Summer Training Presentation

College of Computer Sciences and Engineering

Smart Methods company – Electronic & Power

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COE399 - Summer Training – 203

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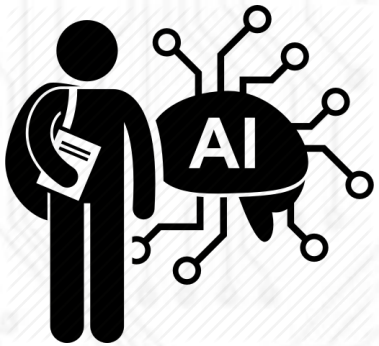
Working procedure

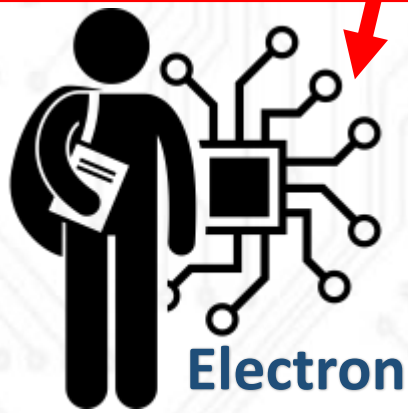
Internet of things

Industrial & systems engineering

Mechanical designing & industrial engineering



Artificial intelligence in robotic



Electronics and power engineering

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Internship concept

Tasks → Learning resources → Implementing and submitting → Review

This training is on the job not academic


IOT

COMPANY BACKGROUND

- Establishment of the company
- Location of the company
- Types of services/products given/produced
- Mission statement and aim of the company
- Organizational chart of the company
- Staff Information

Establishment of the company

- National commercial corporation
- Established in 2010
- Specialized in automated machine, robots, and artificial intelligence.
- Considered 1st in service of researchers and innovators in Arab world
- Classified by Forbes magazine as one of the most innovative companies in Saudi Arabia in the latest classification in 2015

Location of the company

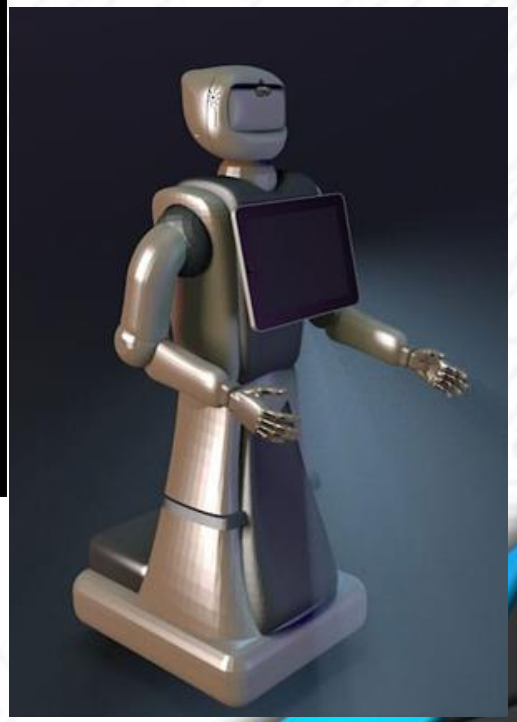
Saudi Arabia – Makkah & Riyadh

- **Headquarter Office:** Butha Quraish - Main street - Almudaa Building - Office No.7
- **Sales Branch:** Misfalah - Alkenkariah Street - Afwaj Al-Tawba Hotel - Exhibition No.4
- **Reception Branch:** Wadi Makkah - Company Building - Office No.

Types of products produced

- Coffee Serving Robot

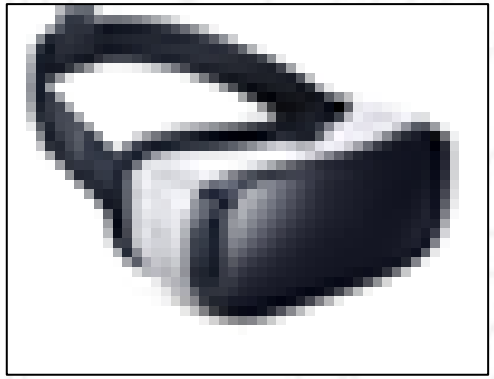
- Service Robot



Mission statement and aim

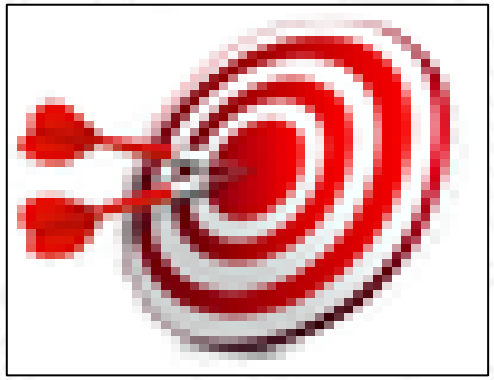
- **Mission statement:**

  transform the technology generation from users to producers and developers.



- **Aim:**

  To be the first destination for innovators and researchers in the Arab world and provide them with everything they need in the field of electronics, mechanics, and computers.



Staff Information

- **Number of staff:** in general 6+.
- **Age groups:** 25 – 50.
- **Education level:** High education engineers with bachelor's or master's degree.
- **Experience:** staff experience range between 2-15 years**.**
- **Behavior:** respectable and cooperative with each other.
- **Dress & Grooming:** Thobe or any acceptance dress.

