FINAL REPORT ON COOPERATIVE TRAINING

Department of Mechanical Engineering

Jubail Industrial College

Prepared by:

Hassan Ali A. Albuwaydi

ID. No: 391 900 538

Name of the Company:

Smart Methods

Submitted to:

Dr. Elaf Naeem Shaker Mahrou

SEMESTERS 443 OCT 2023

ABSTRACT

During the period from July 9, 2023, to August 31, 2023, I had the privilege of participating in a transformative training program at Smart Methods Est. This experience was truly exceptional, offering me valuable insights and enhancing my skills within a dynamic and motivating work environment. This report serves as a comprehensive overview of my training journey, divided into six sections.

The report begins with an introduction that outlines the main training topics and provides an overview of the tasks accomplished during the program. Following this, the Corporate Profile section offers insights into Smart Methods Est.'s operations, vision, and mission.

In the subsequent sections, I delve into my training experiences, highlighting a significant skill acquired and its practical application, as well as showcasing the general skills honed during the program. Furthermore, I reflect on how this training program has contributed to my personal growth and development.

The report concludes by presenting the certificates obtained during the training journey and including the signed weekly reports. This report encapsulates the enriching journey of knowledge and skill enhancement that I embarked on during my summer training program at Smart Methods Est.

ACKNOWLEDGEMENT

I would like to express my deep gratitude to Jubail Industrial College (JIC) for granting me the valuable opportunity to undergo training that allowed me to apply my knowledge and hone my skills in a real-world work environment. This experience was wonderful and of great value. Additionally, I extend my sincere appreciation to the Smart Methods Establishment for their generosity in allowing me to participate in the Summer Training Program. Their willingness to provide me with this fantastic experience is highly appreciated.

I want to give special thanks and heartfelt gratitude to Eng. Wessam Munshi, CEO of the Est. and Eng. Asma Duramae, the Training Manager, and Eng. Moneera Banjar, as well as my training supervisor, Eng. Asim Ibrahim for their continuous support and full encouragement throughout my training journey. They consistently dedicated their time to guide and mentor me, generously sharing their extensive knowledge and wide-ranging experience, which greatly contributed to enhancing my skills. Furthermore, I extend my profound thanks to my Teamwork for their remarkable support and willingness to share their expertise, as well as their prompt responses to all my inquiries: Eng. Ammar Awaji, Eng. Amerh Aljmiei and Eng. Lama Alzahrani.

Finally, I would like to express my sincere gratitude to my supervisor during the training period in the Mechanical Engineering Department at the college, Dr. Elaf Mahrou. His unwavering and continuous support throughout the training, priceless guidance, and constant motivation meant the world to me. His diligent follow-up on my weekly reports was truly invaluable.

(Student Signature)

Hassan Albuwaydi

SUMMARY

This report is prepared to provide an account of the author's on-the-job training experience received over a period of 15th weeks with Smart Methods Est.

Applicant

Hassan Albuwaydi

Checked by:

Eng. Asim Ibrahim

Training Supervisor

Signature and Date

Checked by:

Eng. Asma Duramae

Training Program Director

Signature and Date

Approved by:

Dr. Elaf Mahrou

College Training Supervisor

Signature and Date

CONTENTS

ABSTRACT **1**

1 INTRODUCTION **8**

2 ESTABLISHMENT PROFILE **9**

2.1 Background 9

2.2 Vision 9

2.3 Mission 9

2.4 Workforce 9

2.5 Organizational Structure 10

3 WORK DESCRIPTION **11**

3.1 Background 11

3.2 Introduction 11

3.2.1 Technical Proficiency 11

3.2.2 Collaboration 12

3.2.3 Field Experience 12

3.2.4 Certification 12

3.2.5 Professionalism 12

3.3 Tasks Finishes 13

3.3.1 Mechanical Engineering Department Tasks: 14

3.3.2 Electronics and Power Department Tasks: 21

3.3.3 Robotics and AI Department Tasks: 25

3.3.4 Software Department Tasks: 26

3.3.5 IoT Department Tasks: 27

3.4 Discussion 30

3.5 Problems Encountered and Solutions 30

4 ACHIEVEMENTS 31

4.1 Best Engineer 2023 Award 31

4.2 Experience Certificates: 32

4.3 Full Stack Robotic Engineer Certificate: 32

4.4 Additional Achievement: 33

5 GENERAL SKILLS ACQUIRED 34

5.1 Negotiation Skills: 34

5.2 Technical Skills: 35

5.3 Management Skills: 36

6 CONCLUSION 37

7 REFERENCE 38

8 APPENDICES 39

8.1 4th Task ME - Robotic Arm 39

8.2 Weekly Reports 52

9 CERTIFICATES 76

LIST OF FIGURES

Figure 1. The Screen Robot that we worked on during the training period. 13
Figure 2. GitHub barcode Robot Structure Design files page. 14
Figure 2. Screen Robot base details. 14
Figure 4. Screen Robot 3D body design. 15
Figure 5. GitHub barcode Designing Head Joints for a Robot files page. 15
Figure 6. Pivot Joint. 16
Figure 7. Ball and Socket Joint. 16
Figure 8. GitHub barcode Robotics Suspension System Design files page. 17
Figure 9. Component of the Suspension System. 17
Figure 10. Front Wheel Robot Suspension System. 18
Figure 11. GitHub barcode Robotics Suspension System Design files page. 18
Figure 12. (a) Schematic description of the robot architecture; (b) Finite element analysis FEA. 19
Figure 13. SolidWorks Session One Barcode… 19
Figure 14. SolidWorks Session Two Barcode... 19
Figure 15. SolidWorks Session One. 20
Figure 16. SolidWorks Session Two. 20
Figure 17. GitHub barcode Electronics & Power Task 1 files page. 21
Figure 18. Arduino LED matrix 6x6 to power the lighting simulates the eyes of the robot. 21
Figure 19. GitHub barcode Electronics & Power Task 2 files page. 22
Figure 20. Arduino Servomotor Coding. 22
Figure 21. Arduino DC-Motor Coding. 23
Figure 22. GitHub barcode Electronics & Power Task 3 files page. 23
Figure 23. Ultrasonic Sensor Program. 24
Figure 24. GitHub Barcode Electronics & Power Task 4 files page. 24
Figure 25. PIR Motion Sensors Program. 25
Figure 26. Robot arm in ROS. 26
Figure 27. Robot arm control page task 1. 27
Figure 28. Arduino Transmit & Receive 27
Figure 29. Results of completed tasks. 29

Figure 30. While receiving the award from the ceremony's presenter, "Robot". 31
Figure 31. Results of completed tasks. 33

1 INTRODUCTION

I underwent a training program at Smart Methods Est., specifically in Mechanical Engineering. This immersive experience enabled me to apply my academic knowledge practically, focusing on robotics and engineering. The program encompassed various aspects, including design, programming, and robot development, with certified training courses endorsed by the Professional Training Authority.

Throughout the program, I delved into multiple engineering specializations, such as Mechanical Engineering, Electrical Engineering, Robotics, Artificial Intelligence, Website Programming, Internet of Things, Industrial Engineering, and Systems Engineering. Collaboration across these domains was pivotal to achieving the program's objectives, necessitating my participation in all tracks for a comprehensive understanding of the workflow. It also included certified training courses endorsed by the Professional Training Authority, with a license number (2242168315271812), providing in-depth explanations of the technologies and software tools used across different engineering disciplines.

Within the Mechanical Engineering department, I gained hands-on experience in designing robot components, conducting simulation tests, and creating detailed reports. Effective collaboration with other departments was essential to grasp the entire workflow and deliver a fully functional product that met required standards.

Smart Methods Est. operates as a multidivisional organization, comprising divisions like the Charman office, CEO office, Technical, Training, Manufacturing, and Marketing. It stands as a pioneering institution in Saudi Arabia, celebrated for its expertise in robotics and artificial intelligence.

In essence, my training at Smart Methods Est. offered a rich and practical exposure to the realms of engineering, robotics, and automation. This report aims to articulate my journey and the skills I acquired, underscoring their profound impact on my professional growth and development.

2 ESTABLISHMENT PROFILE

2.1 Background

Smart Methods is a national commercial corporation established in 2010 and registered in the Ministry of Commerce, specializing in automated machines, robots, and artificial intelligence. It is headquartered in the city of Mecca and has additional centers in Jeddah and Riyadh. The commercial facility is considered as the first in Robotics and Artificial Intelligence in Saudi Arabia and classified by Forbes magazine as one of the most innovative companies in the Kingdom of Saudi Arabia in the latest classification in 2015, also classified by Small & Medium Enterprises General Authority (monsha'at) as one of the most innovation company in 2021.

2.2 Vision

To be the first representative in the Kingdom of Saudi Arabia for the manufacture of robotics, artificial intelligence, control systems and automation

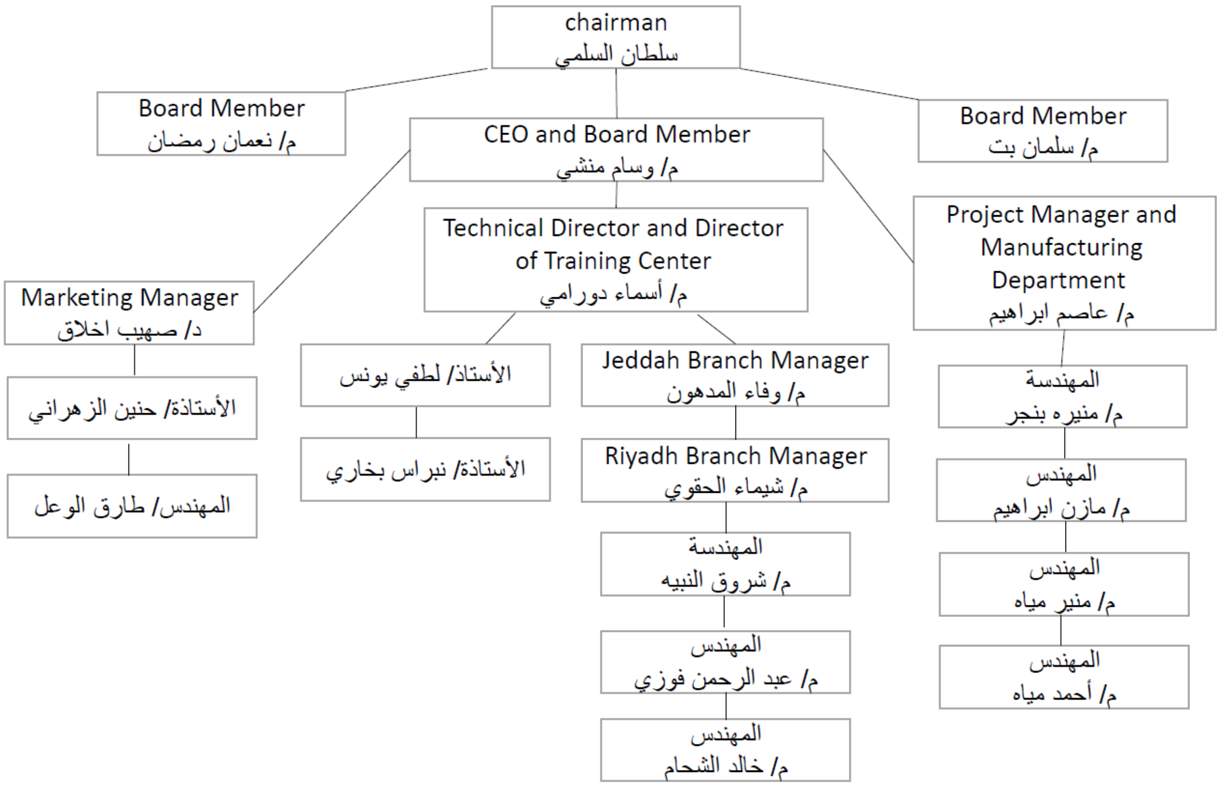
2.3 Mission

Our mission is to meet all the market needs in the field of robotics and artificial intelligence, with a 100% made in Saudi Arabia.

2.4 Workforce

Smart Methods workforce are Saudis. To retain the highly qualified Saudi workforce at Smart Methods, there is a comprehensive talent management program focused on employee professional and leadership development at this world-class.

2.5 Organizational Structure



3 WORK DESCRIPTION

3.1 Background

In today's rapidly advancing technological landscape, robotics had emerged as a pivotal field with far-reaching applications. As automation and artificial intelligence became increasingly integrated into daily lives, the demand for skilled engineers capable of designing, programming, and manufacturing robots had grown exponentially. To meet this demand and foster the development of future engineers, Smart Methods Institution had established a comprehensive summer training program.

The program was designed to provide participants with hands-on workplace training, immersing them in the world of robotics. Trainees were treated as working engineers and were exposed to a wide range of engineering disciplines, including Mechanical Engineering, Electrical Engineering, Robotics and Artificial Intelligence, Web Development and Natural Language Processing, the Internet of Things, and Industrial Engineering. The objective was to equip trainees with the practical skills and knowledge necessary to thrive in the field of robotics.

3.2 Introduction

The Smart Methods Summer Training Program was an immersive and intensive training experience aimed at nurturing the next generation of engineers in the field of robotics. This introduction set the stage for a comprehensive understanding of the program's goals, structure, and methodologies.

The primary goal of the summer training program was to provide trainees with a holistic understanding of robotics and its various engineering facets. This included:

3.2.1 Technical Proficiency

Trainees gained practical skills in designing, programming, and manufacturing robots, covering areas such as mechanical design, electrical systems, artificial intelligence, web development, and more.

3.2.2 Collaboration

The program emphasized cross-functional collaboration, as trainees from diverse engineering backgrounds worked together to build a fully functional robot. This mirrored the real-world dynamics of engineering projects.

3.2.3 Field Experience

Trainees had the opportunity to work on-site at client locations, deploying robots and managing real-world projects. This hands-on experience was crucial for understanding how robotics solutions were applied in various industries.

3.2.4 Certification

The program offered accredited training courses, and trainees could earn certifications in multiple engineering domains upon successful completion.

3.2.5 Professionalism

Trainees were encouraged to develop professionalism, effective communication skills, and the ability to work in multidisciplinary teams – all essential qualities for success in the engineering field.

This comprehensive program had equipped trainees with the knowledge, skills, and practical experience necessary to excel in the dynamic and rapidly evolving field of robotics. The following sections delved into the various types of tasks encountered throughout the training journey.

3.3 Tasks Finishes

The primary objective of this year's summer training program was to design a versatile robot, the "Screen Robot," with a focus on person recognition through AI, displaying advertisements, and engaging in visual interactions. This objective aligns with the training plan and timelines, aiming to equip trainees with practical knowledge and skills in mechanical engineering.

Figure 1. The Screen Robot that we worked on during the training period.

