Prof S. Caro, Prof D. Chablat and Dr S Briot, IRCCyN, Nantes

### Funding supports

- French Australian Science Technology Program 2010
- Monash ESGS 2010

### Selected publications

- Abeywardena, S. and Chen, C., 2016, Inverse dynamic modelling of a three-legged six-degree-of-freedom parallel mechanism, *Multibody System Dynamics*.
- Chen, C., Gayral, T., Caro, S., Chablat, D., Moroz, G., Abeywardena S., 2012, A Six-Dof Epicyclic-Parallel Manipulator, *ASME Journal of Mechanism and Robotics*, 4, November, 041011.