Organizational chart of the company

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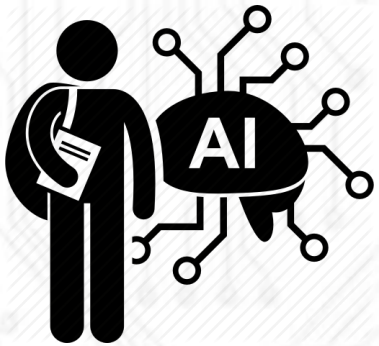
Internet of things

Industrial & systems engineering

Mechanical designing & industrial engineering



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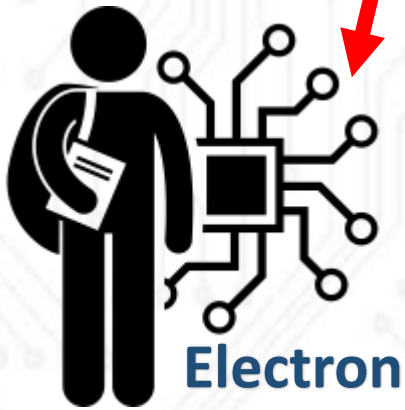


Electronics and power engineering

Mechanical Engineering:-

- **Field of work & Responsibility:**
  - 3-dimensional design
  - engineering and mechanical drawing
  - mechanical movement.

Electronics and Power Engineering:-

- **Field of work & Responsibility:**
  - Programming with C and Embedded C.
  - Writing algorithms and data structuring.
  - Electronic rotor design and installation
  - Geometry Calculations

IoT and software development:-

- **Field of work & Responsibility:**
  - Programming with Python
  - Dealing with the ROS Operation system
  - Programming with TensorFlow

Robotics and AI:-

- **Field of work & Responsibility:**
  - Programming with PHP and Java
  - Database management using MySQL and Fire Base
  - Using the IBM and Watson flutter

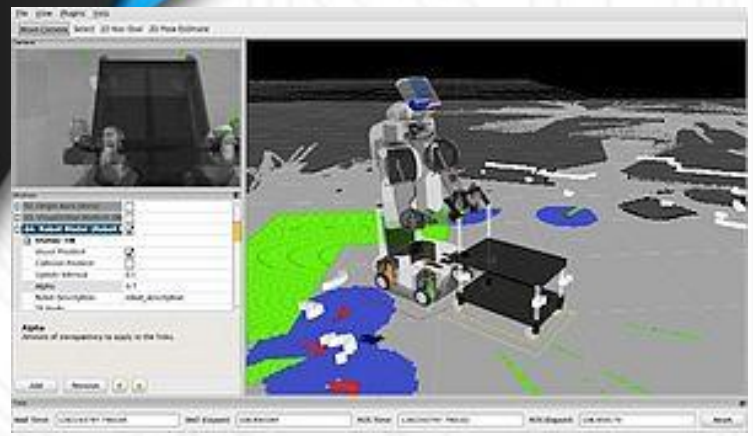
Industrial and system engineering:-

- **Field of work & Responsibility:**
  - Engineering Project Management
  - Industrial planning for production lines
  - Analysis of projects innovative and complexity
  - Applying practical application of actual projects.

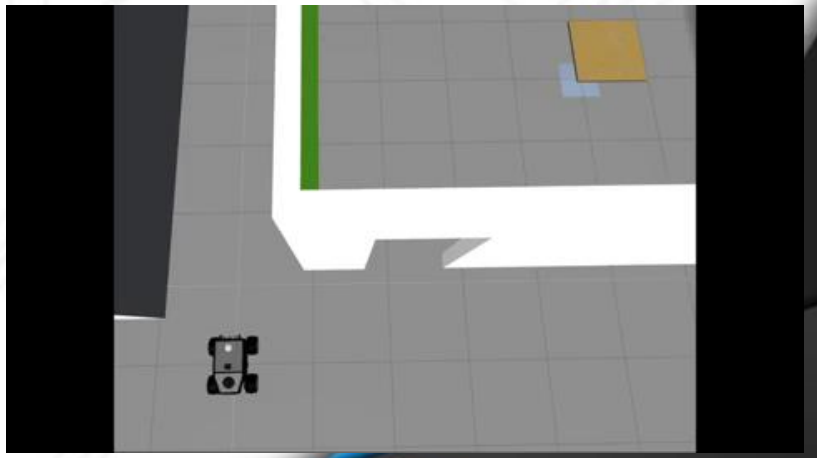
WORK EXPERIENCE

- **PROJECT:** Build Reception & Serving Robot
  - My Department: Electronics and Power
  - Project description
  - What I did
  - What I learned
  - How will this experience help me in the future?
  - Limitations
  - Time spends
  - Project/ Task Status

Project description

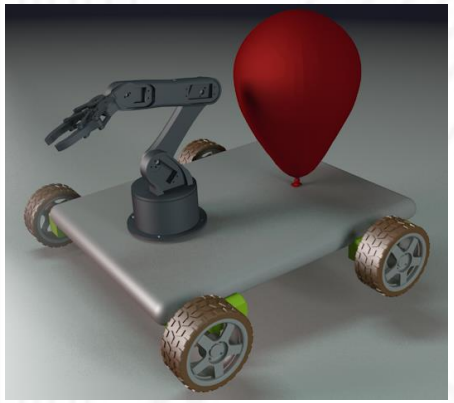


TINKERCAD



Requirements

- Robot arm
- Movement ability
- Recharging system
- Interaction screen
- Voice communication
- Movement detecting



