Lecture Notes on Robotics

Course Code (M1596)

Dr. Mohamed Shehata Saleh

Department of Mechanical Engineering
Benha Faculty of Engineering
Benha University

Lecture 01: Introduction to Robotics Course

Course Description

Course Information

Robotics **M1596** Starts: February 11, 2024

Tuesday: 09:00 AM - 11:25 AM Lecture Room: A4

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Lecturer Contact Information

Lecturer:
Mohamed Shehata, Ph.D.
Tele.: 01091688215
Email: mohamed.saleh@bhit.bu.edu.eg

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Teaching Assistant:
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Tele.: 01002798908
Email: ayman.sayed@bhit.bu.edu.eg

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12. Introduction to robot control.
13. Linear and nonlinear position control.

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Grading policy

Final Exam	90
Midterm Exam	20
Assignments	10
Section work	10
Attendance/Participation	5
Project	15
Total	**150**

Class attendance: Attendance will be taken once time randomly.

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- **Colour Detector:** system consists of sensors and pistons that separate different objects according to their colours.

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- **Pick and place arm robot:** Arm robot used to transport object from one place to another.
- **Robot position and orientation:** How can you identify the robot position and orientation in an unknown environment?
- **Obstacle avoidance robot:** The goal is to design a robot that can avoid obstacle by using array of sensors in different direction.

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Important Software in robotics field

- **Programming software:** such as Matlab, Python, C++ , Maple, Javascript ..... etc.
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Further details will be in given during the semester

Break

Questions

Introduction to robotics (Robot Definition)

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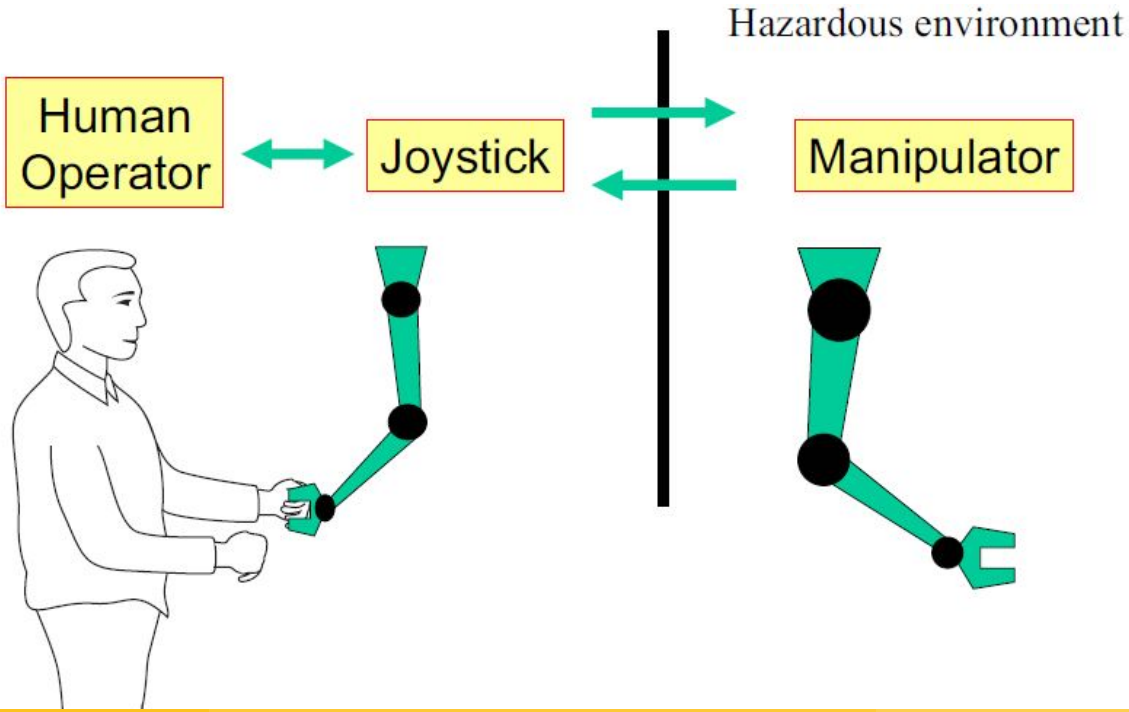
A motorized controlled machine that can be human operator or programmed to do a variety of tasks especially repeatable and tiresome ones.