3.3.1 Mechanical Engineering Department Tasks:

3.3.1.1 Robot Structure Design (1st Task):

In the first task, the focus was on designing the structural foundation of the robot to ensure precision and functionality. Extensive discussions and guidance from instructors paved the way for trainees to conceptualize their design ideas. SolidWorks emerged as the preferred software due to its capacity for precision. Utilizing SolidWorks, a detailed 3D model was created, taking into consideration aspects such as motion, strength, screen mounting, and wheelbase. The resulting 3D model served as the foundation for subsequent tasks. This task was completed individually. The precision 3D model established the basis for a technologically advanced robot, and no significant problems were encountered during this phase.

To access the files page, visit: https://github.com/H16Bw/Mechanical-Department-Task-1-

Figure 2. GitHub barcode Robot Structure Design files page.

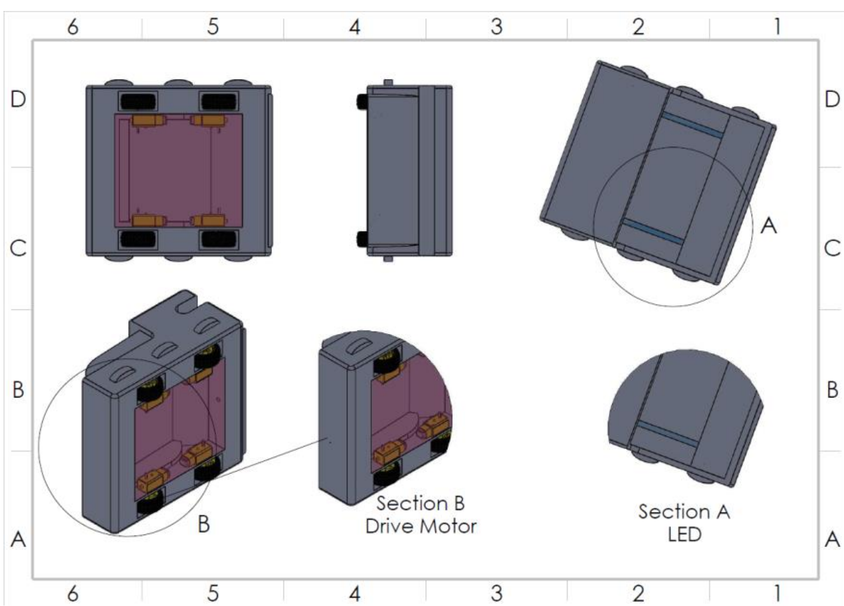


Figure 3. Screen Robot base details.

Figure 4. Screen Robot 3D body design.

3.3.1.2 Designing Head Joints for a Robot (2nd Task):

Task two involved designing head joints that enable precise motion control, incorporating both pivot and ball and socket joints. The goal was to integrate these joints with DC motors and program them using Arduino for sensor-based control. Integration of pivot and ball and socket joints with DC motors was executed, allowing the robot's head to respond to environmental stimuli and achieve specific motion objectives. Data focused on assessing the motion capabilities of the robot's head. This task was completed individually, and the successful integration of joints enabled responsive and precise motion control. The only problem encountered during this task was the size of the area in which the joints would be installed. It was small due to the small size of the robot's head, and therefore the focus was on these two types of joints due to their ease of application and simplicity.

To access the files page, visit: https://github.com/H16Bw/Mechanical-Department-Task-2

Figure 5. GitHub barcode Designing Head Joints for a Robot files page.

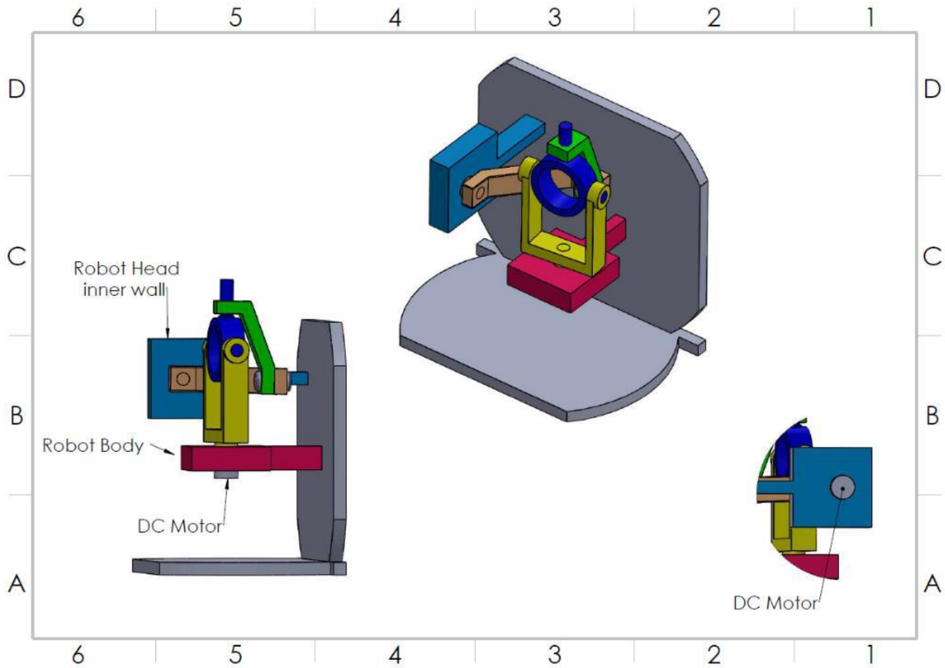


Figure 6. Pivot Joint.

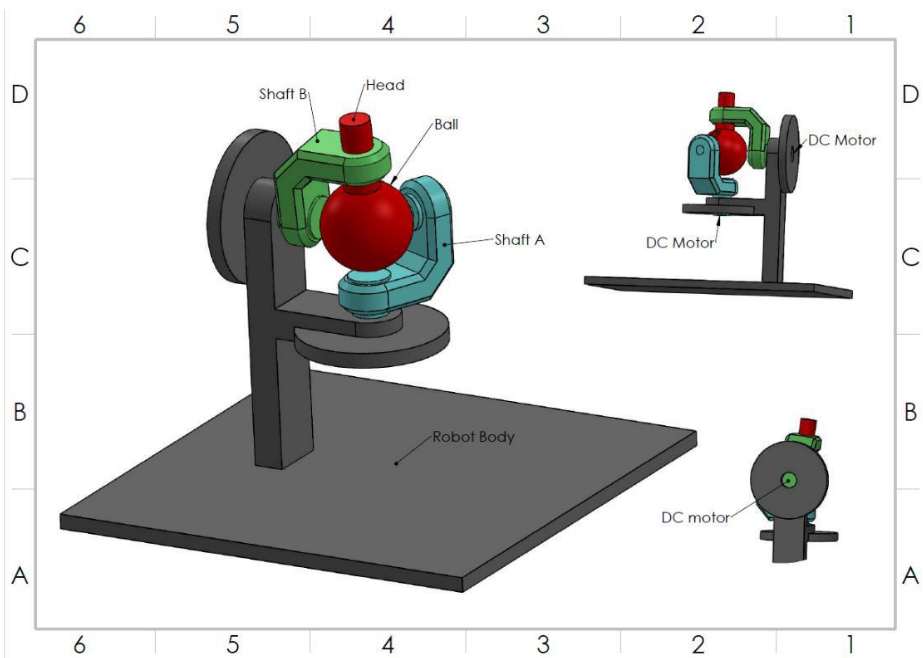


Figure 7. Ball and Socket Joint.

3.3.1.3 Robotics Suspension System Design (3rd Task):

Task three centered on designing a suspension system using SOLIDWORKS to optimize vehicle stability, comfort, and handling. This required a comprehensive understanding of suspension system components. SOLIDWORKS was employed to simulate and visualize the front wheel suspension system for robots, focusing on components such as springs, shock absorbers, control arms, and more. The task involved collecting simulation data related to suspension system behavior. This task was completed individually, and understanding suspension systems contributes significantly to vehicle performance, comfort, and handling.

To access the files page, visit: https://github.com/H16Bw/Robotics-and-AI-Department-tasks

Figure 8. GitHub barcode Robotics Suspension System Design files page.

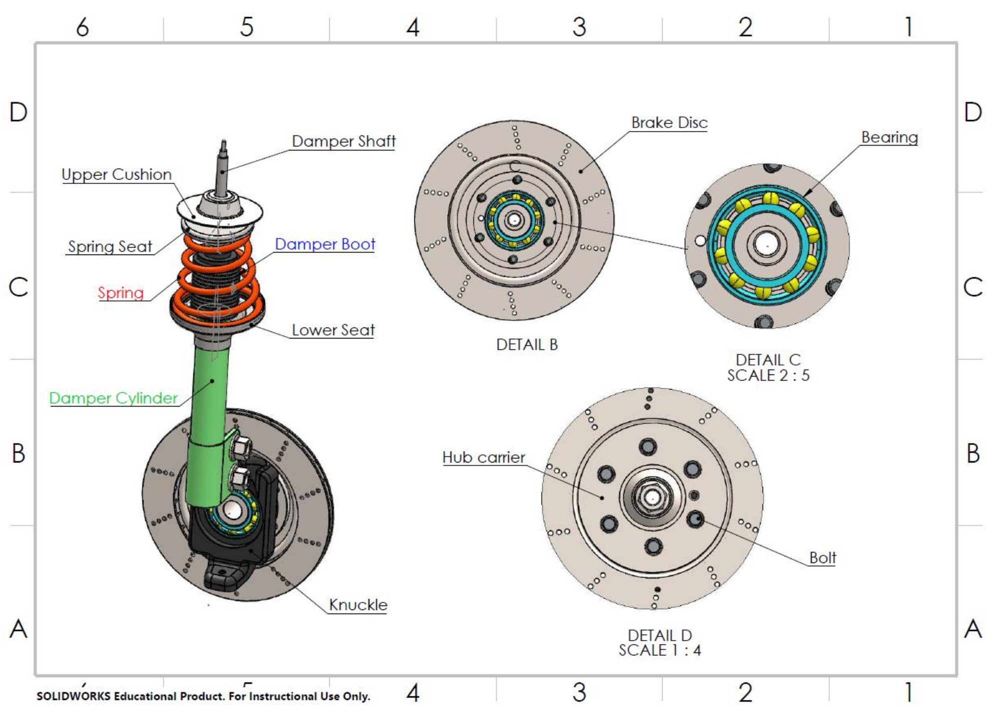


Figure 9. Component of the Suspension System.

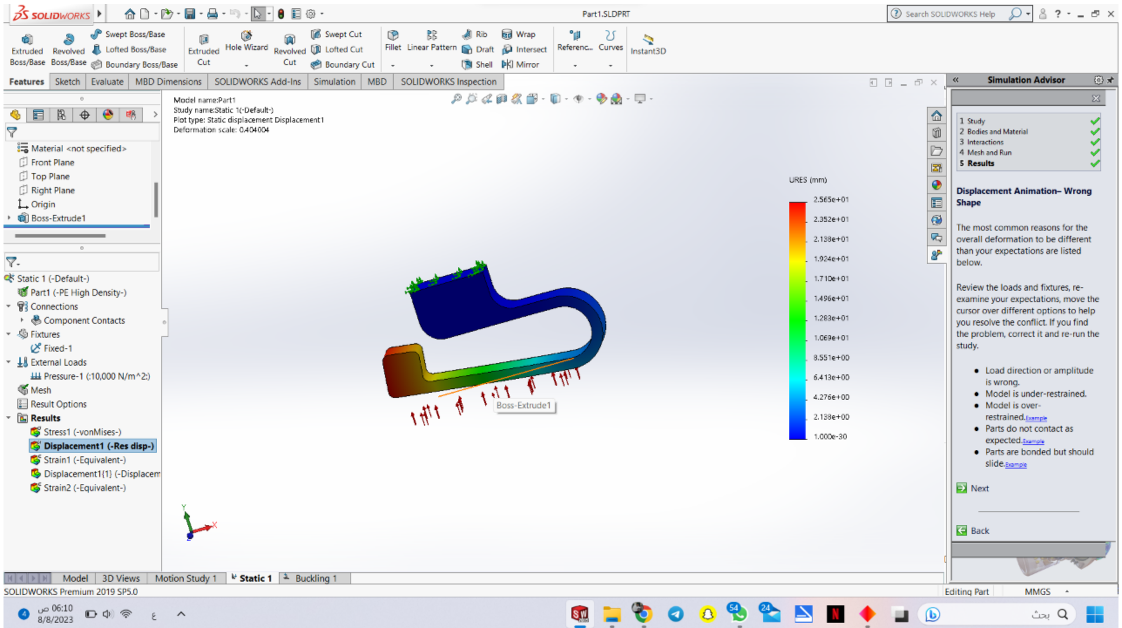


Figure 10. Front Wheel Robot Suspension System.

3.3.1.4 Robotic Arm Design (4th Task):

Task four involved designing a robotic arm to efficiently carry a shield during a company's closing ceremony. The focus was on precision engineering and material choice. Using SolidWorks, the process included determining shield dimensions, selecting appropriate joints, designing arms, and creating a secure clamp for shield retention. Data encompassed design specifications and parameters for the robotic arm. This task was completed individually, and precision engineering and material selection were emphasized as crucial for the optimal performance of the robotic arm. No significant problems were encountered during this phase. (See Appendix Page: 38)

To access the full Robot page, visit: https://github.com/H16Bw/Mechanical-Department-Task-4

Figure 11. GitHub barcode Robotics Suspension System Design files page.

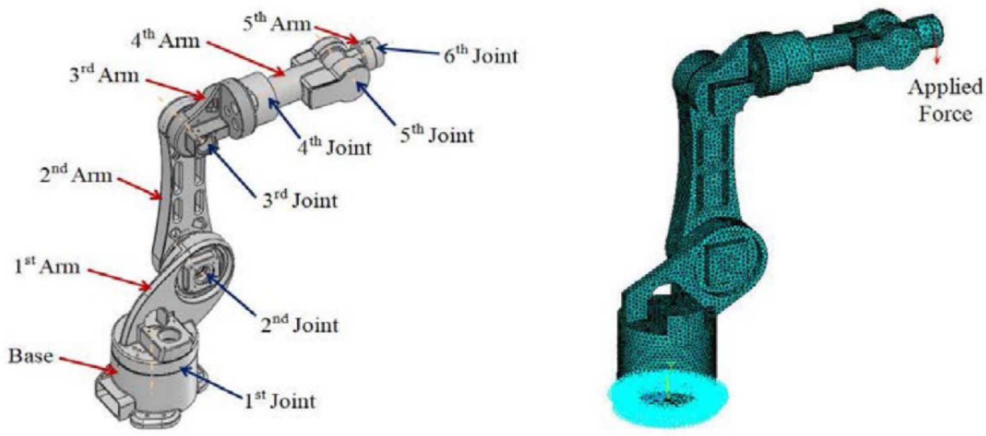


Figure 12. (a) Schematic description of the robot architecture; (b) Finite element analysis FEA model

3.3.1.5 Additional Contribution: Training Session on SolidWorks

In addition to my work on the previous assignments, I had the privilege of conducting a training session for my fellow trainees. This session focused on the utilization of SolidWorks in engineering and assembly of common mechanical components. I shared my knowledge and expertise, guiding my peers through the intricacies of SolidWorks, and demonstrating its practical applications in the field of engineering.