Structure and Developed Models

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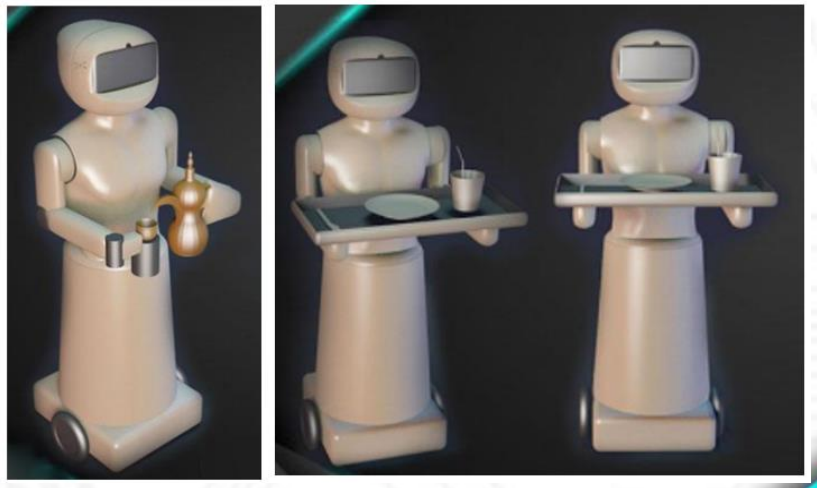
Reception Robot

Serving Robot



Description of the hardware used

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- Arduino Uno
- Servo motors
- LCD screen
- Ultrasonic sensor
- Bluetooth module
- Speaker
- DC Motor






Software packages used

- Arduino IDE
- Tinkercad
- Ubuntu
- ROS
- The Construct
- Oracle VirtualBox

Company Stiff

المهندس/ عاصم

المهندسة/ منيرة

المهندسة/ أسماء

المهندس/ خالد

المهندسة/ شيماء

المهندسة/ نادرة

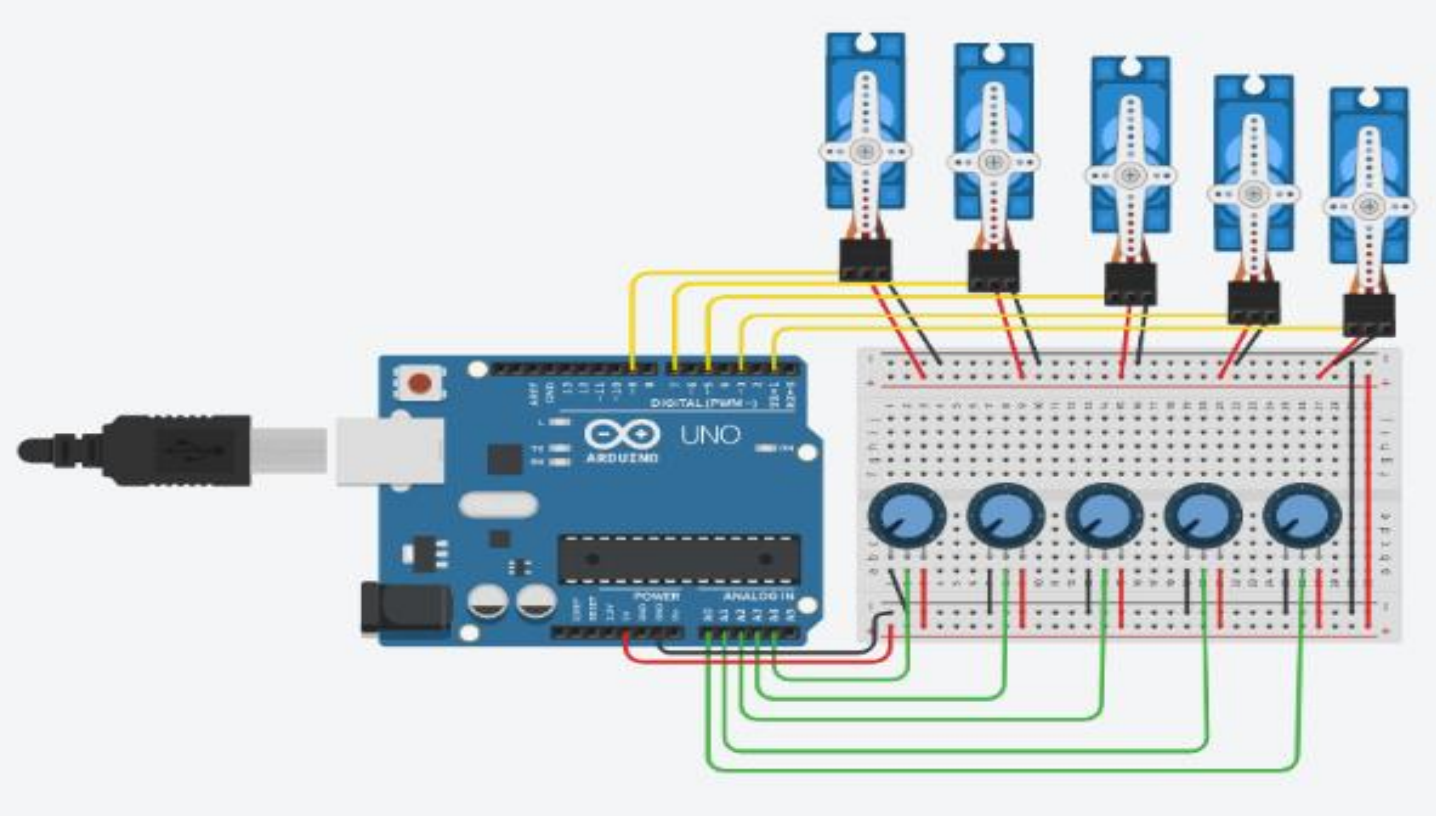
What I did (my role)

- Motor drive design and implementation for
  - Robot arm.
  - Two-wheel robot base.
  - Robot sensing.
  - Reception robot.
  - Restaurant robot.

