



SWINBURNE
UNIVERSITY OF
TECHNOLOGY

Collaborative Manipulators based on Parallel Kinematic Architecture

CRICOS provider 00111D

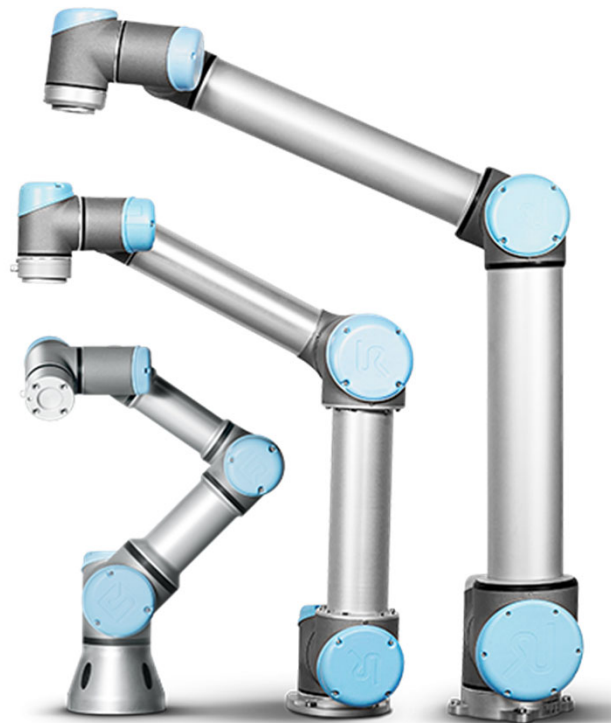
Candidate: Alaleh Arian
Principal Supervisor: Mats Isaksson