To access the Video,

Session one visit: https://www.youtube.com/live/bZXdv6KJyag?si=aNudt_5BAAbt1DRt

Session two visit: https://www.youtube.com/live/sFGnbTytqdk?si=H0ffIEwdiLyQlXjJ

Figure 13. SolidWorks Session One Barcode.

Figure 14. SolidWorks Session Two Barcode.

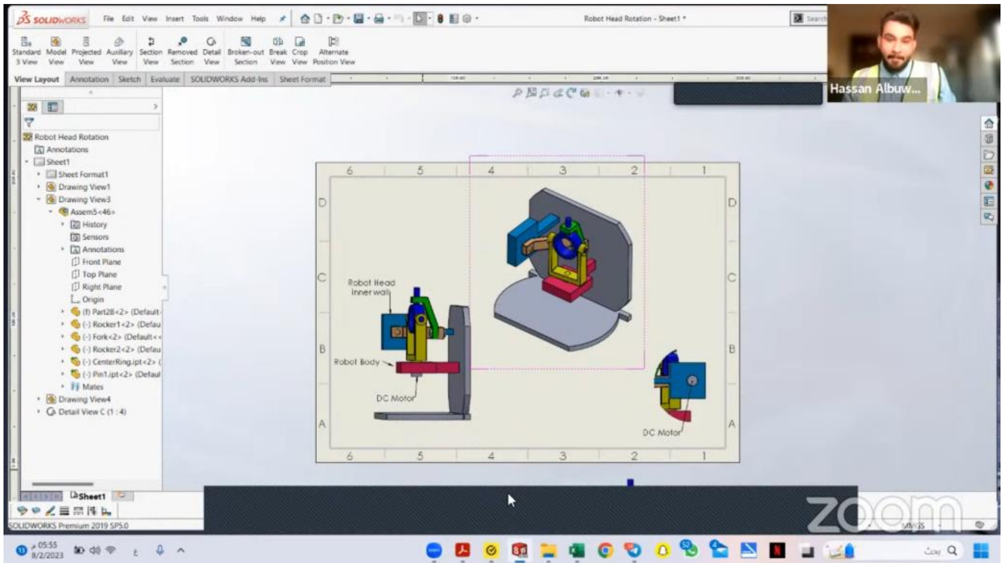


Figure 15. SolidWorks Session One.

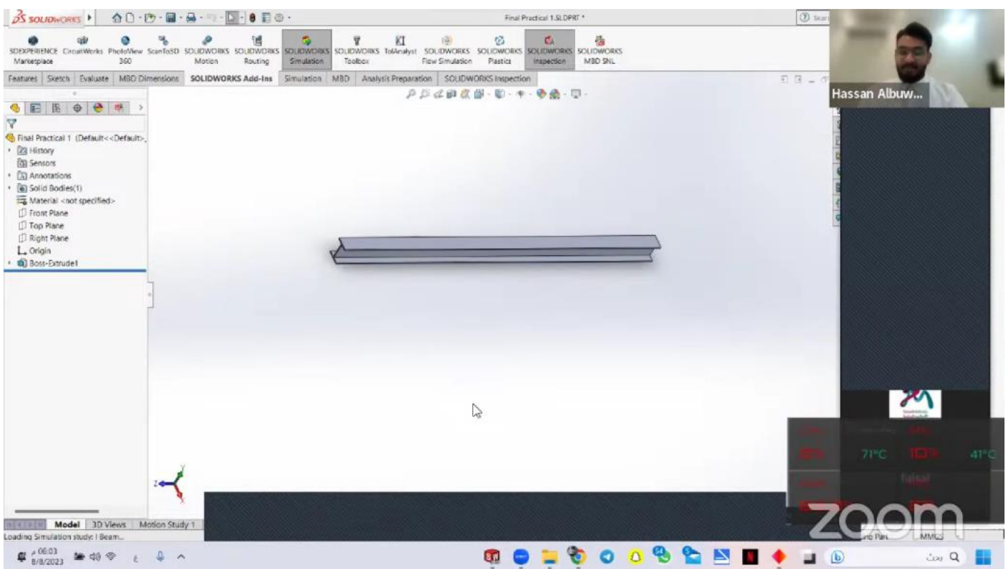


Figure 16. SolidWorks Session Two.

3.3.1.6 Discussion

All tasks were successfully completed, aligning with the objectives of the training program. The acquired skills and knowledge hold high relevance in real-world mechanical engineering applications. No significant improvements were identified, and no significant problems were encountered throughout the tasks. All tasks were completed successfully, meeting the established objectives.

3.3.2 Electronics and Power Department Tasks:

In the Electronics and Power Department, my team of four trainees, 3 of whom are from the Computer Department embarked on a comprehensive learning journey that significantly contributes to the thriving robot industry and holds immense importance for the Mechanical Engineering Department. Our tasks covered diverse aspects of electronics, programming, and sensor integration, fostering both individual skill development and teamwork.

Our journey began with electronic circuit design and Arduino programming, essential skills for the robot industry. We created critical circuits for robotic applications, and Arduino programming using C++ became a valuable tool in our toolkit. The integration of electronics and programming was guided by specialists, setting a strong foundation for robotics-related endeavors.

To access the files page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Tasks

Figure 17. GitHub barcode Electronics & Power Task 1 files page.

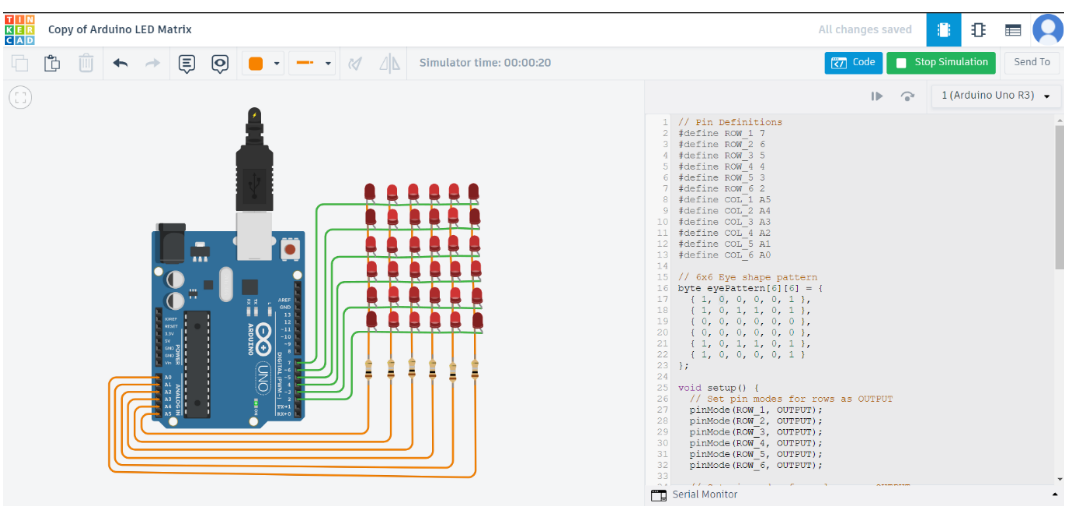


Figure 18. Arduino LED matrix 6x6 to power the lighting simulates the eyes of the robot.

As we delved deeper into motor control during the second task, using Arduino to manage Servomotors and DC-motors, we realized the collaborative nature of our work. Specialists from the Computer Department provided insights that bridged the gap between electronics and software, reinforcing the idea that interdisciplinary collaboration is at the heart of the robot industry.

To access the files page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Task-2

Figure 19. GitHub barcode Electronics & Power Task 2 files page.

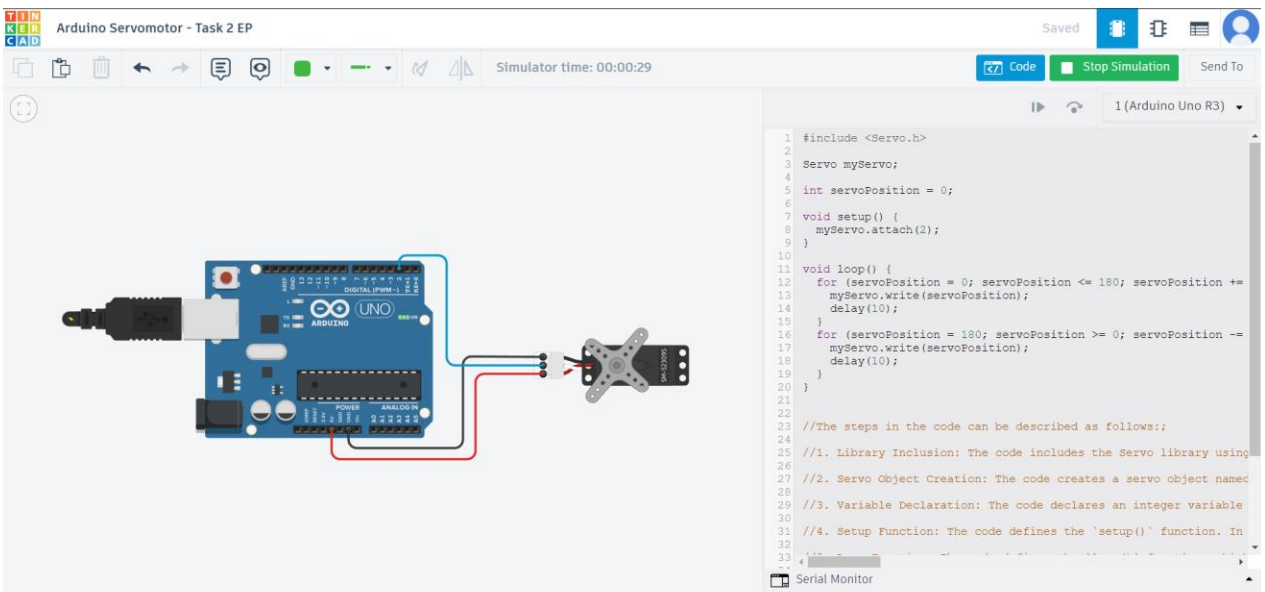


Figure 20. Arduino Servomotor Coding.

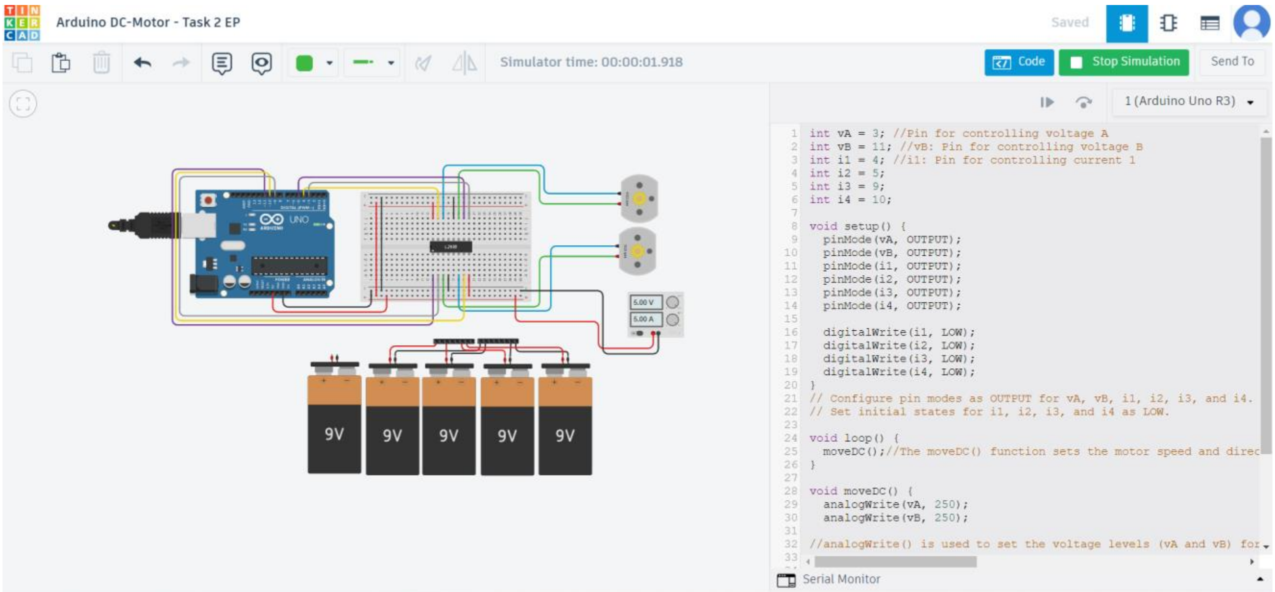


Figure 21. Arduino DC-Motor Coding.

The third task focused on sensor technology, particularly Ultrasonic Sensors, enhancing our understanding of real-time data acquisition and decision-making. The guidance of specialists in the Computer Department was instrumental in mastering sensor integration.

To access the full report page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Task-3

Figure 22. GitHub barcode Electronics & Power Task 3 files page.

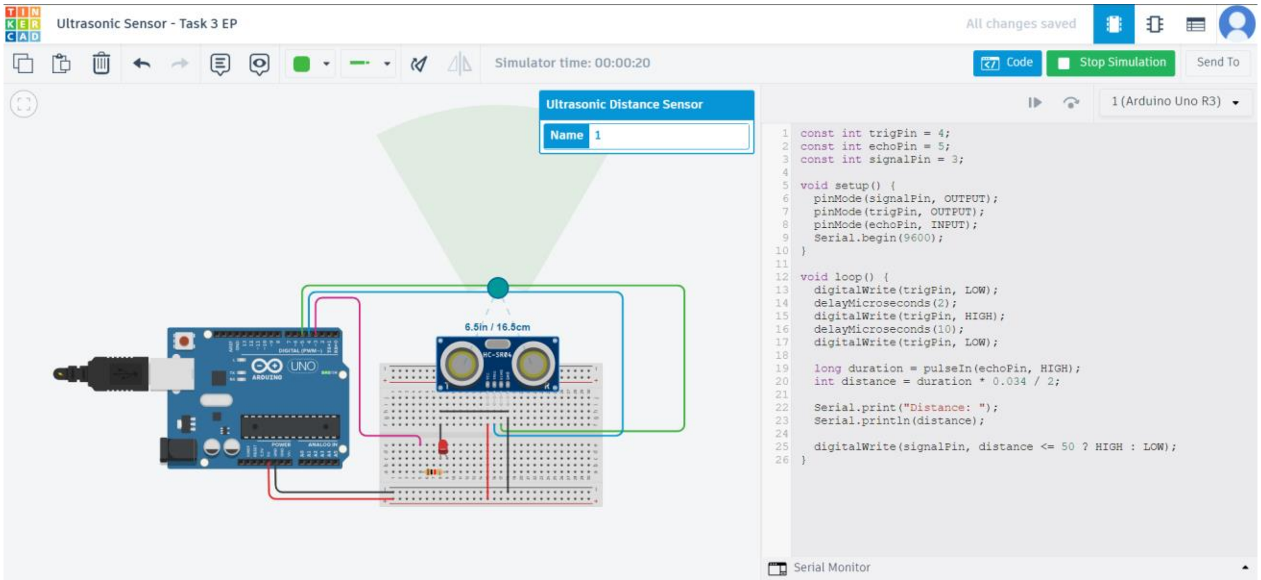


Figure 23. Ultrasonic Sensor Program.