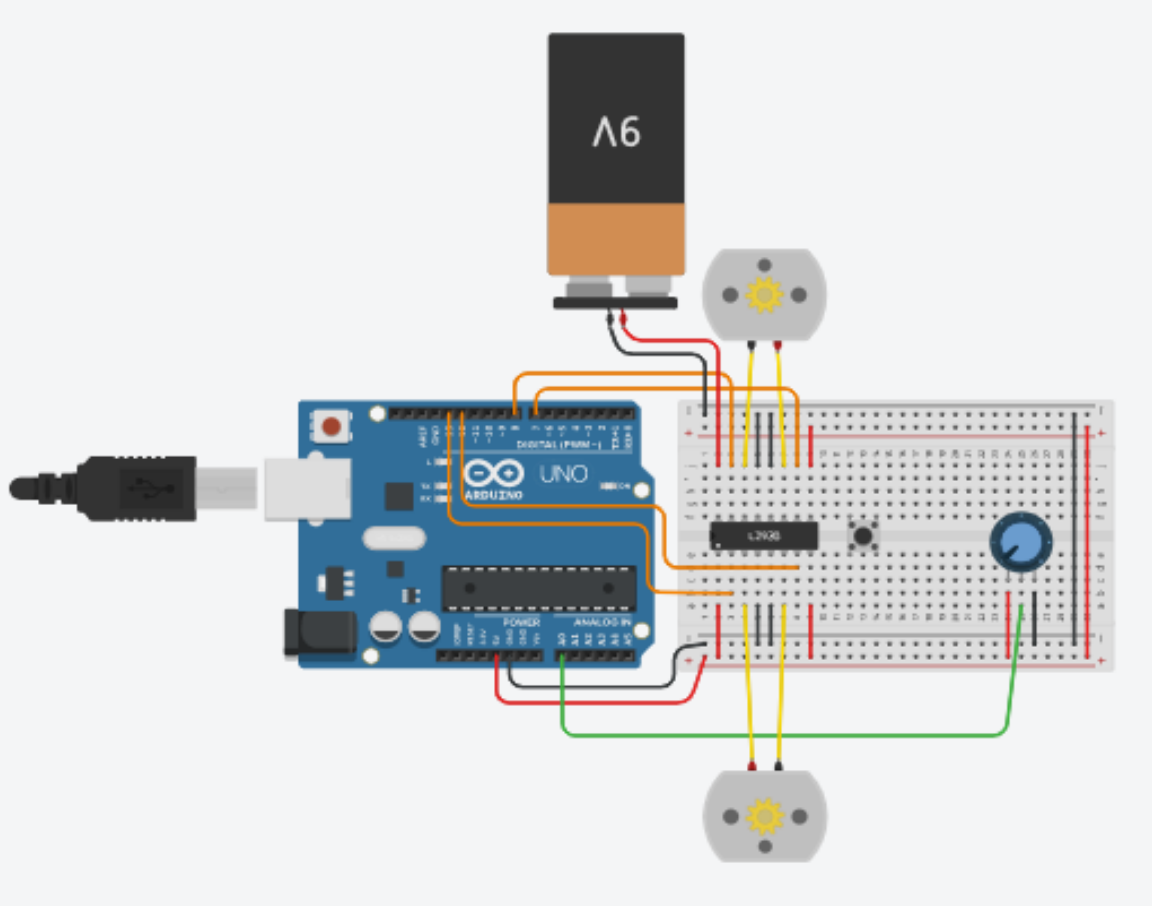
- (IoT and software development department) tasks.

- (Mechanical department) tasks.

Robot Arm Circuit



Wheel Robot Base Circuit



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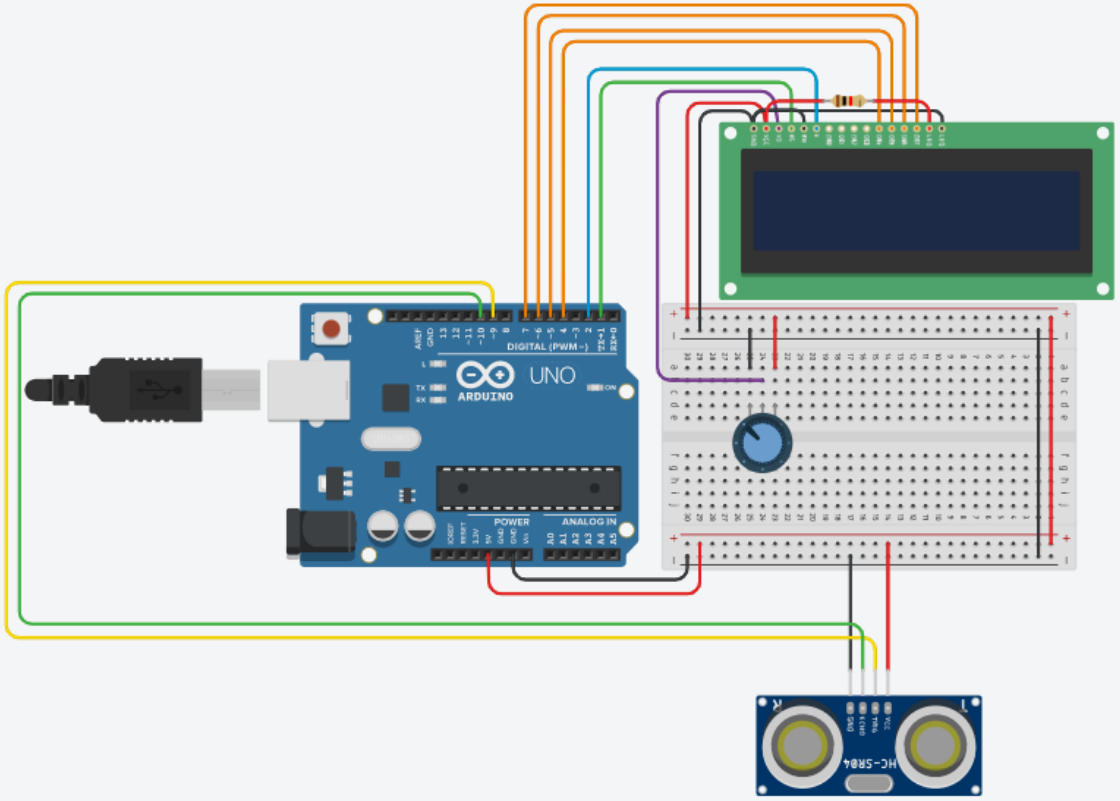
Robot Sensing Circuit