Introduction to robotics (Robot Definition)

What meant by the word Robot?

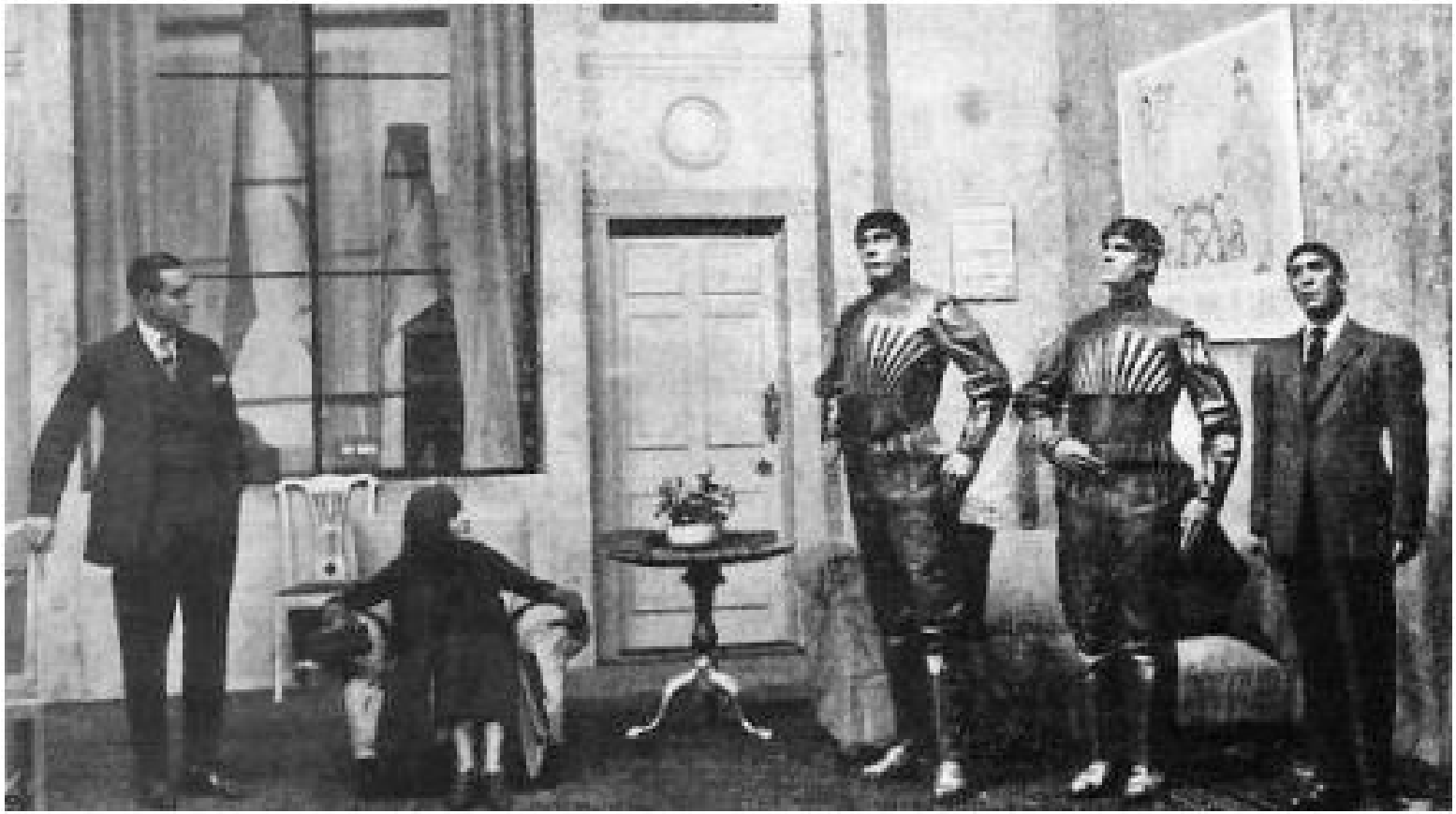
The study of robotics concerns itself with the desire to synthesize some aspects of human function by the use of mechanisms, sensors, actuators, and computers.