In the fourth task, we applied our knowledge to create a visitor tracking system using PIR motion sensors and Arduino. This task highlighted our ability to work as a team and effectively implement sensor-based systems with the support of Computer Department specialists.

To access the files page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Task-4

Figure 24. GitHub Barcode Electronics & Power Task 4 files page.

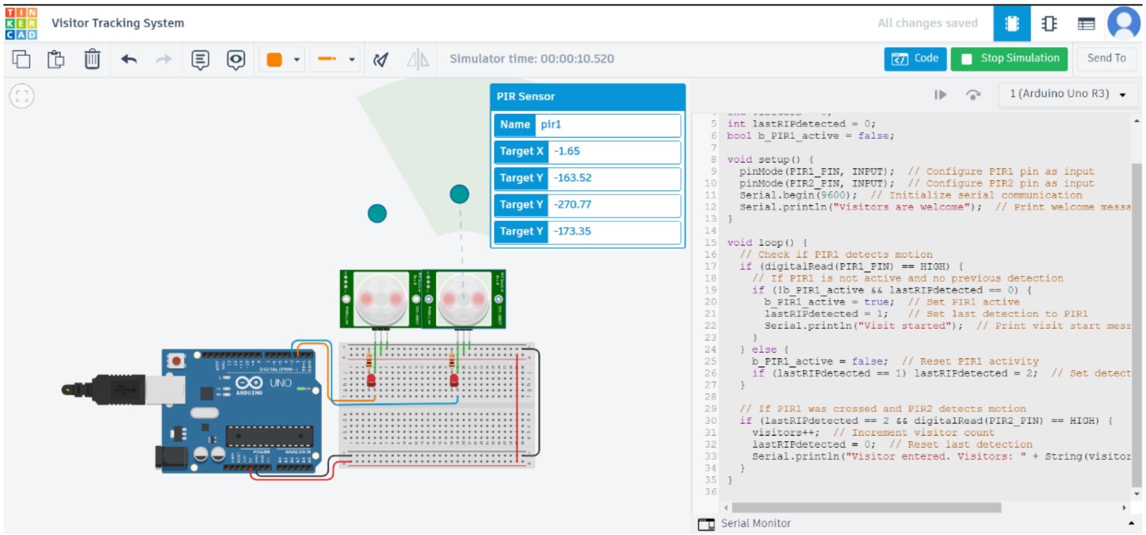


Figure 25. PIR Motion Sensors Program.

Overall, our endeavors in the Electronics and Power Department have armed us with a robust foundation in electronics, programming, sensor integration, and motor control. This skill set is indispensable for the rapidly evolving robot industry and serves as a valuable resource for the Mechanical Engineering Department, where the fusion of these technologies is driving innovation and shaping the future of robotics. Interdisciplinary collaboration, as witnessed in our tasks, is the key to advancing both departments' contributions to the field and ensuring their relevance in this dynamic landscape.

3.3.3 Robotics and AI Department Tasks:

In the Robotics and AI Department, my team undertook a series of tasks that expanded our knowledge and skills in robotics and artificial intelligence. Our initial task involved setting up a virtual machine with Ubuntu and installing ROS Noetic, along with the Robot Arm package. This laid the foundation for understanding ROS and its practical applications in robotics. These skills are essential for the growing robot industry, where the integration of robotics and AI is transforming various sectors.

To access the full report page, visit: https://github.com/H16Bw/Robotics-and-AI-Department-tasks

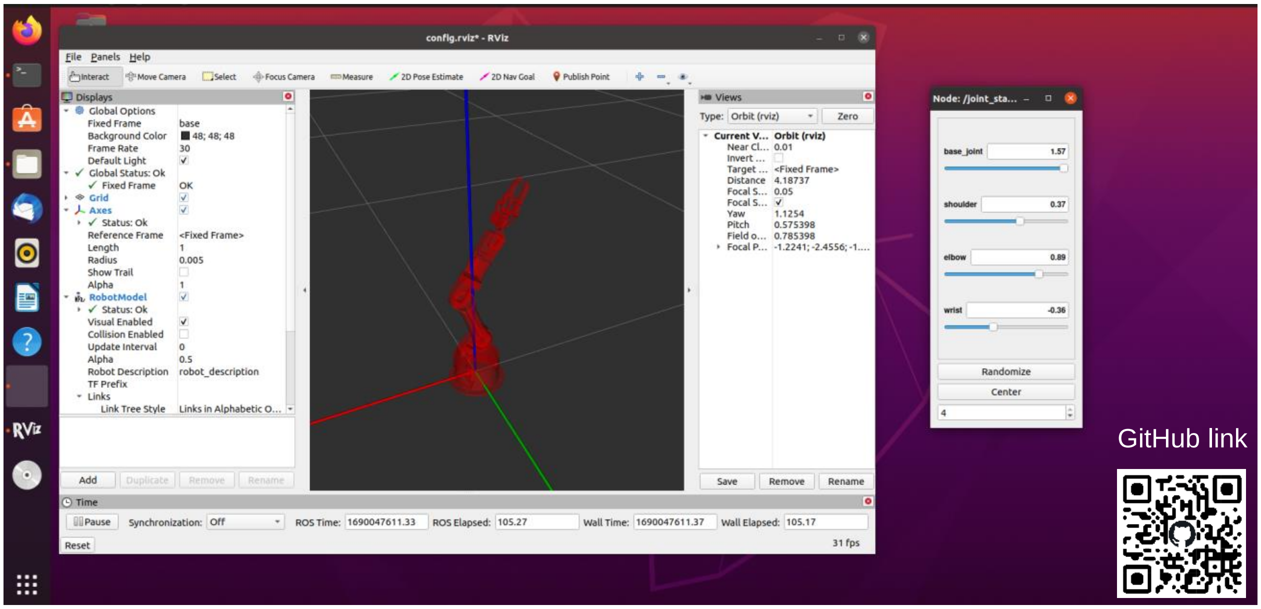


Figure 26. Robot arm in ROS.

The Robotics and AI Department's importance to the Mechanical Engineering Department cannot be overstated. Mechanical engineers play a pivotal role in designing the physical structures and components of robots, ensuring they are not only functional but also efficient and safe. Collaborating with experts in robotics and AI allows mechanical engineers to integrate cutting-edge technologies and intelligence into their designs, making robots more adaptable and capable of performing complex tasks.

3.3.4 Software Department Tasks:

In the Software Department, our team, embarked on collaborative tasks. Our first task involved web development, where we gained expertise in HTML programming and server architecture. This knowledge enabled us to create a dedicated webpage for remote robot control, providing users with a user-friendly interface to control the robot via their smart devices. In the second task, we designed an interactive control panel within a webpage, allowing us to manipulate the robot's movements and visualize its path in real time using HTML, CSS, and JavaScript. These tasks highlighted the vital synergy between software and hardware in modern robotics and equipped us with valuable skills to advance automation and engineering.

To access the files page, visit: https://github.com/H16Bw/Software-Department-Task-1-

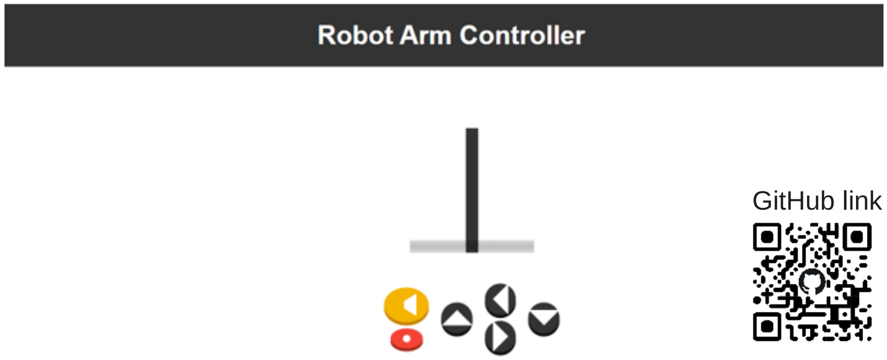


Figure 27. Robot arm control page task 1.

3.3.5 IoT Department Tasks:

In the Internet of Things (IoT) Department, our team undertook a series of tasks with direct implications for the robot industry and the Mechanical Engineering Department. Our initial task involved creating an Arduino program for remote LED control via Wi-Fi, demonstrating our proficiency in Arduino programming and the potential of internet-based robot communication. This task highlighted the significance of remote robot control, a key aspect of modern robotics, and showcased our capacity to utilize HTTP GET requests for such purposes.

To access the full report page, visit: https://github.com/H16Bw/Internet-of-Things-Department-Task-2

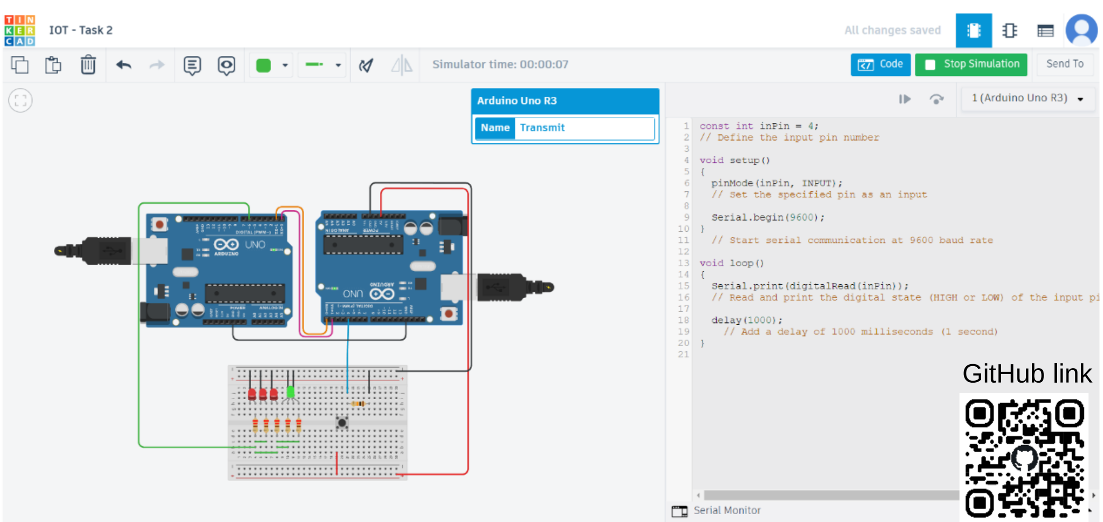


Figure 28. Arduino Transmit & Receive

In the subsequent task, we designed an electronic circuit incorporating two Arduino boards with Serial Communication. This setup enabled real-time data exchange between devices, offering insights into the dynamic interaction of data and robot actions. Lastly, we developed an Arduino sketch for ESP8266/ESP32 boards to collect and transmit temperature and humidity data via Wi-Fi. While primarily focused on electronics and programming, the gathered environmental data holds paramount importance for the Mechanical Engineering Department, offering essential inputs for robot design, adaptability, and performance optimization. These tasks collectively emphasize the pivotal role of IoT in the robot industry, demonstrating how hardware and software integration can contribute to advancements in robotics.

الرئيسية / المهمات / نتائج المهمات

مهمات حسن علي احمد البويدي

	رقم المهمة	المسار	اسم المهمة	رابط GITHUB	الحالة	ملاحظات	
1	1	القوى الكهربائية والالكترونيات	Arduino: Single LED	https://github.com/H16Bw/Electronics-and-Power-Department-Tasks	مقبولة		تعديل
2	2	القوى الكهربائية والالكترونيات	Arduino Servo-Motor	https://github.com/H16Bw/Electronics-and-Power-Department-Task-2	مقبولة		تعديل
3	1	الهندسة الميكانيكية	Screen Robot Design - Task 1	https://github.com/H16Bw/Mechanical--Department-Task-1	مقبولة		تعديل
4	1	برمجة المواقع ومعالجة اللغات الطبيعية	web page to control the robot	https://github.com/H16Bw/Software--Department-Task-1	مقبولة		تعديل
5	1	الذكاء الصناعي وأنظمة تشغيل روبوتات ROS	Installing ROS and the Robot Arm - Task 1	https://github.com/H16Bw/Robotics-and-AI-Department-tasks	مقبولة		تعديل
6	1	انترنت الأشياء	Remotely control LED using Wi-Fi	https://github.com/H16Bw/Internet-of-Things-Department-Task-1	مقبولة		تعديل
7	2	انترنت الأشياء	Two Arduino - using Serial Communication	https://github.com/H16Bw/Internet-of-Things-Department-Task-2	مقبولة	good readme	تعديل
8	3	القوى الكهربائية والالكترونيات	Ultrasonic Sensor - Task 3	https://github.com/H16Bw/Electronics-and-Power-Department-Task-3	مقبولة		تعديل
9	2	الهندسة الميكانيكية	Head Joints - Task 2	https://github.com/H16Bw/Mechanical-Department-Task-2	مقبولة		تعديل
10	2	الذكاء الصناعي وأنظمة تشغيل روبوتات ROS	ROS simulation || turtlebot3 and Gazebo	https://github.com/H16Bw/Robotics-and-AI-Department-Task-2	مقبولة		تعديل
11	2	برمجة المواقع ومعالجة اللغات الطبيعية	WebPage Control Panel - Task 2	https://github.com/H16Bw/Software-Department-Task-2	مقبولة		تعديل
12	3	الذكاء الصناعي وأنظمة تشغيل روبوتات ROS	Machine Learning T3	https://github.com/H16Bw/Robotics-and-AI-Department-Task-3	مقبولة		تعديل
13	3	انترنت الأشياء	Data collection and transmission using a Wi-Fi network	https://github.com/H16Bw/Internet-of-Things-Department-Task-3	مقبولة		تعديل
14	3	الهندسة الميكانيكية	suspension system	https://github.com/H16Bw/Mechanical-Department-Task-3	مقبولة		تعديل
15	4	الهندسة الميكانيكية	Robotic Arm Design	https://github.com/H16Bw/Mechanical-Department-Task-4	مقبولة		تعديل
16	4	القوى الكهربائية والالكترونيات	Visitor Tracking System	https://github.com/H16Bw/Electronics-and-Power-Department-Task-4	مقبولة		تعديل

Figure 29. Results of completed tasks.