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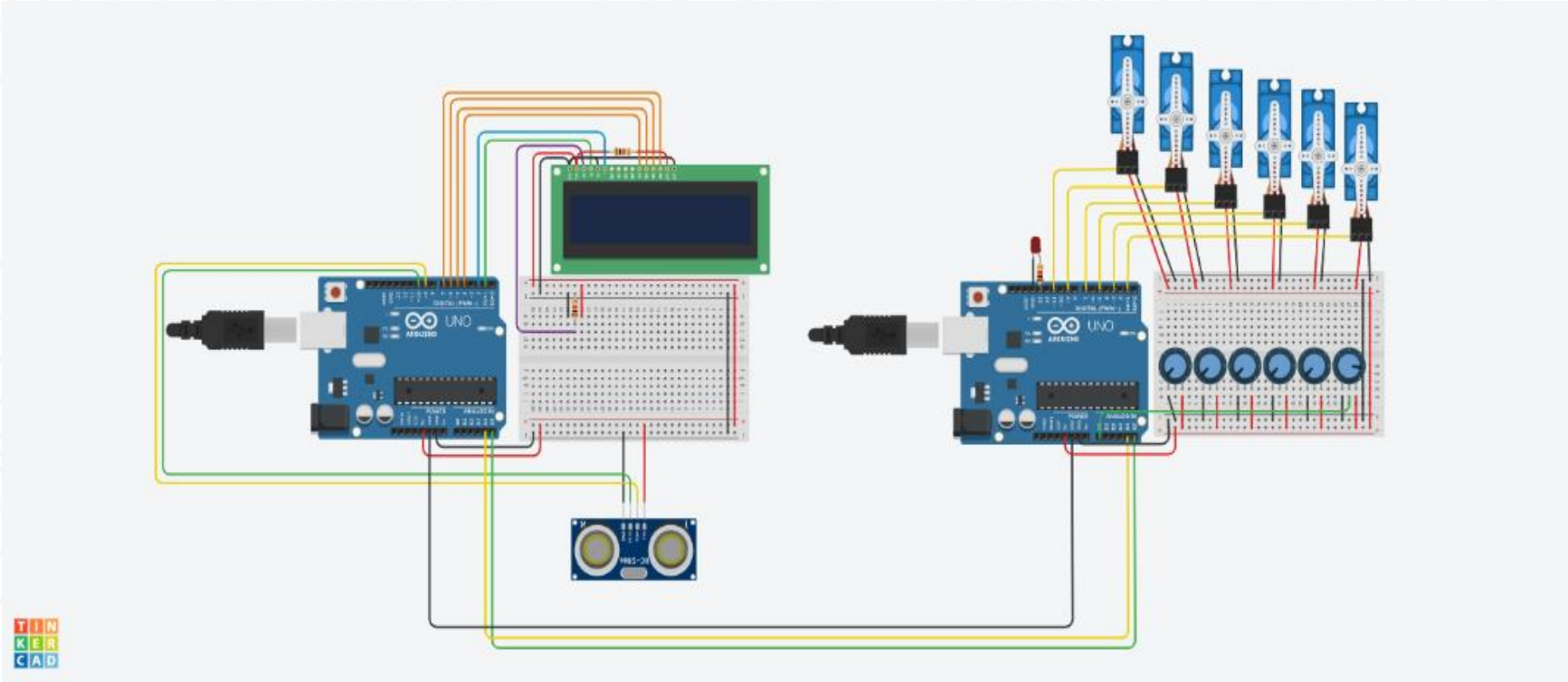
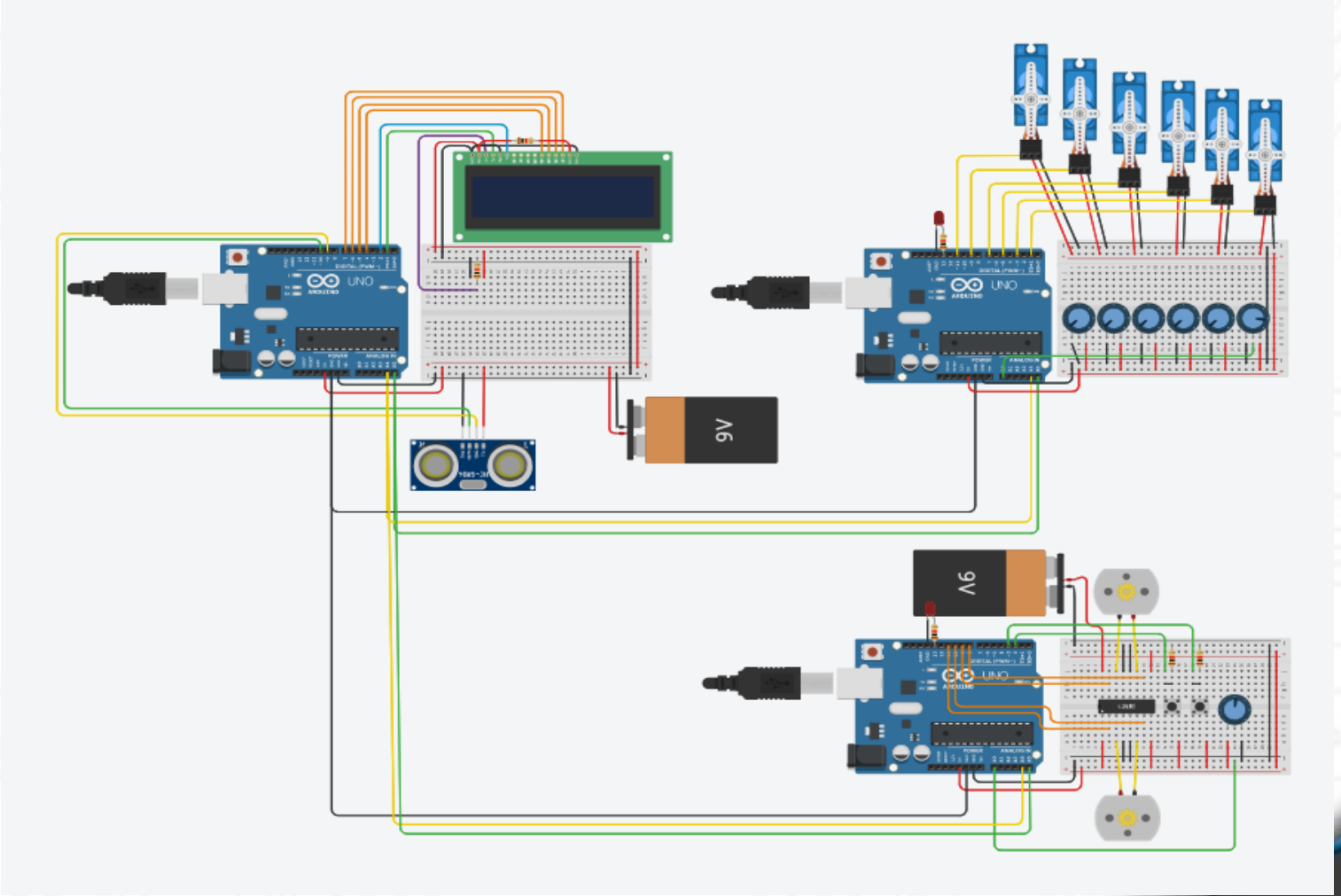
Reception Robot Circuit