Programmed robot

Robonova

Introduction to robotics (Robot History)

The term **robot** was first used in 1920 by the Czech author Karel Capek in his play RUR (Rossum Universal Robot) and tis drive from the Greek word **Robota**.



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The earliest designs of industrial robots were put into production process during world war I and extended to world war II. These manipulators had joints modelled on human shoulder-arm-wrist kinetics to replicate human motions like pulling, pushing, pressing and lifting.

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At the end of 1940s and the beginning of 1950, developer of robots had the idea of combining the NC milling machine to produce an automation process of mass production.

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In 1954, Devol filed a U.S. patent for a new machine for part transfer, and he claimed the basic concept of teach-in/playback to control the device. This scheme is now extensively used in most of today's industrial robots.

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Some Examples of industrial robots are FANCUC, SCARA, ABB and many others.

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Development of humanoid robots continued to advance; Robonaut 2 was launched to the International Space Station aboard Space Shuttle Discovery on the STS-133 mission in 2011 as the first humanoid robot in space.

Introduction to robotics (Robot History)

By the very end of the decade, robotics had started to make advancements on the nanotechnology scale. In 2019, engineers at the University of Pennsylvania created millions of nanobots in just a few weeks using technology borrowed from the mature semiconductor industry.

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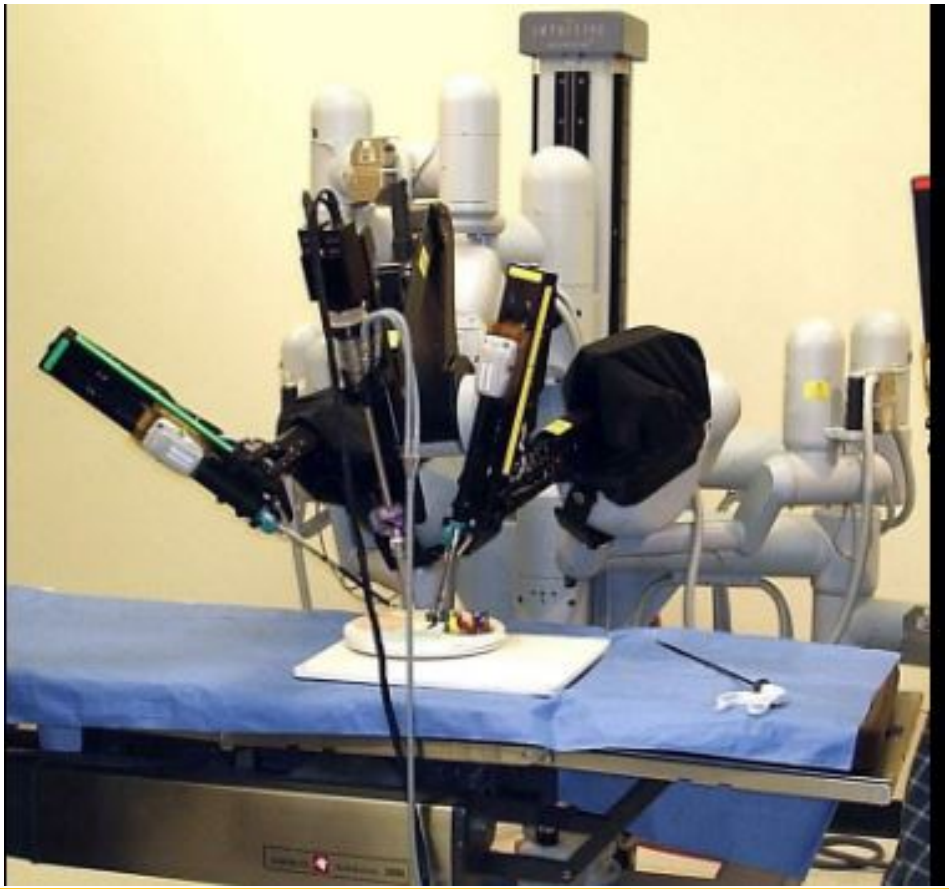