3.4 Discussion

The tasks undertaken in various departments were successfully completed, meeting the program's objectives. The skills and knowledge gained hold immense importance in real-world engineering applications, especially in the robot industry. These tasks contributed to precision engineering, sensor integration, electronics, programming, and hardware-software integration.

The importance of these results in the robotics industry is significant. Robotics is a rapidly growing field, and engineers with expertise in mechanical design, electronics, programming, and hardware-software integration are in high demand. The tasks provided hands-on experience and practical skills that directly translate to real-world robot design, development, and deployment.

To improve the training experience, it could be beneficial to introduce more interdisciplinary tasks that require collaboration between departments. Additionally, providing exposure to emerging technologies and industry trends would enhance trainees' readiness for the evolving robotics landscape.

3.5 Problems Encountered and Solutions

No significant problems were encountered during the tasks, indicating effective guidance and support from instructors and specialists. Any minor challenges were addressed collaboratively within the teams. The tasks were completed successfully, meeting the established objectives.

4 ACHIEVEMENTS

Throughout my participation in the Smart Methods Summer Training Program in 2023, I attained several significant accomplishments that serve as a testament to my unwavering dedication and commitment to engineering excellence:

4.1 Best Engineer 2023 Award

It is with great pride that I accept the prestigious "Best Engineer 2023 Award" from Smart Methods Est. This accolade serves as a reflection of my exceptional performance, unwavering dedication, and substantial contributions during the training program.

Figure 30. While receiving the award from the ceremony's presenter, "Robot".

4.2 Experience Certificates:

I successfully earned five distinct experience certificates, each requiring a dedicated commitment of 280 hours. These certificates acknowledge my exceptional achievements in the following tracks:

- Mechanical Engineering
- Electronics and Programming
- Robotics and AI
- Software Development
- Internet of Things (IoT)

4.3 Full Stack Robotic Engineer Certificate:

To underscore the breadth of my training and proficiency spanning various engineering domains, I proudly received the esteemed "Full Stack Robotic Engineer Certificate." This recognition affirms my capacity to operate proficiently in mechanical design, electronics, programming, and software development – positioning me as a well-rounded engineer poised to tackle intricate challenges within the realm of robotics.

These remarkable achievements were unveiled during the closing ceremony, a momentous event held in Jeddah to celebrate the accomplishments of the trainees. These certificates and awards not only reflect my technical prowess but also demonstrate my unwavering passion for engineering and my relentless pursuit of growth in the ever-evolving landscape of robotics and automation.

With these accomplishments, I am poised to embark on the next phase of my engineering journey, eager to apply the skills and knowledge I have acquired during this transformative cooperative training program.

4.4 Additional Achievement:

In recognition of my outstanding performance and contributions to the Smart Methods Summer Training Program, I was selected by the Training Director to deliver a keynote speech during the closing ceremony. This honor provided me with the opportunity to address the entire gathering of trainees and share my comprehensive training experience.

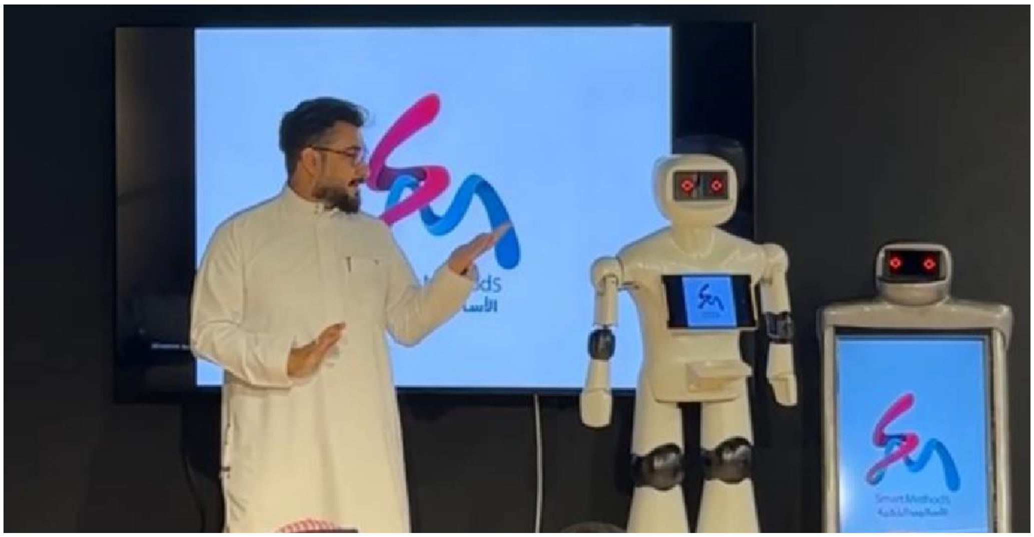


Figure 31. Results of completed tasks.

During my speech, I had the privilege of reflecting on the valuable insights gained throughout the program and how it has contributed to my personal and professional growth. I expressed my deep gratitude for the guidance and mentorship provided by the esteemed instructors and specialists, acknowledging their pivotal role in shaping my journey.

Sharing my training experience with fellow trainees was an incredibly rewarding moment, and I emphasized the significance of dedication, teamwork, and a relentless pursuit of knowledge in the field of engineering. My speech aimed to inspire and motivate my peers to continue their pursuit of excellence in this ever-evolving landscape of engineering and technology.

This recognition and the opportunity to address my fellow trainees further highlight the significance of my achievements and the impact of this training program on my personal and professional development.

5 GENERAL SKILLS ACQUIRED

5.1 Negotiation Skills:

During the Smart Methods Summer Training Program, our team and I had the opportunity to develop and refine our negotiation skills through various aspects of our tasks and interactions. These skills played a crucial role in our overall professional growth. Some key facets of negotiation skills acquired by our team and me included:

- **Communication:** Effective communication was vital in conveying our ideas, discussing project goals, and collaborating with team members from different engineering backgrounds.

- **Presentation Skills:** We improved our ability to communicate our ideas and project outcomes effectively through presentations.

- **Conflict Resolution:** We learned how to identify and resolve conflicts within our team, ensuring that disagreements did not hinder our progress and that solutions were reached amicably.

- **Problem-Solving:** Negotiation often involved finding solutions to unexpected challenges that arose during our tasks, further enhancing our problem-solving abilities.

- **Adaptability:** As we negotiated with various stakeholders, we adapted our communication styles and approaches to suit different contexts and audiences.

- **Interdisciplinary Collaboration:** Our negotiation skills were particularly valuable when collaborating with team members from diverse engineering disciplines, as we needed to find common ground and align our goals effectively.

5.2 Technical Skills:

The Training Program provided our team and me with a comprehensive set of technical skills that were essential for our success in the fields of robotics and engineering. These technical skills covered a wide range of areas, including:

- **Mechanical Engineering:** We gained expertise in precision design, structural analysis, and material selection, all of which were fundamental for creating robot structures and components.

- **Electronics and Programming:** Our training encompassed electronic circuit design, Arduino programming, and motor control, equipping us with the knowledge to integrate electronics into robotic systems.

- **Sensor Integration:** In the Electronics and Power Department, we developed proficiency in sensor technology, especially Ultrasonic Sensors, allowing us to collect real-time data and make data-driven decisions in robotics applications.

- **Software Development:** The Software Department equipped us with skills in web development, including HTML, CSS, and JavaScript programming. We learned to create user-friendly interfaces for remote robot control, highlighting the synergy between software and hardware in modern robotics.

- **IoT Skills:** In the IoT Department, we became adept at creating Arduino programs for remote control and data collection, emphasizing the significance of remote robot management in contemporary robotics.

- **Arduino Skills:** Throughout the program, we acquired advanced skills in using Arduino for various applications, further expanding our technical capabilities.

5.3 Management Skills:

Management skills were indirectly developed and honed by our team and me throughout the program as we engaged in complex tasks, collaborated within teams, and managed project timelines and objectives. These management skills included:

- **Teamwork:** Collaboration was at the core of our training, and our ability to work seamlessly within teams allowed us to combine our strengths effectively.
- **Team Building:** Our collaborative projects naturally led to team building, fostering strong working relationships and effective teamwork.
- **Time Management:** With multiple tasks and deadlines, we learned to manage our time efficiently, ensuring that we met project timelines without compromising on quality.
- **Risk Management:** We learned to identify, assess, and mitigate risks in our projects, ensuring that potential issues were proactively addressed.
- **Adaptability:** The program exposed us to various challenges that required us to adapt to changing circumstances and find innovative solutions.
- **Leadership:** In different situations, team members took on leadership roles, which helped us develop leadership skills and the ability to guide and motivate others.
- **Attention to Detail:** Attention to detail was crucial in the design and development of robots, as even small oversights could have significant consequences.
- **Research Skills:** Research skills became valuable when exploring new technologies, materials, and approaches in the field of robotics, contributing to our knowledge base and innovative thinking.

6 CONCLUSION

The Smart Methods Summer Training Program provided an enriching and transformative experience that significantly contributed to my growth as an engineer specializing in Mechanical Engineering. This immersive journey exposed me to a multitude of engineering disciplines, each contributing unique skills and insights to my repertoire. The training was comprehensive, encompassing robotics, electronics, programming, and management, and offered certified courses that fortified my understanding of these domains.

I acquired a diverse range of skills, including technical proficiency in mechanical design, electronics, and software development. These skills were honed through practical tasks and interdisciplinary collaboration, reinforcing the importance of teamwork and adaptability in the engineering field.

The program also fostered the development of vital soft skills, such as negotiation, presentation, and problem-solving abilities. These skills proved invaluable in navigating complex engineering challenges and effectively communicating with colleagues from diverse backgrounds.

Furthermore, the hands-on experience gained in robot design and development, as well as the exposure to real-world engineering projects, was instrumental in bridging the gap between theory and practice. It solidified my understanding of the dynamic robotics industry and its constant evolution.

The training was meticulously structured, enabling trainees to develop a holistic perspective of engineering and robotics. This comprehensive approach not only prepared me for the demands of the industry but also sparked a deeper passion for engineering innovation.

Overall, the Smart Methods Summer Training Program was a highly relevant and impactful experience for my specialization. It provided a solid foundation of technical and soft skills, equipping me to contribute effectively to the field of Mechanical Engineering, particularly in the realm of robotics and automation. I am confident that the knowledge and expertise gained during this training will serve as a strong foundation for my future endeavors in engineering, and I am grateful for the opportunity to be a part of this exceptional program.

7 REFERENCE

1. Smart Methods Est. (n.d.). About Us. (https://www.smart-methods.com/about-us/)
2. Forbes Middle East. (2015). Saudi Arabia's Top 100 Companies: #1 Smart Methods. (https://www.forbesmiddleeast.com/en/list/saudi-top-100-companies/item/1-smart-methods)
3. Small & Medium Enterprises General Authority (Monsha'at). (2021). Saudi SMEs (https://www.monshaat.gov.sa/ar/content/classification)
4. SolidWorks. (n.d.). (https://www.solidworks.com/)
5. Arduino. (n.d.). (https://www.arduino.cc/)
6. ROS.org. (n.d.). Robot Operating System (ROS). (https://www.ros.org/)
7. GitHub. (n.d.). (https://github.com/)
8. Internet of Things (IoT). (n.d.). (https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT)
9. PIR Sensor. (n.d.). (https://learn.sparkfun.com/tutorials/pir-motion-sensor-hookup-guide)
10. ESP8266 and ESP32. (n.d.). (https://www.espressif.com/en/products/esp8266)
11. Temperature and Humidity Sensor (DHT Series). (n.d.). (https://learn.adafruit.com/dht)
12. Internet of Things (IoT) in Robotics. (n.d.). (https://www.elprocus.com/internet-of-things-iot-in-robotics/)

8 APPENDICES

8.1 4th Task ME - Robotic Arm

Design of a Robotic Arm for Carrying a Shield

Hassan Albuwaydi - Mechanical Engineer - Trainee at Smart Methods Est.

1. ABSTRACT

This study introduces an engineering approach for designing a robotic arm capable of carrying a shield with specific dimensions, using the SolidWorks software. The aim is to facilitate the efficient delivery of shields during a company's closing ceremony. The arm's design involves stages like determining shield dimensions, selecting appropriate joints for movement, configuring arm lengths, and creating clamp designs for secure shield retention. The arm's overall structure prioritizes durability and lightweight construction. Materials like aluminum alloys and steel are considered for their lightweight and corrosion-resistant properties. Key references, such as "Mechanics of Machines" and "Shigley's Mechanical Engineering Design," aid in calculating joints, selecting gears, and guiding material testing. This research underscores the importance of precision engineering and proper material selection for successful robotic arm design.

Keywords

Robotic Arm, Mechanical Design, SolidWorks, Joint Selection, Materials, Engineering.

2. INTRODUCTION

The significance of mechanical engineering and robotics has grown across various fields, emphasizing the need for designing mechanical devices that cater to diverse requirements. This research aims to present an engineering approach to design a robotic arm capable of carrying a shield with specific dimensions using the SolidWorks software, facilitating the delivery of shields to trainees at a company's closing ceremony.

3. ROBOTIC ARM DESIGN

The design of the robotic arm for carrying the shield involves several crucial stages:

4. Requirements Determination

Precise dimensions of the shield (15 cm height, 17 cm width, 5 cm thickness) must be specified, in addition to defining the arm's function in smoothly and securely delivering the shields.

Figure 1. Dimensions of the shield.

5. Selection of Appropriate Joints

Joint design is a fundamental element in achieving arm movement. Revolute joints can be used for rotary motions, and Prismatic joints for linear motions.

5.1 Revolute Joint:

Revolute joints, as Shown in Figure 2, [1] Allows rotational movement around a specific axis, like the elbow joint.

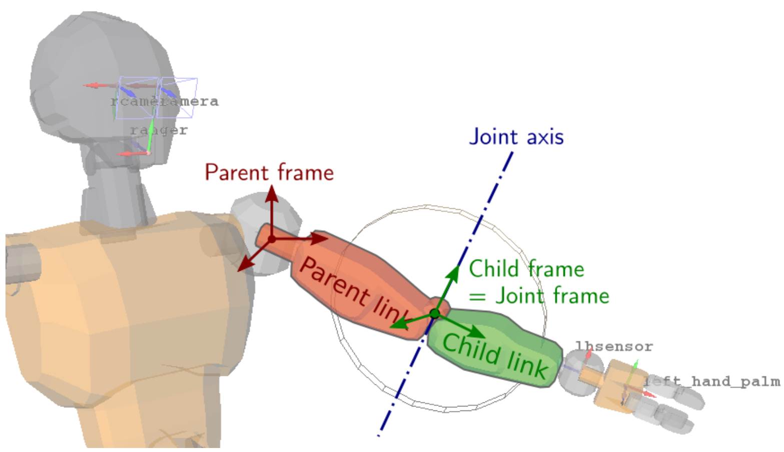


Figure 2. Revolute joints.