Restaurant Robot Circuit



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(Iot And Software Development)

Tasks.

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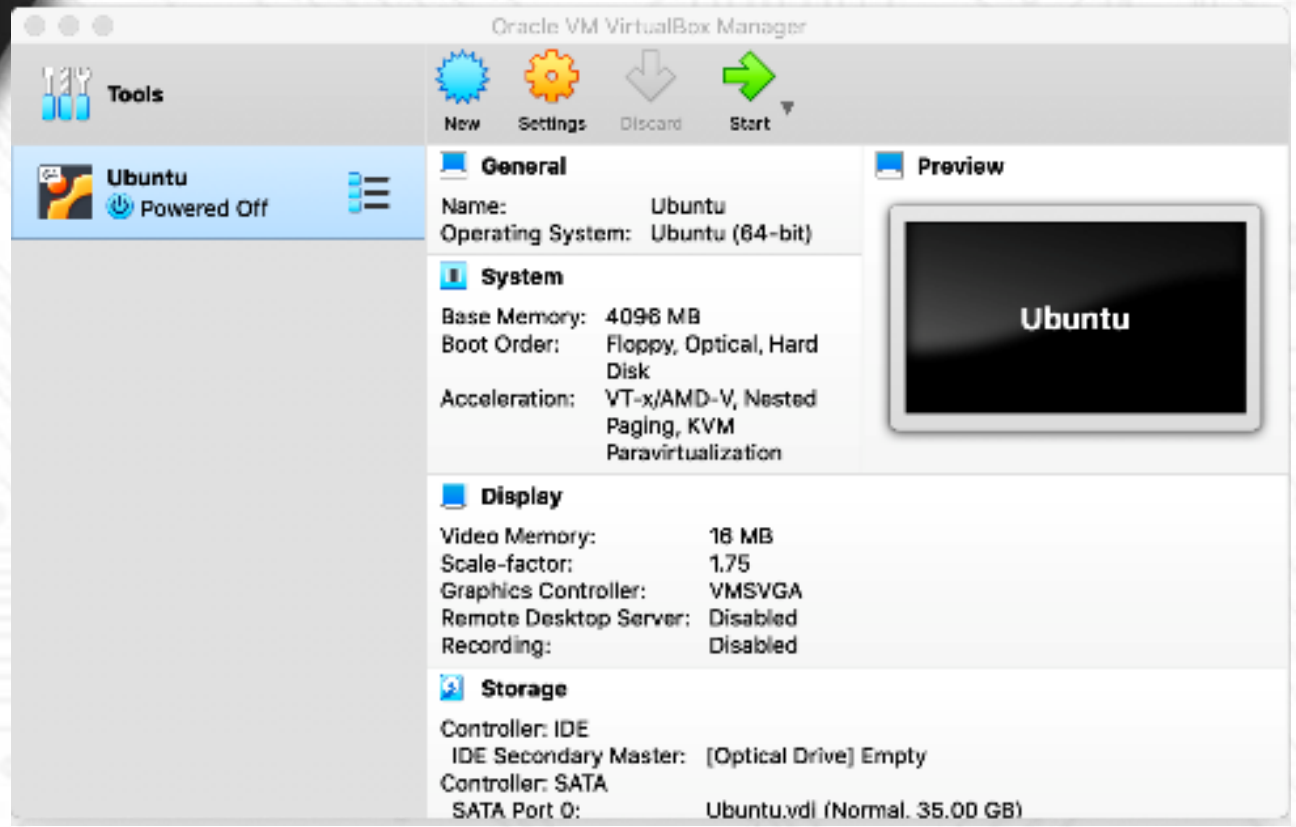