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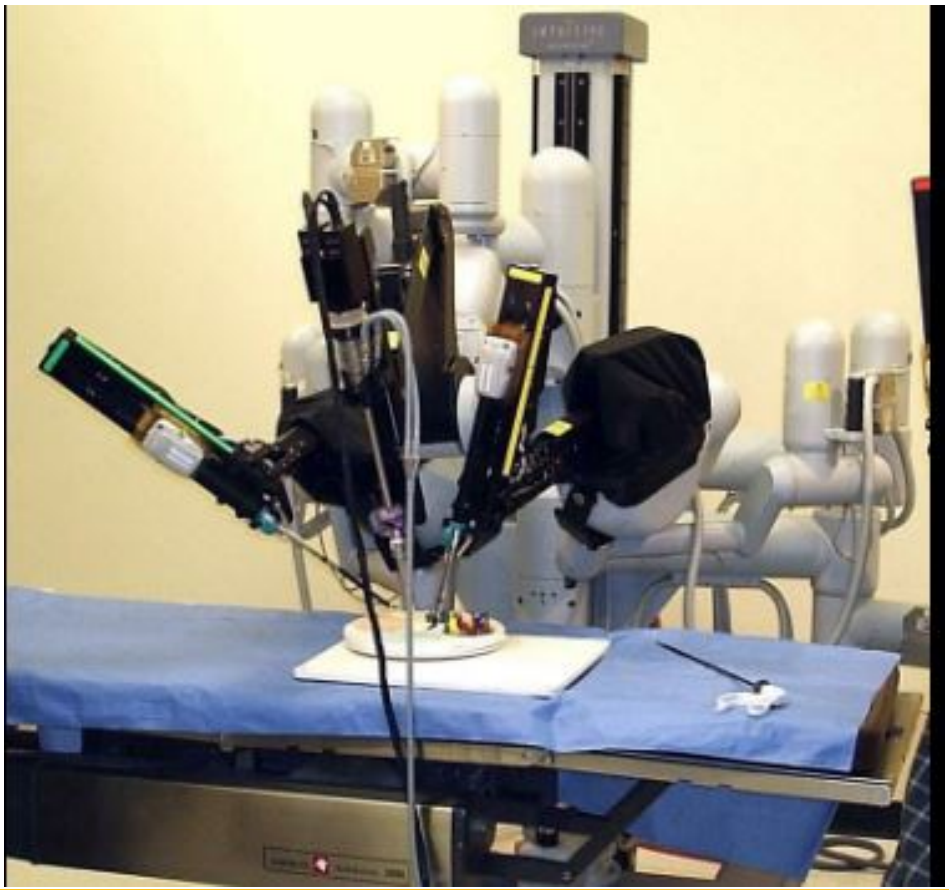

These microscopic robots, small enough to be injected into the human body and controlled wirelessly, could one day deliver medications and perform surgeries, revolutionizing medicine and health. **Finally, with the great development in artificial intelligence, no one can predict what will happen in the future of robots.**

Matlab Simulation Example

This course focuses on the mechanics and control of the most important form of the industrial robot manipulator. This curriculum is textbook-research-based,aligns with standards, and focuses on the development of 21st century skill sets in students.