PhD Project

Collaborative Manipulators based on Parallel Kinematic Architecture

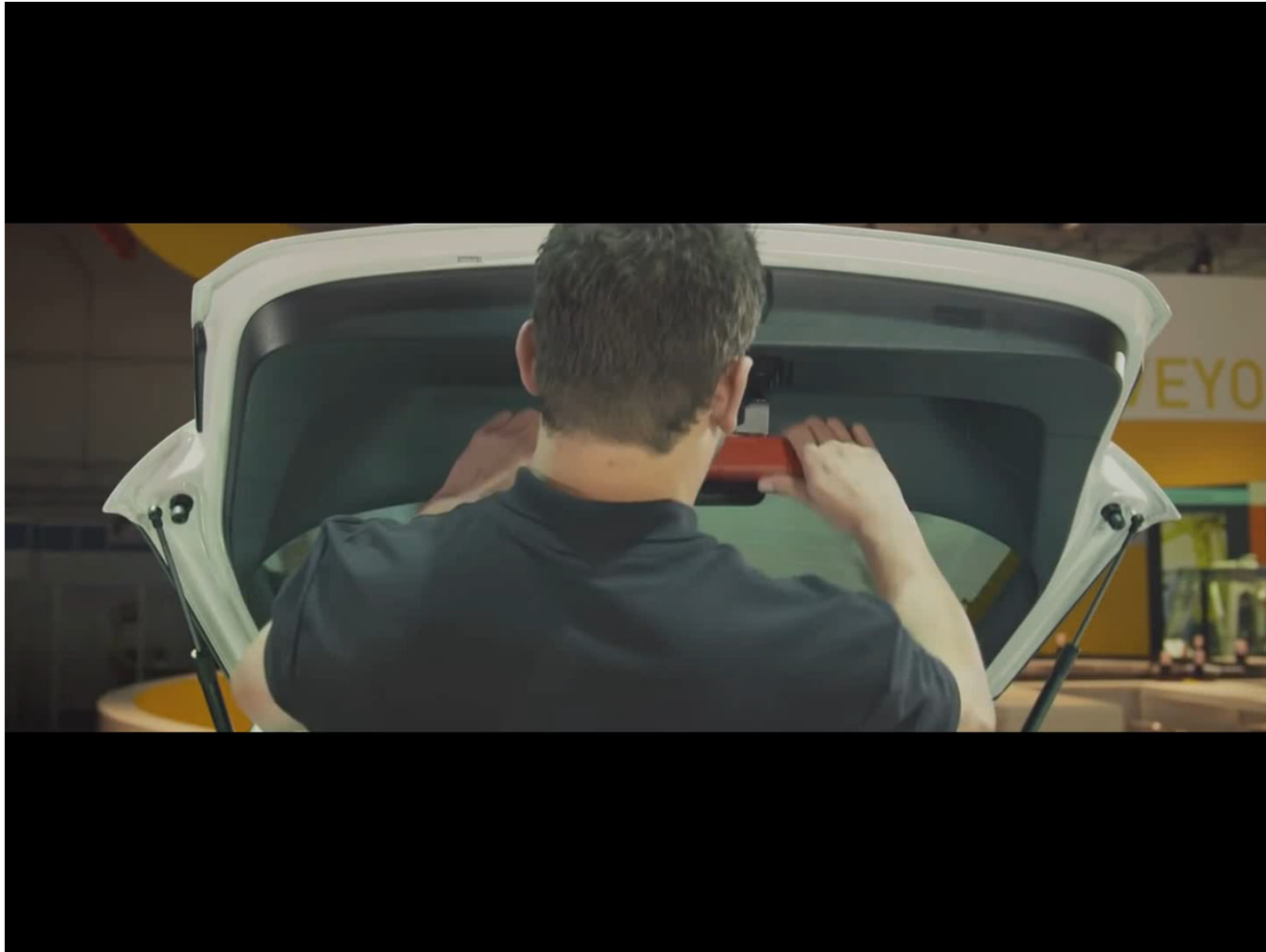
Background

- Collaborative robots (Cobots)
 - ✓ **Definition**
 - ✓ Benefits
 - ✓ Applications
 - ✓ Features
 - ✓ Types



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Background

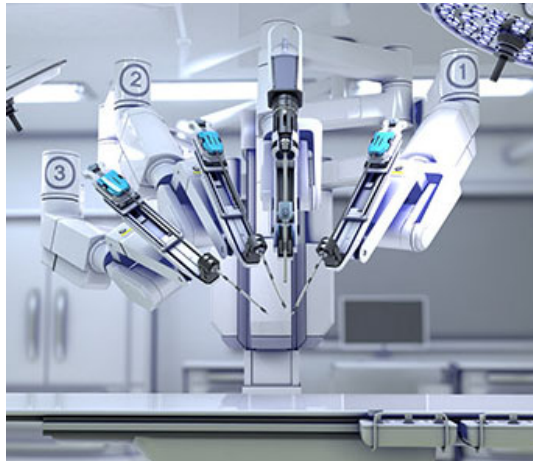
- Collaborative robots (Cobots)
 - ✓ Definition
 - ✓ **Benefits**
 - ✓ Applications
 - ✓ Features
 - ✓ Types
- Weight compensation
- Strength amplification
- More consistent and accurate than humans

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- ☐ Pick and place
- ☐ Packaging and pelletizing
- ☐ Assembly
- ☐ Machine tending
- ☐ Injection molding
- ☐ Biomedical purposes
- ☐ ...

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- ❑ Power and force limiting
- ❑ Hand guiding



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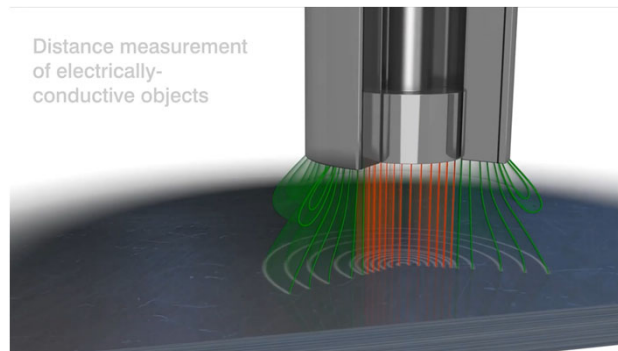
Collaborative Manipulators based on Parallel Kinematic Architecture

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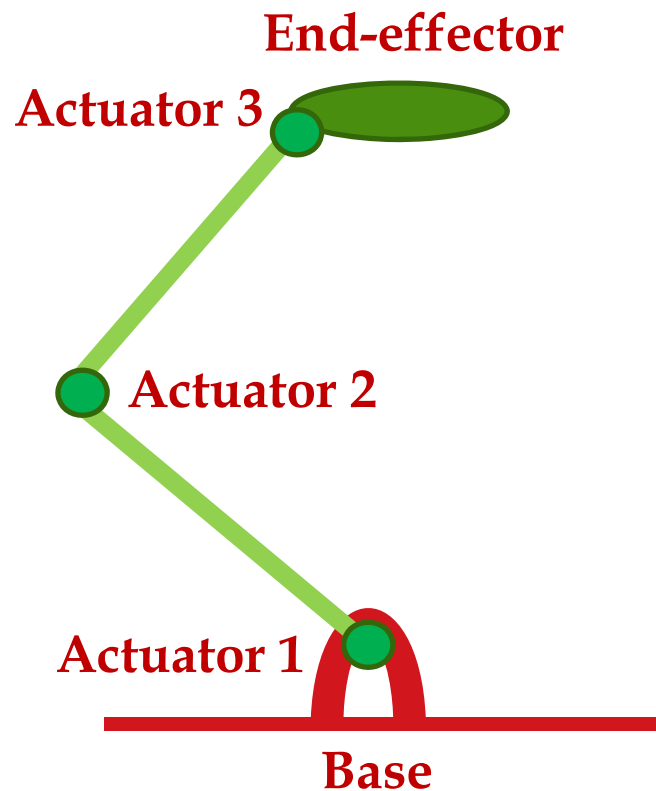
- ✓ Definition
- ✓ Benefits
- ✓ Applications
- ✓ Features
- ✓ **Types**