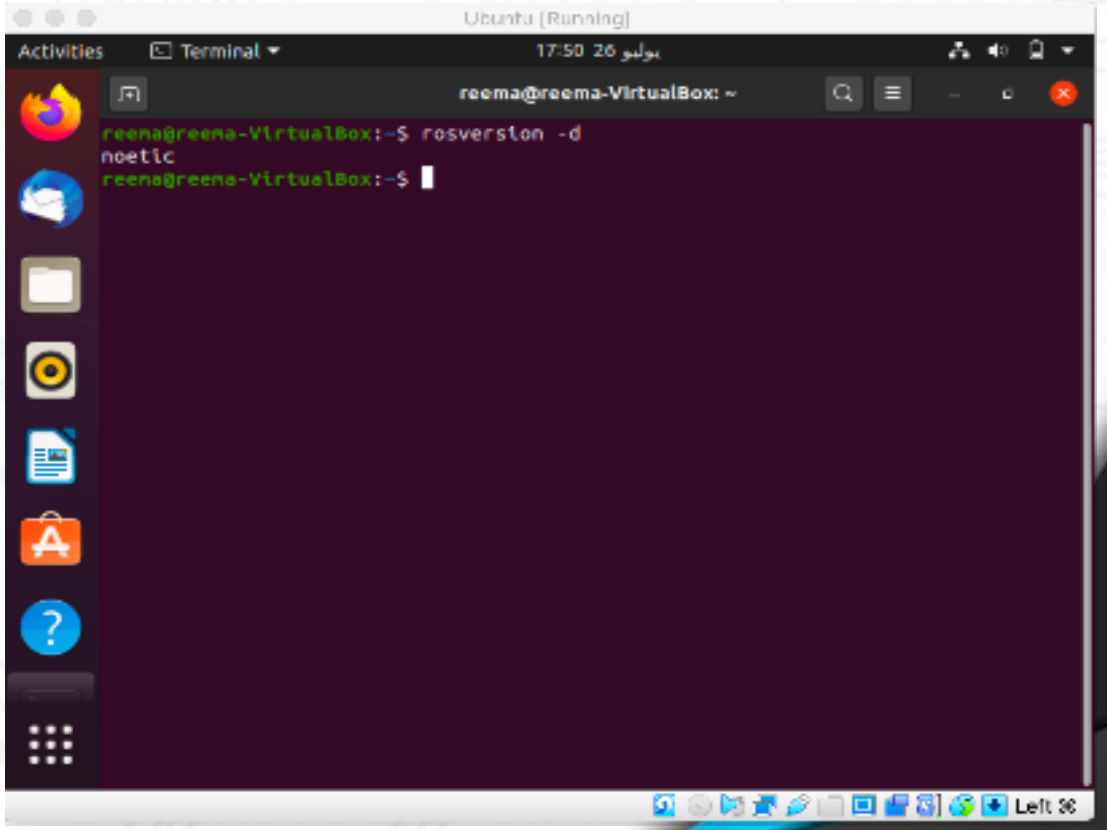

(Mechanical Department) Tasks

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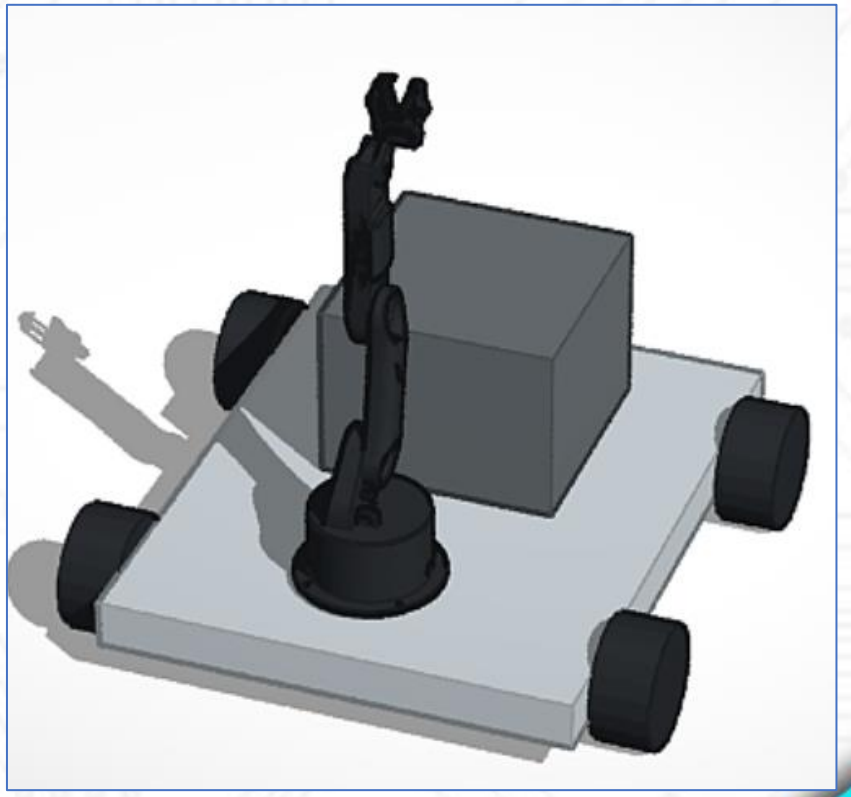

What I learned

- 3D shape design
- Robot Operating System (ROS)
- The Construct website
- Design robot arm and base
- Robot battery recharging system
- Ubuntu Terminal commands

Experience Benefits For My Future

- Robots requirements from various engineering specialties.
- Background about build a business by my own.
- Experience real-world engineering work.