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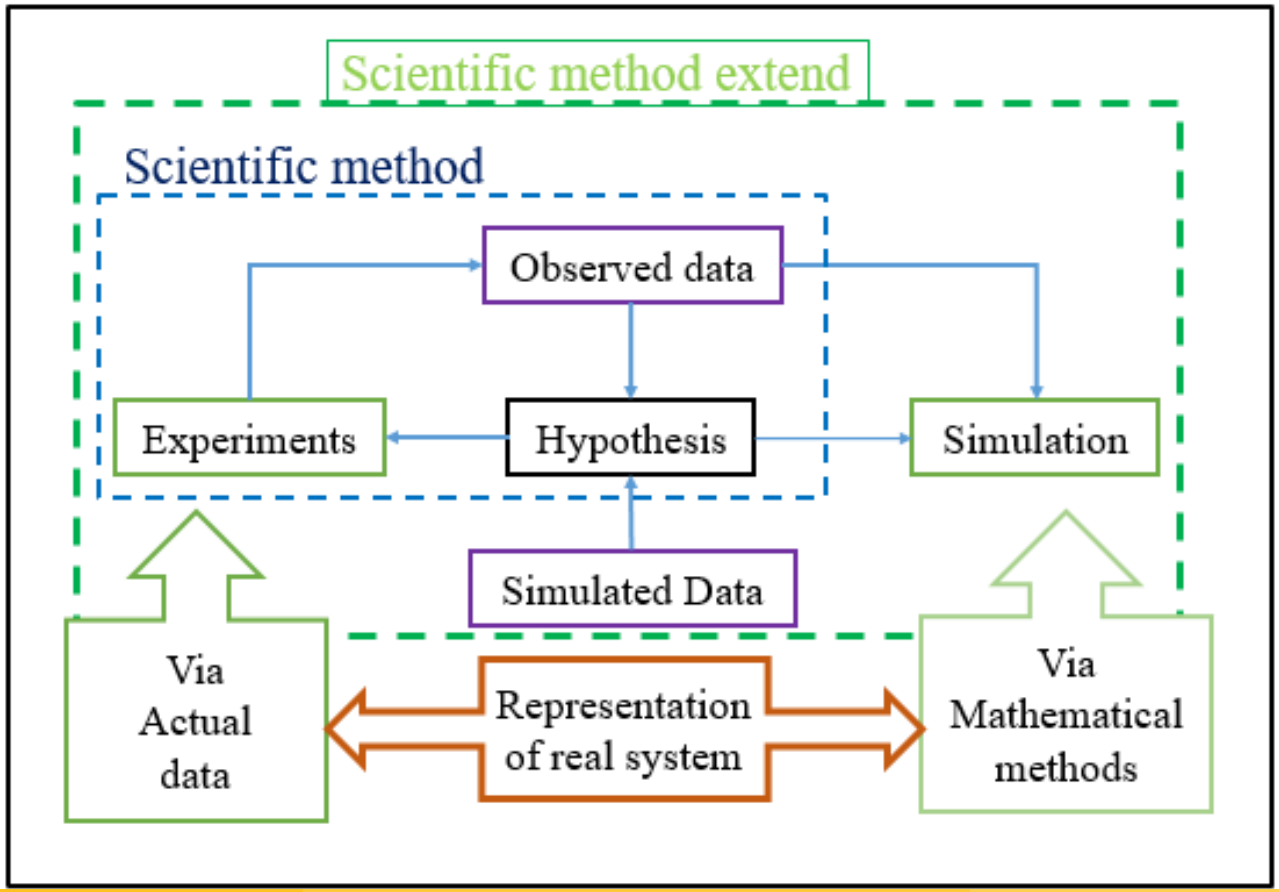