5.2 Prismatic Joint:

Prismatic Joint, as Shown in Figure 3, [2] Permits semi-linear motion, suitable for arm movement and shield delivery.

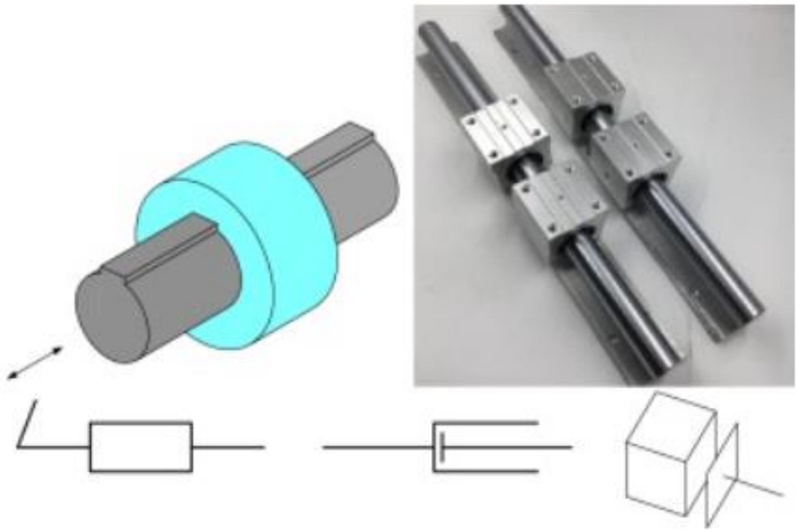


Figure 3. Prismatic Joint.

5.3 Arm Design

Arms must be designed with lengths and shapes that ensure shield stability and protection. Connected arms with joints can achieve more precise movement, as Shown in Figure 4, [3]

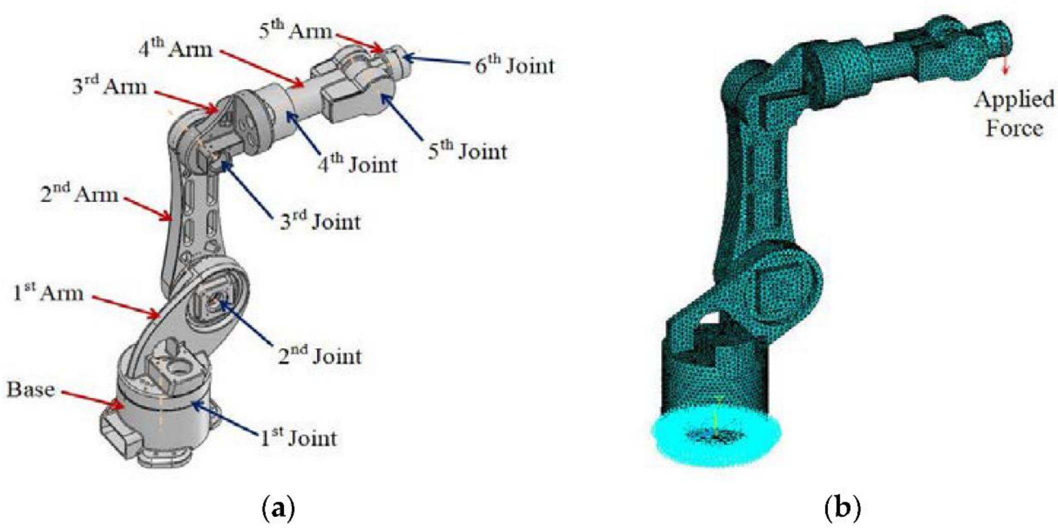


Figure 4. Robot configuration:

(a) Schematic description of the robot architecture; (b) Finite element analysis FEA model.

5.4 Kinematics and Arm Design

The study of kinematics is vital in arm design. Kinematics involves analyzing the motion of bodies without considering the forces that cause that motion. Designers need to determine how the arm's joints interact to produce the desired motion of the shield. This involves concepts such as forward and inverse kinematics, which help determine joint angles and positions required to achieve a specific end-effector (shield) position.

5.5 Shield Protection and Ergonomics

In addition to stability, arm design should also focus on shield protection and ergonomic considerations. The arms should prevent the shield from being damaged during movement, including minimizing any vibrations or impacts that might occur. Furthermore, the design should consider human interaction, ensuring that the shield is easy to load onto and remove from the arm, and that the overall design is user-friendly.

5.6 Overall Structure

The arm's structure should be durable and lightweight, with attention to improving load distribution and shock resistance.

6. CLAMP DESIGN: Ensuring Secure Shield Retention

In the design process of the robotic arm aimed at carrying a shield, one crucial aspect that demands special attention is the clamp design. Clamps serve as the means by which the shield is securely held in place throughout the arm's movement and operation. The effectiveness of the clamp design directly impacts the overall functionality, safety, and efficiency of the robotic arm in its intended task.

Figure 5. Robot DH Robotics 3 Finger Adaptive Gripper [4]

6.1 Purpose of Clamps

The primary purpose of the clamps is to provide a stable and reliable means of securing the shield to the robotic arm. Given the dynamic nature of the arm's movements and the potential variations in orientation and angles, it's imperative that the shield remains firmly attached at all times. This ensures that the shield doesn't dislodge, fall, or interfere with the arm's movements during its operation, particularly in scenarios where the arm's motion might involve sudden accelerations or decelerations.

6.2 Versatility in Clamp Design

The design of the clamps should take into consideration the diverse range of shields that the robotic arm might need to carry. Shields can come in various shapes, sizes, and dimensions, each potentially requiring a slightly different clamp configuration. As such, the clamp design needs to be versatile enough to accommodate different shield geometries while maintaining a secure grip.

6.3 Ease of Installation and Removal

Apart from ensuring secure retention, the clamps should also be designed for practicality. They should be easy to install and remove, allowing for efficient shield swapping or maintenance. Clamps that are overly complex or time-consuming to operate could lead to operational inefficiencies, potentially slowing down the process of attaching or detaching shields.

6.4 Material Selection and Ergonomics

The choice of materials for the clamps is also significant. They should be durable enough to withstand the mechanical stresses imparted during the arm's movements, as well as any potential external forces the robotic arm might encounter in its operational environment. Moreover, ergonomic considerations play a role; the clamps should be designed in a way that facilitates intuitive and quick manipulation by operators.

6.5 Validation and Testing

To ensure the effectiveness of the clamp design, it's crucial to subject it to thorough validation and testing. Simulations and physical testing can help verify the clamps' ability to hold the shield securely under different conditions. This validation process contributes to the overall reliability and safety of the robotic arm's operation.

7. Material Selection for the Arm

Selecting suitable materials for the arm is a crucial aspect of ensuring its performance, durability, and longevity. The choice of materials should align with the arm's functional requirements and the environmental conditions it will be subjected to. The following subsections elaborate on the various material options available:

7.1 Aluminum Alloys: Lightweight and corrosion resistant.

Aluminum alloys are widely recognized for their excellent combination of low density and high strength-to-weight ratio. These materials offer the advantage of reducing the overall weight of the arm without compromising structural integrity. Additionally, aluminum alloys exhibit natural corrosion resistance due to the formation of a protective oxide layer on their surface. This characteristic is particularly beneficial when the arm is exposed to humid or corrosive environments.

7.2 Steel: Strong and durable.

Certain types of steel, such as stainless steel, provide a balance between strength, ductility, and corrosion resistance. Stainless steel variants, like 304 and 316, are commonly used in engineering applications where resistance to corrosion and staining is essential. Stainless steel's robustness and longevity make it suitable for arms that may come into contact with moisture, chemicals, or varying temperatures.

7.3 Composite materials: Combine various features like strength and lightness.

Composite materials, composed of two or more distinct materials combined to harness their advantageous properties, offer an attractive option for arm design. These materials can be tailored to meet specific requirements by selecting appropriate reinforcement materials and matrix resins. Composites exhibit high strength-to-weight ratios, corrosion resistance, and the ability to dampen vibrations, making them suitable for arms subjected to dynamic loads or harsh environments.

7.4 Titanium Alloys: High Strength and Corrosion-Resistant.

Titanium alloys boast exceptional strength-to-weight ratios, making them suitable for applications where both durability and weight reduction are critical. Their resistance to corrosion, particularly in aggressive environments, makes them suitable for arms used in marine or aerospace applications. However, titanium's high cost may be a consideration in material selection.

7.5 Plastics and Polymers: Lightweight and Versatile.

Certain plastics and polymers, like nylon and polyethylene, can be employed in arm design due to their lightweight nature and versatility. These materials are characterized by their low friction coefficients, electrical insulation properties, and ease of machining. While not as robust as metals, they can find application in arms that require minimal weight and less demanding environments.

7.6 Hybrid Materials: Tailored Properties.

Hybrid materials, created by combining different classes of materials, allow for tailored properties that suit specific arm requirements. For instance, a hybrid composite-metal arm could combine the lightweight advantage of composites with the strength of metals in critical areas.

Ultimately, material selection should be guided by a comprehensive understanding of the arm's intended use, load conditions, environmental factors, and cost considerations. Each material option presents a trade-off between various properties, and the final choice should align with the arm's functional goals and design constraints.

8. BOOKS SOURCES

8.1 Mechanics of Machines for Joint and Connection Calculations

The book "Mechanics of Machines" provides a strong foundation in machine mechanics and aids in better understanding the calculation of joints and connected points in mechanical devices. It assists in analyzing part movements and designing joints with precise engineering methods.

8.2 Example from Page 152 of "Mechanics of Machines" - Degrees of Freedom Calculation:

"When analyzing the robotic arm, the degree of motion freedom must be calculated using the relationship between the number of links and the number of joints. For instance, if a robotic arm is connected by only two joints, the degree of motion freedom will be (number of links × 3) - (number of joints × 2) = (3 × 4) - (2 × 6) = 5."

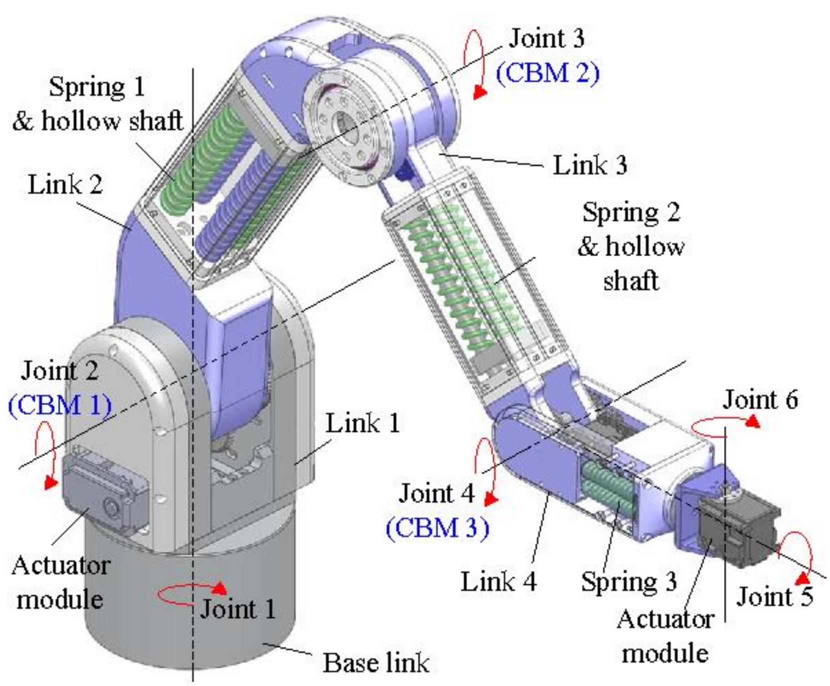


Figure 6. Design of 6-DOF articulate counterbalance robot arm [5]

8.3 Shigley's Mechanical Engineering Design - Optimal Gear and Joint Selection:

“Shigley's Mechanical Engineering Design” is an essential reference for comprehending the design of mechanical parts, aiding in the selection of suitable gears and joints in arm design. It presents computational and practical concepts to ensure effective transmission of desired motions.

8.4 Example from Page 310 of “Shigley's Mechanical Engineering Design” - Gear Selection:

“When designing the robotic arm, appropriate gears should be chosen to achieve the desired motion transmission. For example, if rotational motion needs to change direction, bevel gears can be used with pinions to ensure effective motion transfer.”

8.5 Materials Science and Engineering - Material Testing:

“Materials Science and Engineering” offers advanced insights into the mechanical and structural properties of materials. It can be used to understand suitable tests for selecting materials that align with arm design, such as tensile and bending tests.

8.6 Example from Page 240 of "Materials Science and Engineering" - Tensile Testing:

“The tensile test can be used to determine tensile strength and elongation of materials. For instance, if the materials used in arm design need to withstand high mechanical loads, they should be tested using the tensile test to verify their durability.”

9. CONCLUSION

This research demonstrates that designing a robotic arm for carrying a shield requires a precise engineering approach and the use of three-dimensional design techniques like SolidWorks. Utilizing appropriate joints and selecting the right materials play a crucial role in achieving optimal performance. Reliable sources should be consulted to support information and confirm results.

10.REFERENCE

1. SCARON. (Website). "Revolute Joints in Robotics." Available at: https://scaron.info/robotics/revolute-joints.html
2. "Prismatic Joint." ScienceDirect. Available at: https://2u.pw/z7kXq5U
3. MDPI. (2020). Design and Analysis of a Robotic Arm for Carrying a Shield: A SolidWorks Approach. Applied Sciences, 10(7), 2223. Retrieved from: https://www.mdpi.com/2076-3417/10/7/2223
4. "DH Robotics Catalog." Unchained Robotics. Available at: https://uploads.unchainedrobotics.de/media/file_upload/DH-Robotics-catalog-EN_4a562d30.pdf
5. Kim, D., & Min, B. H. (2017). Multi-DOF counterbalance mechanism for low-cost, high-performance robotic arms. Journal of Mechanical Science and Technology, 31(5), 2421-2430.
6. John J. Craig. (2005). **Introduction to Robotics: Mechanics and Control**. Pearson Prentice Hall.
7. Saeed B. Niku. (2019). **Introduction to Robotics: Analysis, Control, Applications.** Wiley.
8. Peter R.N. Childs. **Mechanical Design Engineering Handbook**.
9. M. S. Whittaker. (2007). **Mechanical Design Engineering Handbook.** Butterworth-Heinemann.
10. M. McCarthy. (1990). **Introduction to Theoretical Kinematics.** MIT Press.
11. R.C. Hibbeler. (2019). **Mechanics of Materials**. Pearson.
12. R.C. Hibbeler. (2020). **Engineering Mechanics: Statics**. Pearson.