- ☐ Joint Sensing (most common)
- ☐ Force Sensor Base
- ☐ Inherently Safe (weak)
- ☐ Skin Sensing (Safest)
 - Tactile Sensor (physical interaction)
 - Capacitive Sensor (dielectric different from air)

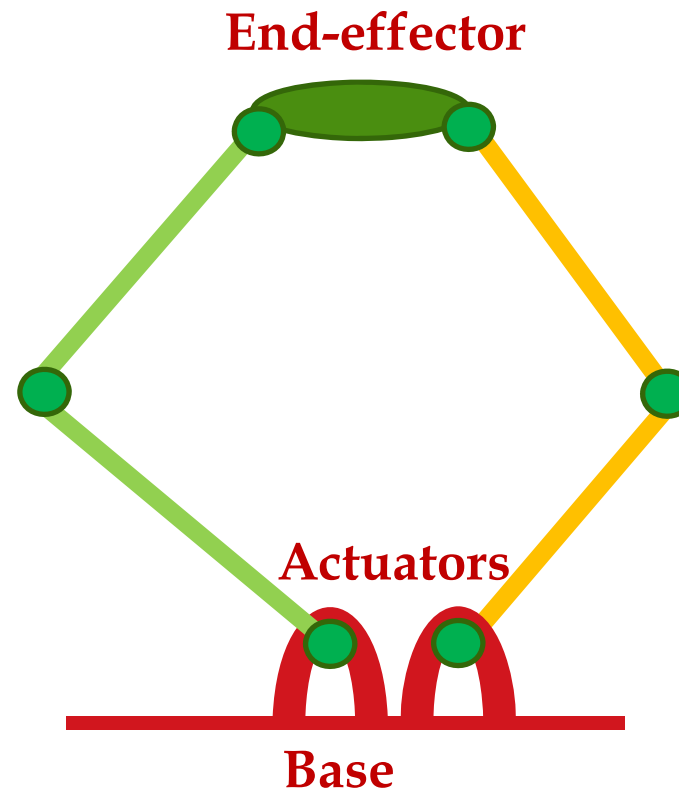


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Serial robot



Parallel robot

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Parallel robot and their features and benefits

| Feature | Serial robot | Parallel robot |
|----------------------------|---|---|
| Stiffness | Low | High |
| Areas of application | A great number in different areas, especially in industry | Currently limited, especially in industry |
| Payload/weight ratio | Low | High |
| Speed and acceleration | Low | High |
| Accuracy | Low | High |
| Workspace/robot size ratio | High | Low |

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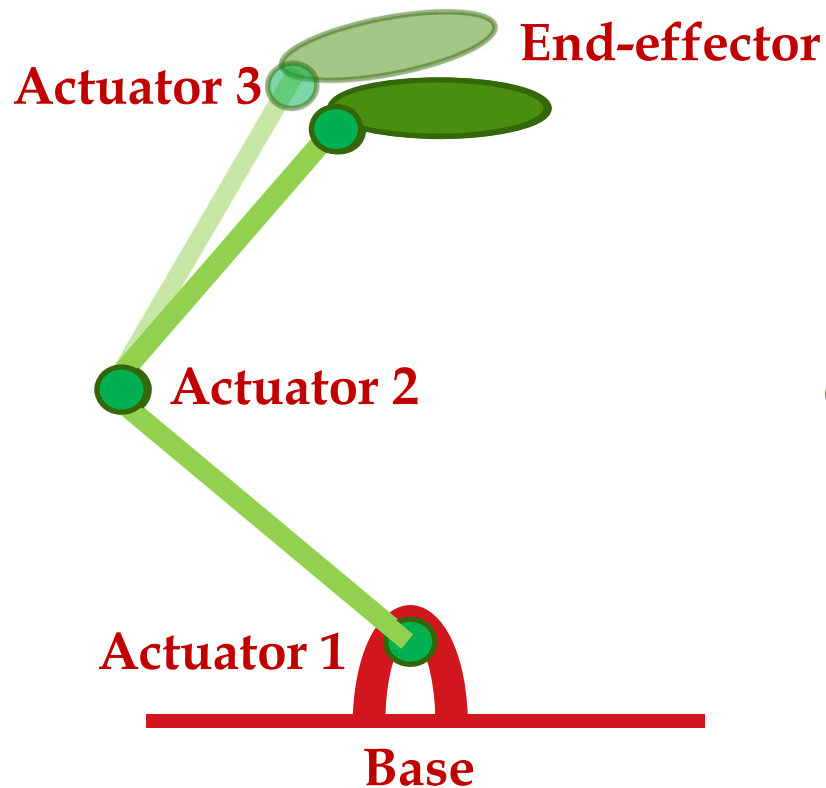
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Parallel robot and their features and benefits