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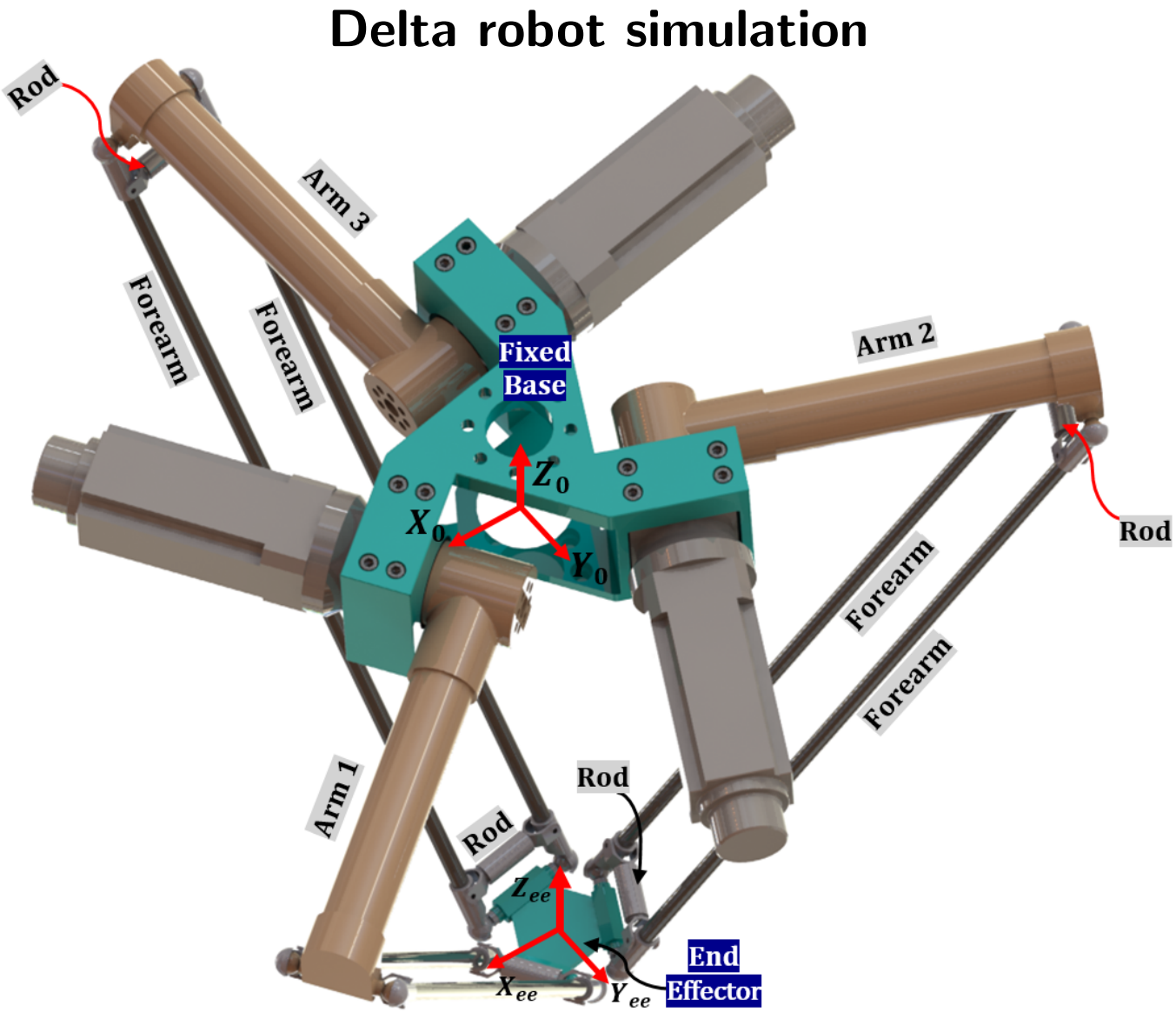

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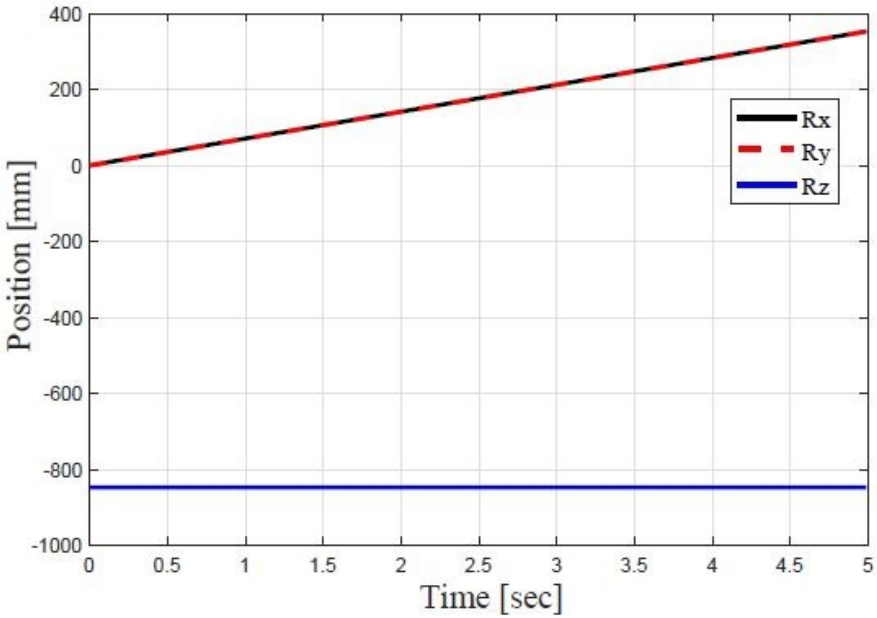
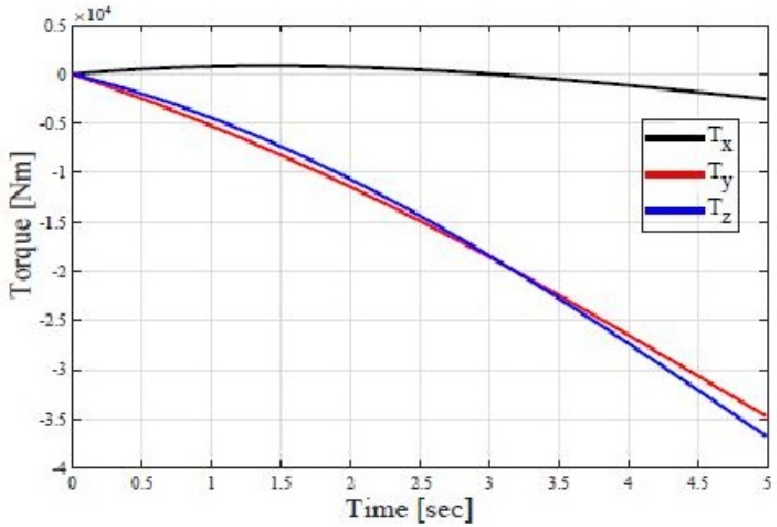