Limitations

Problems faced and solution used to solve it.

- **Installing ROS**
- **Connecting ROS with Arduino IDE**
- **Installing and running Cinema 4D**
- **Connecting 2 Arduino UNO**
- **Lack of Bluetooth and Wi-fi module hardware**

How could I have done my work better and gained more experience

- Buying all required Arduino hardware

Project/ Task Status

Week&Dates	Project	Tasks	Status
1st 2021/06/06	No project	Get familiar with the GitHub website.	Done
2nd 2021/06/13	Robot Arm	1- configure and program an Arduino UNO microcontroller with 4 servo motors, and resistance controllers. 2 - Download and get a background of Robot Operating System. 3 - Designing simple HTML page that will be used to control robot arm's servo motors.	Done
3rd 2021/06/20	Mobile Robot Base	1 - Design and program an Arduino UNO microcontroller with 2 DC motors, using H brage l298. 2 - Implementing the battery and the recharging system in Arduino electric circuit. 3 - Install Robot Operating System (ROS) and Arduino IDE in Ubuntu.	Done
4th 2021/06/27	Robot Sensing	1 - Design and program an Arduino UNO microcontroller with ultrasonic sensor and LCD screen that going to measure and show the distance between it and another object. 2 - Configure the microcontroller to move its arm accordingly, after sensing client movement in front of him. 3 - Practice and simulate Robot Operating System (ROS) projects in The Construct website.	Done
5th 2021/07/04	Reception Robot	1 - Improving my earlier Arduino subprojects quality and design. 2 - Connecting these subprojects together in one complete project in Tinkercad. Taking some ROS tutorial from The Construct website. Such as Linux for Robotic. 3 - Uploading and simulating ROS (Robot Arm) and (Robot Base) subprojects in The Construct website.	Done
6th 2021/07/11	Restaurant Robot	1 - Reverse engineering for power circuits in the semi-auto robot wheel. 2 - Power circuit design and implementation for restaurant mobile robots. 3 - Implementing the battery and the recharging system in the electric circuit.	Done
7th 2021/08/01	Registration Robot Remote Control	1 - Control circuit design using ARM controller. 2 - Motor drive design and implementation for robot neck and hand. 3 - Connecting ESP32 with Arduino microcontroller and identify it to external router	Under Testing
8th 2021/08/08	Project Review	Power tolerance examination and improvement process.	Done

CONCLUSION & RECOMMENDATIONS

- Summary
- Thoughts, views, and comments in general about the company and work experience.
- Courses Recommendation
- General recommendations for (Company – University & Department - Trainee)

Courses

- **Courses I heavily use:**
  - **ICS102**: Introduction to Computing II
  - **ICS202**: Introduction to Computing II
  - **COE202**: Digital Logic Design
  - **COE203**: Digital Logic Laboratory
  - **EE202**: Electrical Circuits I
  - **EE212**: Electrical Circuits Lab
  - **ICS324**: Database Systems
  - **COE300**: Principles of Computer Engineering Design.
  - **COE301**: Computer Organization
  - **COE306**: Intro. to Embedded Systems
- **Courses that may help during the training:**
  - **COE454**: Internet of Things.
  - **COE484**: Introduction to Robotics.
- **Courses I think the department should introduce**
  - Course and Lab about (ROS) Robotic Operation System

General recommendations

- Smart Methods Company
- University and Department
- Future trainee

RESOURCES

- **GitHub Link for My Work: https://github.com/OsamaBujwaied/Smart-Methods**
- **Tinkercad Link for My Work:**
  - **Circuits**
    - **Robot Arm: https://www.tinkercad.com/things/lF04lTViYp8**
    - **Robot Base: https://www.tinkercad.com/things/dPHmimNhj8J**
    - **Sensing Object: https://www.tinkercad.com/things/5xWiTewA0xr**
    - **Reception Robot: https://www.tinkercad.com/things/b6IOtsDXvdC**
    - **Serving Robot: https://www.tinkercad.com/things/6ltT23nC9BR**
  - **3D Design**
    - **Robot Arm: https://www.tinkercad.com/things/bC57s0awtQZ**
    - **Robot Base: https://www.tinkercad.com/things/8Nhkhhxh86r**

RESOURCES

Smart Methods Company Resources

- **PowerPoint Slides link:** https://drive.google.com/drive/folders/1jmIA4Wuc1V7_JbsLvDLPw1-TdoYx_r00
- **Previous meeting link:** https://drive.google.com/drive/folders/1IvOSywn7RTNONyjyz6pcEulNFw4ZjqIc
- **YouTube channel link:** https://www.youtube.com/channel/UCE_H1qLVp2cTJ2cl7oQFnmg
- **Training Introduction Documents:**


جدول التدريب الصيفي.pdf


Task List.pdf


خطاب القبول.pdf


دليل التدريب الصيفي.pdf

- **Training Completing Form:**


Training Completing Form.pdf

Any Question