13. R.C. Hibbeler. (2019). **Engineering Mechanics: Dynamics.** Pearson.
14. R.C. Hibbeler. (2022). **Mechanical Engineering Design.** Pearson.
15. Callister Jr., W.D., & Rethwisch, D.G. (2017). **Materials Science and Engineering: An Introduction.** Wiley.
16. R.C. Budynas, and J.K. Nisbett. (2021). **Shigley's Mechanical Engineering Design**. McGraw Hill.
17. David W. Hutton. (2020). **Mechanics of Machines**. CRC Press.

8.2 Weekly Reports

WEEKLY RECORD OF TRAINING

WEEK NO: 1 **FROM:** 9 July 2023 **TO:** 13 July 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

Write below briefly:

a. The work you have done this week.

b. Any new tool/equipment you have used or something new you have learnt.

a. Starting this week, I have begun my summer internship with the Smart Methods Institution. I was accepted into the program after successfully completing a pre-assessment test and a personal interview. I will be pursuing the Mechanical Engineering track, which focuses on the manufacturing of smart robots, as well as learning about other tracks such as the Electronics and Power Department, Robotics and AI Department, Software Department, Internet of Things Department, and Industrial Engineering Department.

During the internship, I am required to complete all the assigned tasks in my chosen track of Mechanical Engineering. However, I am also eager to challenge myself and complete tasks from the other departments, aiming to receive a comprehensive training certificate.

My initial task was to design a robot body using engineering design software such as Cinema 4D and Tinkercad. I decided to work practically on SolidWorks for this purpose.

b. Throughout this week, I have also learned about the tasks and responsibilities in the other departments. Additionally, I acquired knowledge of Tinkercad software for simulating electrical circuits, and I have started learning languages like PHP and HTML for creating a web-based control page for the robot, allowing it to be operated from any device with internet access, in addition to the steps to protect intellectual property for projects and the method of filling out the form on the site, which is in the industrial engineering department.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent ☑ [90-100%]	Very Good ☐ [80-89%]	Good ☐ [70-79%]	Satisfactory ☐ [60-69%]	Not Satisfactory ☐ [less than 60%]

Any other comment:

مؤسسة الأساليب الذكية للإلكترونيات
س.ت ٤٠٣١٠٦٠٤٨٥
C.R. 4031060485
Smart Methods Trading Est.

Eng. Asim Ibrahim		17/7/2023
Supervisor's Name	**Signature**	**Date**

WEEKLY RECORD OF TRAINING

WEEK NO: 2 **FROM:** 16 July 2023 **TO:** 20 July 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

Write below briefly:
a. The work you have done this week.
b. Any new tool/equipment you have used or something new you have learnt.

During the second week of my training at Smart Methods Corporation, I focused on the Mechanical Engineering track, to which I belong. In this track, I delved into the history of Mechanical Engineering and learned about the fascinating inventions of ancient times. One such invention was the Elephant Clock, a mechanical water-powered clock created by the ingenious scientist Al-Jazari (1136-1206). The clock featured a weight-driven mechanism in the shape of an elephant, and its various components were housed in a structure mounted on the elephant's back. This remarkable clock was designed to emit sounds every half an hour, serving as a mechanical means of telling time during that era..

Figure 1. The Elephant Clock is depicted in a manuscript by Al-Jazari (1206 CE) from "The Book of Knowledge of Ingenious Mechanical Devices."

One of the tasks in the Mechanical Engineering track involved designing a robot body using SolidWorks, a powerful engineering software. I created a precise 3D model of the robot's body, paying close attention to detail.

To access the files page, visit: https://github.com/H16Bw/Mechanical-Department-Task-1-

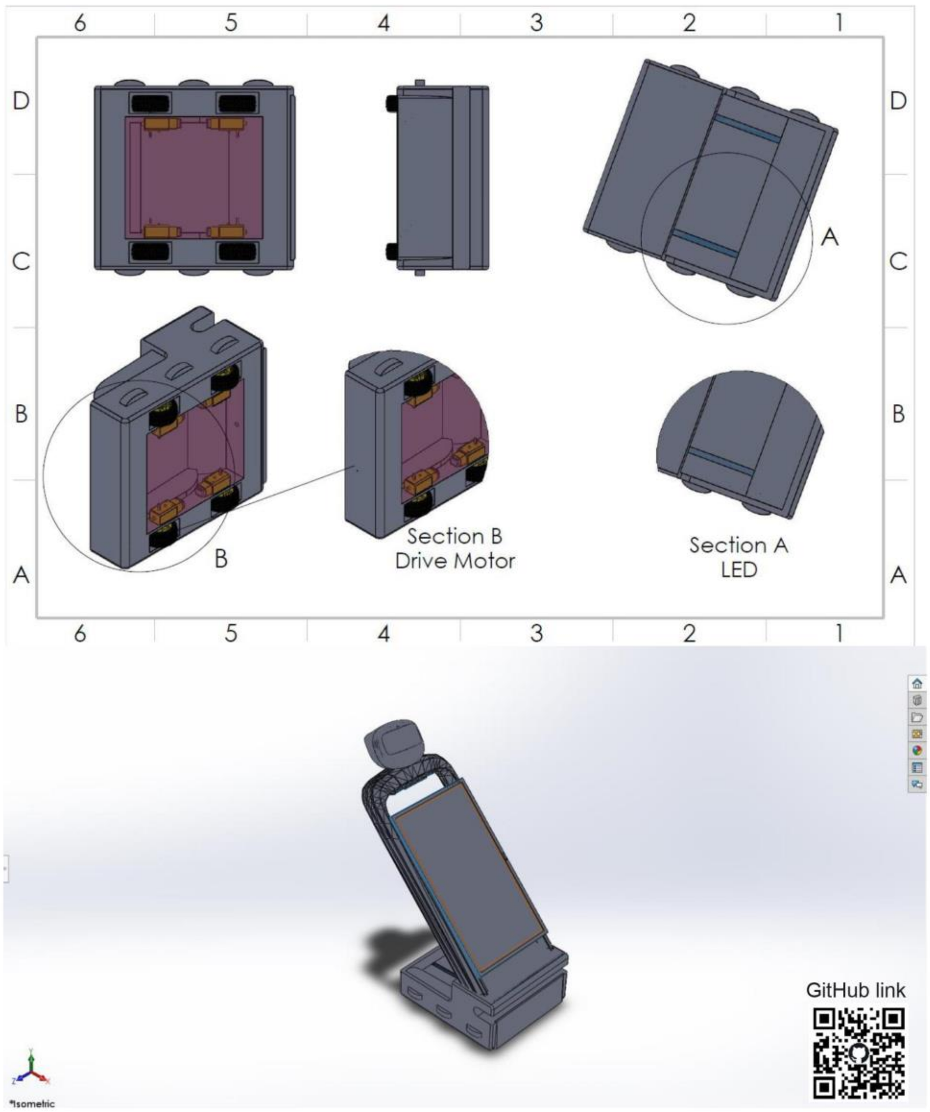


Figure 2. 3D design of the robot body

I also had the opportunity to explore the Electronics and Power Department. Here, I learned about electrical and electronic circuits and how to use components like resistors. Additionally, I delved into programming with Arduino and its IDE. I successfully designed critical electrical circuits for the robot and programmed the Arduino board using C++ to control it.

To access the files page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Tasks

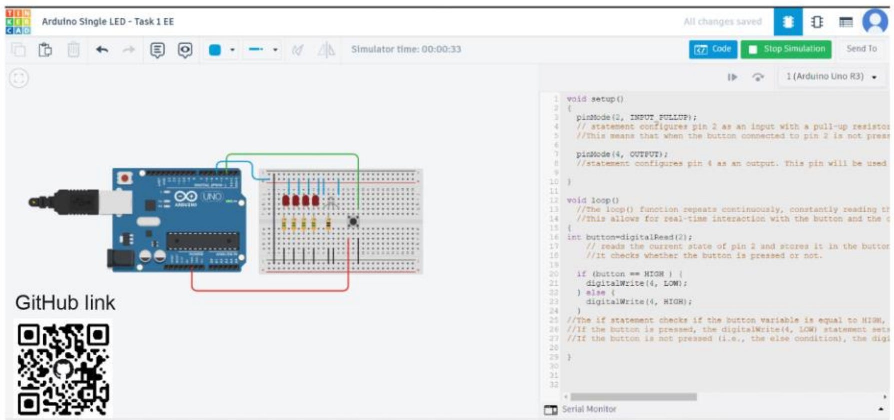


Figure 3. Arduino Single LED circuit

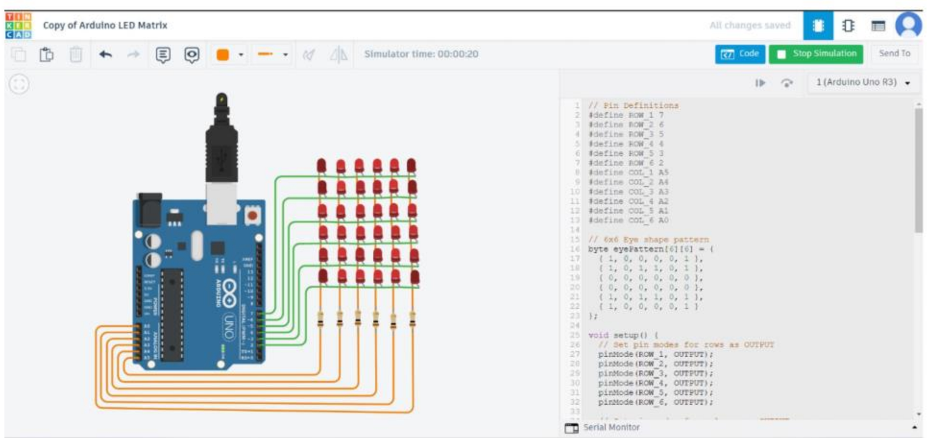


Figure 4. Arduino LED matrix 6x6 to power the lighting simulates the eyes of the robot

In the Software Department, I gained knowledge about building web pages for remote robot control using HTML programming language and understanding server structures. As a result, I developed a dedicated webpage for the robot, enabling users to control it remotely using their smart devices.

To access the files page, visit: https://github.com/H16Bw/Software-Department-Task-1-

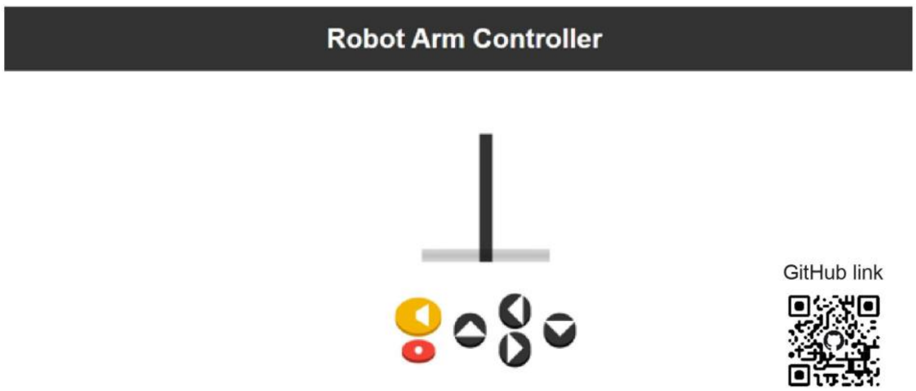


Figure 5. Robot arm control HTML page

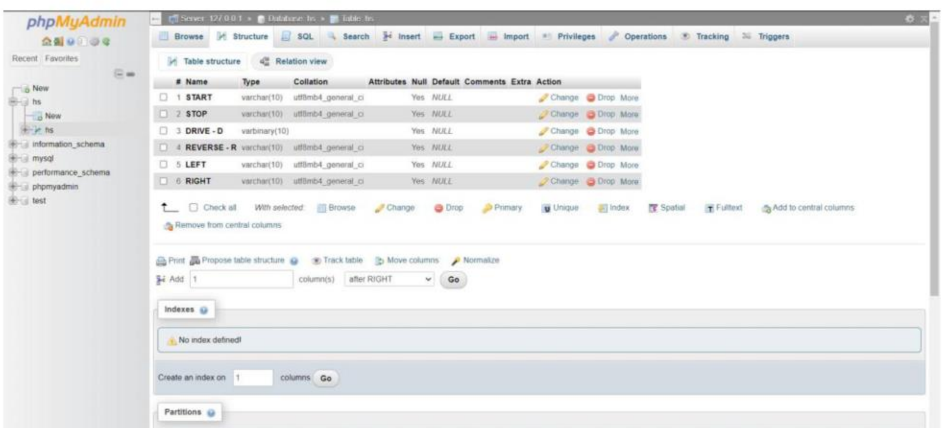


Figure 5. PHP Server to create the control page.

Furthermore, I acquired valuable insights into intellectual property rights and the process of registering ideas and projects with the Saudi Authority for Intellectual Property at the Industrial Engineering Department. Inspired by this, I proposed the idea of registering my previous college graduation project, which I had presented with my colleagues in the last semester-442.

Overall, the training provided me with a wealth of information and practical skills in Mechanical Engineering, Electronics, Power, and Software Development. I am grateful for this comprehensive learning experience this week, and I look forward to applying these newfound skills and knowledge to future projects in the training.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent ☑	Very Good ☐	Good ☐	Satisfactory ☐	Not Satisfactory ☐
[90-100%]	[80-89%]	[70-79%]	[60-69%]	[less than 60%]

Any other comment:

___

___

___

مؤسسة الأساليب الذكية للتدريب
س.ت ٤٠٣١٠٦٠٤٨٥
C.R. 4031060485
Smart Methds Training Est.

Eng. Asim Ibrahim		25/7/2023
Supervisor's Name	**Signature**	**Date**

5

WEEKLY RECORD OF TRAINING

WEEK NO: 3 **FROM:** 23 July 2023 **TO:** 27 July 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

Write below briefly:
a. The work you have done this week.
b. Any new tool/equipment you have used or something new you have learnt.

During this week, I was assigned a new task to design mechanical joints for the robot's head to enable its movement. I will use SolidWorks software for this project. Although the requirement was to design only one type of joint, I ended up choosing three types: axis joints, angle joints, and ball joints. The deadline for delivering this task is at the end of the next week.

Alongside this project, I also learned how to use the ROS (Robot Operating System) and simulated the robot arm in Robotics and AI Department.