Fig 4-5 Displacement of point p on the end-effector



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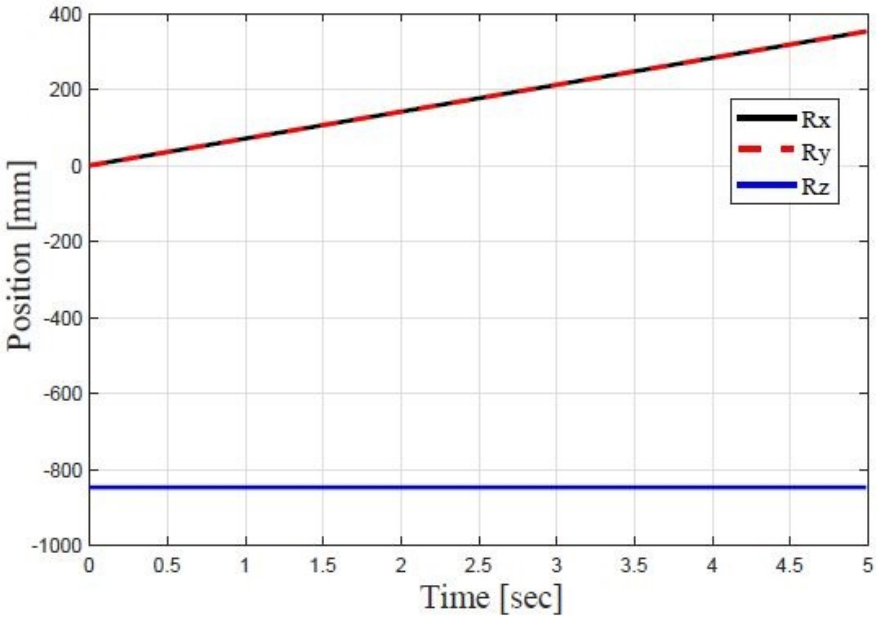