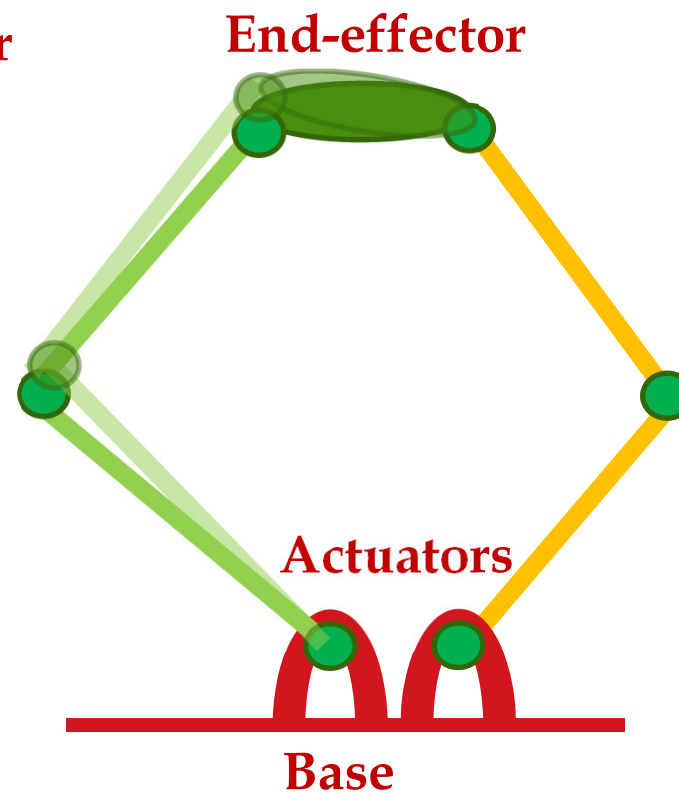
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Serial robot

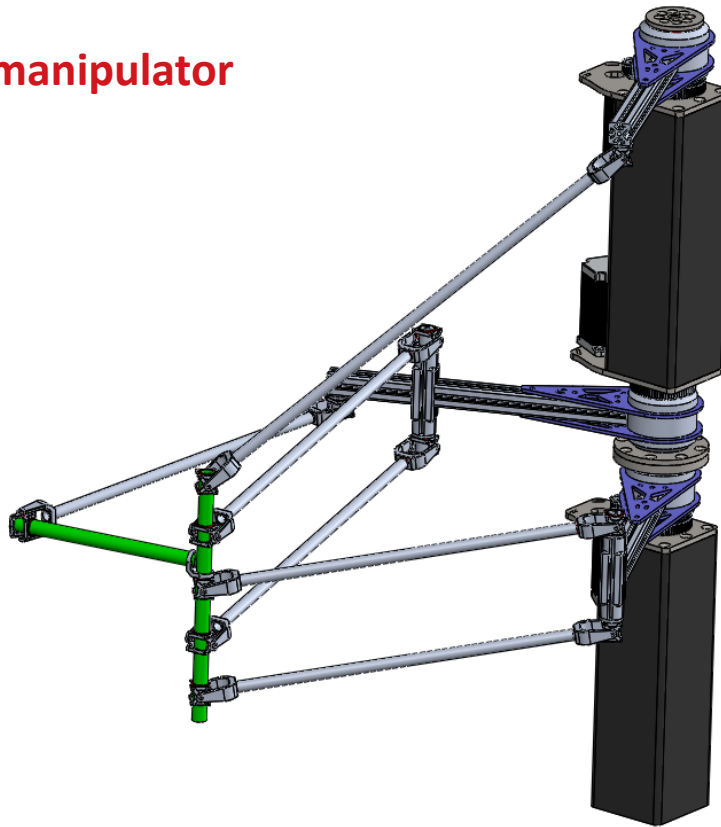


Parallel robot

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Understudy parallel manipulator
-Parallel arm
-3-DOF

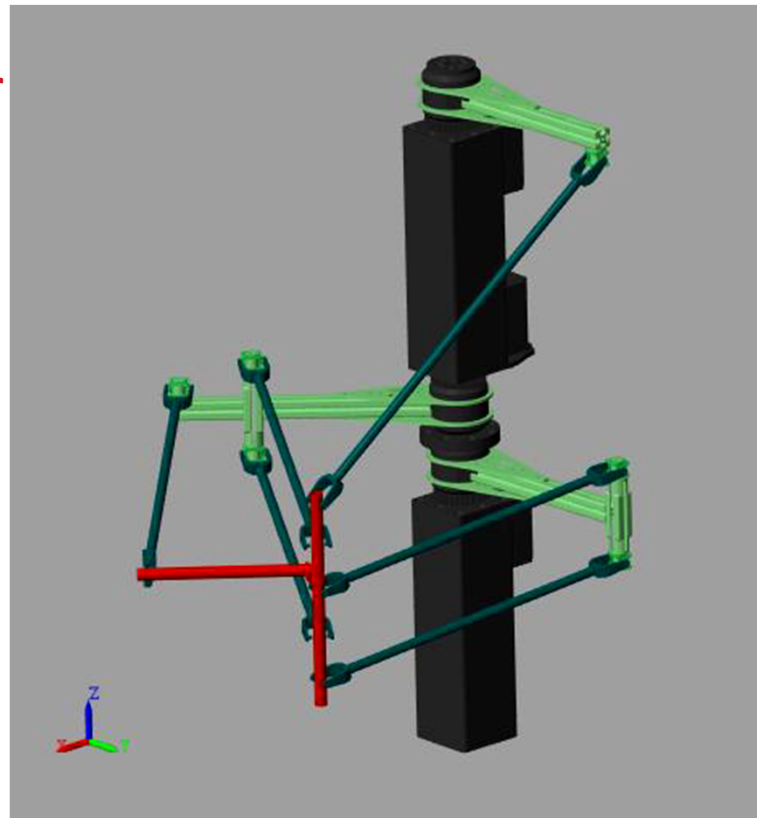


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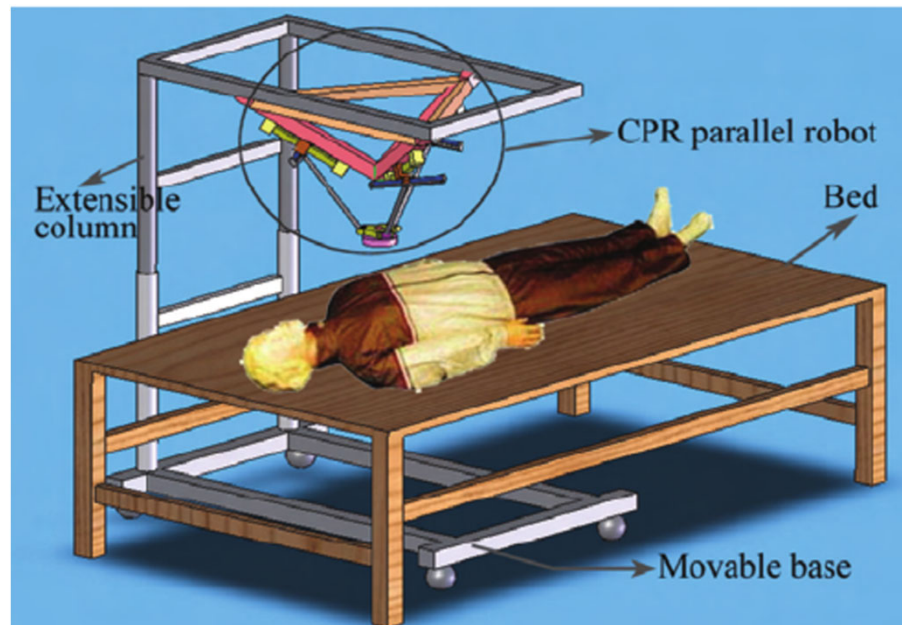
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Collaborative Manipulators based on Parallel Kinematic Architecture

Make a collaborative robot for biomedical purposes

- Joint Sensing
- Skin Sensing



Thank you!

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