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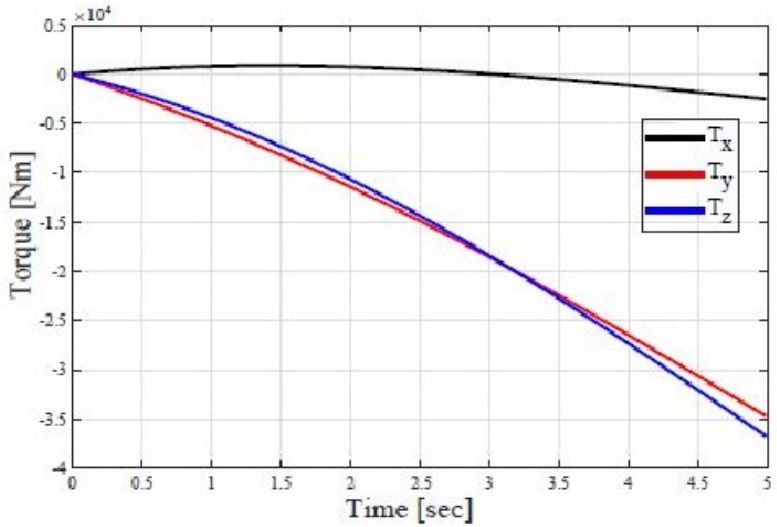
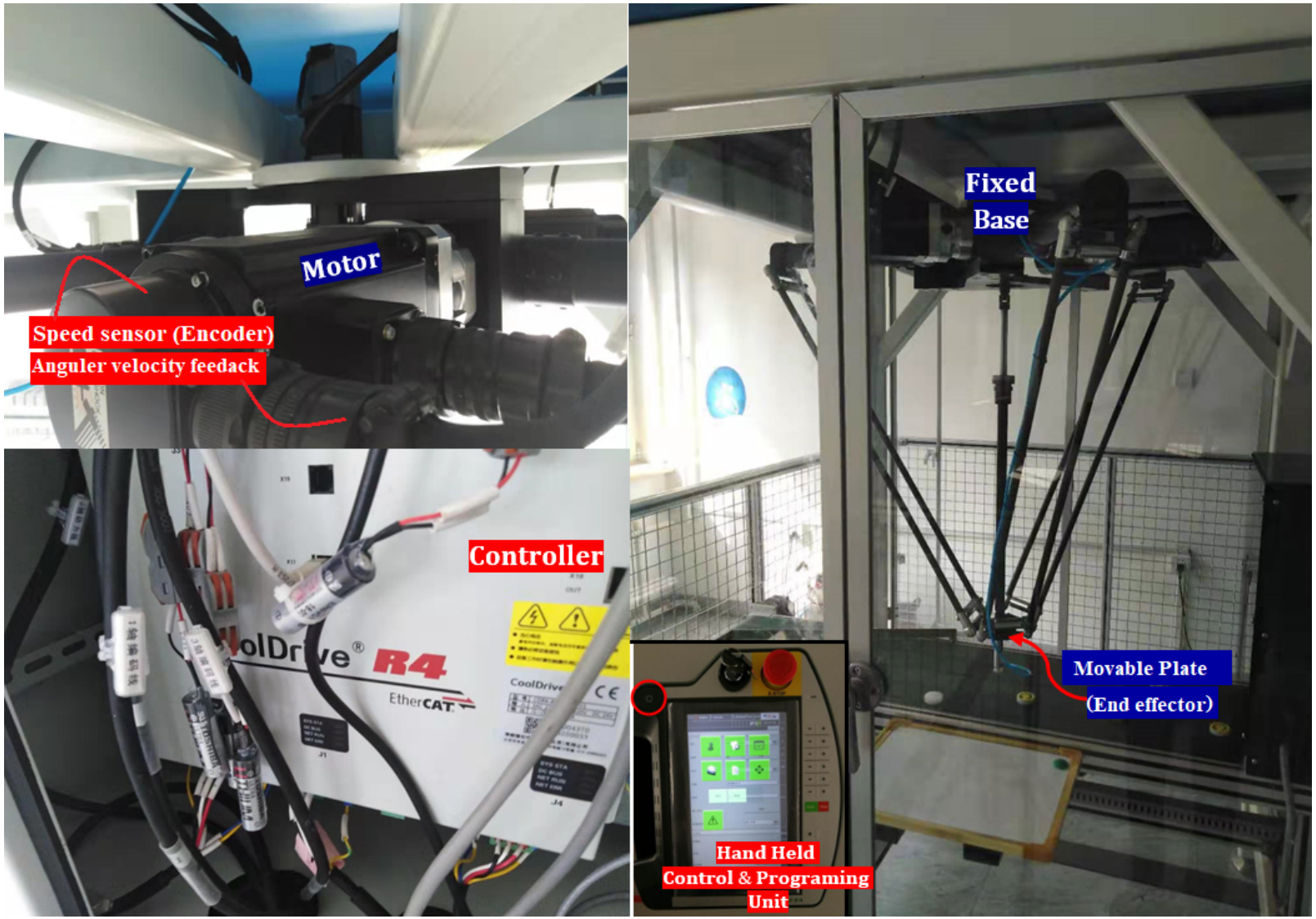


b) Reaction torque on base frame

To develop the mathematical model, we need to be familiar with vectors in space and matrix operations.

Experimental validation



Lecture end

Thank You for Attention !!

Any Questions