To access the full report page, visit: https://github.com/H16Bw/Robotics-and-AI-Department-tasks

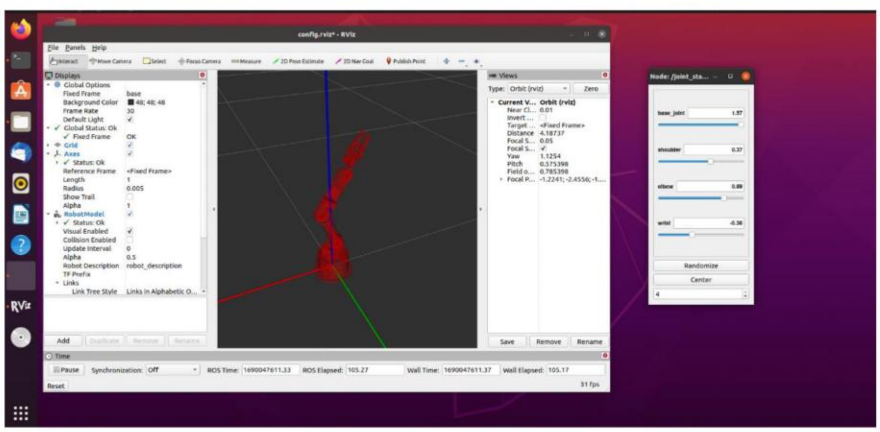


Figure 1. Robot arm in ROS.

In the Internet of Things Department (IoT), I worked on creating an electronic circuit consisting of two Arduino boards. One board receives data from a web page, and the other board uses this data to control the movement of the robot.

To access the full report page, visit: https://github.com/H16Bw/Internet-of-Things-Department-Task-2

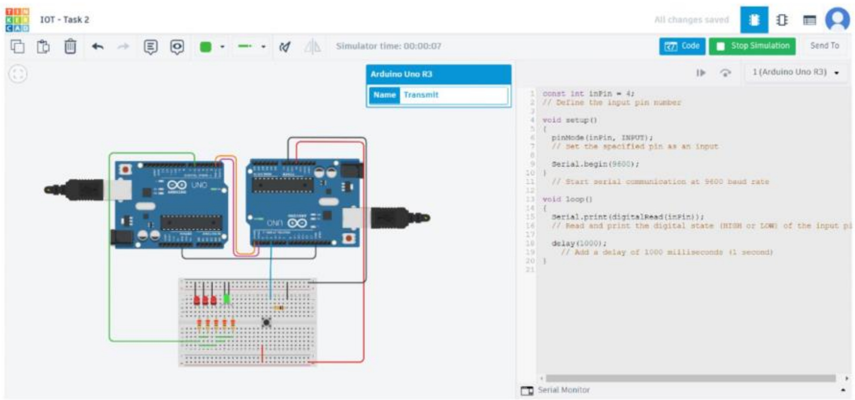


Figure 2. Arduino Transmit & Receive.

Additionally, I learned how to work with HTML code with the help of my team. I successfully implemented a code to remotely control an LED using Wi-Fi, which allows connecting the robot to the internet via a private network and using a web page to control its actions.

To access the full report page, visit: https://github.com/H16Bw/Internet-of-Things-Department-Task-1

Furthermore, I gave a presentation titled "(Glossophobia) A story with FEAR " to encourage colleagues to overcome their fear of public speaking and to instill confidence in them to speak without fear and hesitation.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent [90-100%]	Very Good [80-89%]	Good [70-79%]	Satisfactory [60-69%]	Not Satisfactory [less than 60%]
☑	☐	☐	☐	☐

Any other comment:

None

Eng. Asim Ibrahim		**12/1/1445**
Supervisor's Name	**Signature**	**Date**

WEEKLY RECORD OF TRAINING

WEEK NO: 4 **FROM:** 30 July 2023 **TO:** 03 Agu. 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

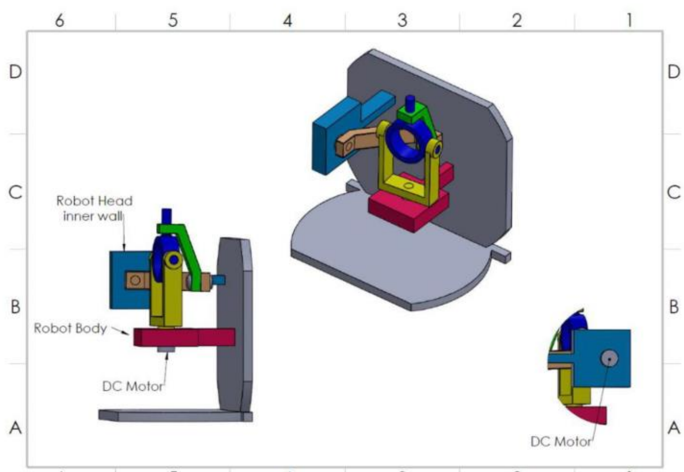
Write below briefly:
a. The work you have done this week.
b. Any new tool/equipment you have used or something new you have learnt.

This week, I focused on designing two joints for the robot's head, the pivot joint, and the ball-and-socket joint, using SolidWorks software. These joints will provide the robot with enhanced mobility and the ability to move its head in various directions.

To access the full report page, visit: https://github.com/H16Bw/Mechanical-Department-Task-2

- **Pivot Joint:**

The pivot joint allows rotational motion around a single axis, enabling the robot's head to tilt up and down or swivel left and right. It is operated by two DC electric motors—one for horizontal movement (X-axis) and another for vertical movement (Y-axis). These motors work together to achieve specific angles between the axes.

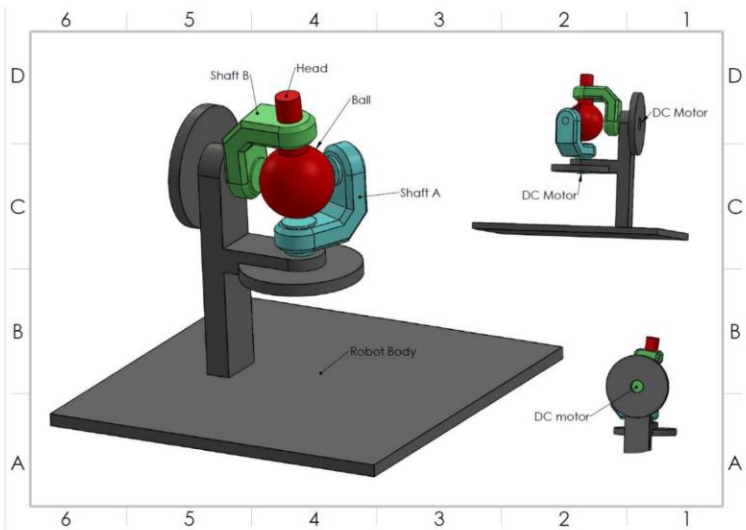


GitHub link

Figure 1. Pivot Joint

- **Ball and Socket Joint:**

The ball-and-socket joint grants the robot's head a wide range of motion in multiple axes, allowing freedom of movement in all directions. It consists of a ball-shaped piece within the robot's head and a socket in the neck. Using DC electric motors, the robot's head can move in different directions depending on motor activation.

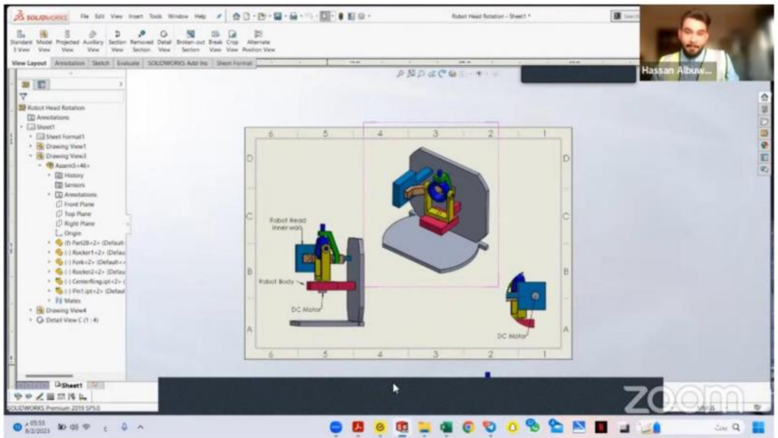


GitHub link

Figure 2. Ball and Socket Joint.

In addition to my design work, I conducted a training session for my fellow interns, demonstrating the usage of SolidWorks for engineering and assembling mechanical joint components.

To access the Video, visit: https://www.youtube.com/watch?v=bZXdv6KJyag

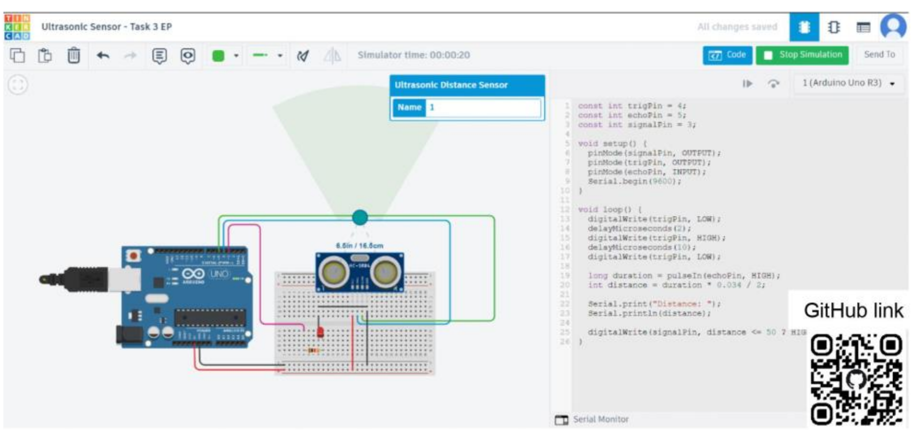


YouTube link

Figure 3. SolidWorks session.

During the week, I also worked on creating an electronic circuit and programming it for the ultrasonic sensor in the electronics and power section path. This circuit allows the robot to measure the distance between itself and obstacles, helping it to avoid collisions during its movement.

To access the full report page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Task-3



GitHub link

Figure 5. Ultrasonic Sensor Program.

Additionally, I engaged in simulating ROS (Robot Operating System) through TurtleBot3 and Gazebo. ROS is a widely used framework for building robotic applications, and TurtleBot3 is a popular and affordable mobile robot platform. Gazebo serves as a powerful simulation environment that allows me to test and validate my ROS code in a virtual setup.

To access the full report page, visit https://github.com/H16Bw/Robotics-and-AI-Department-Task-2

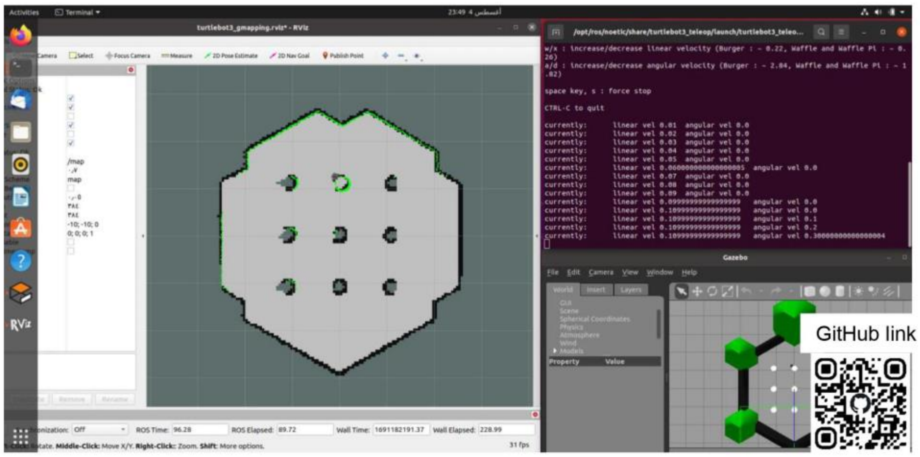


Figure 6. ROS through simulation with TurtleBot3 and Gazebo.

Overall, this week has been productive, with significant progress in designing mechanical joints, enhancing electronics skills, and exploring simulation techniques for robotics applications.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent [90-100%] ☑	**Very Good** [80-89%] ☐	**Good** [70-79%] ☐	**Satisfactory** [60-69%] ☐	**Not Satisfactory** [less than 60%] ☐

Any other comment:

Eng. Asim Ibrahim		19/1/1445
Supervisor's Name	**Signature**	**Date**

WEEKLY RECORD OF TRAINING

WEEK NO: 5 **FROM:** 06 Agu. 2023 **TO:** 13 Agu. 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

Write below briefly:
a. The work you have done this week.
b. Any new tool/equipment you have used or something new you have learnt.

a. This week, I've worked on various tasks from different departments as part of the summer training program at Smart Methods:

1. Mechanical Department Task 3:

I've been working on the 3rd task of the Mechanical Department's Summer training program at Smart Methods. The task involves designing a suspension system using SOLIDWORKS. I've been focusing on understanding the various components of a suspension system and how they work together to ensure vehicle stability, comfort, and handling. I've also been using SOLIDWORKS to create simulations and visualizations of the suspension system's front wheel suspension for Robots.

To access the full report page, visit: https://github.com/H16Bw/Mechanical-Department-Task-3

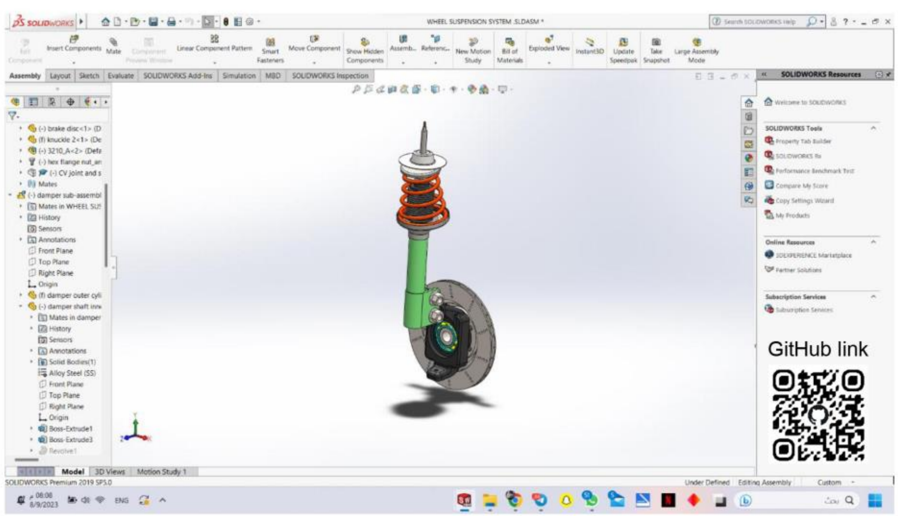


Figure 1. A suspension system.

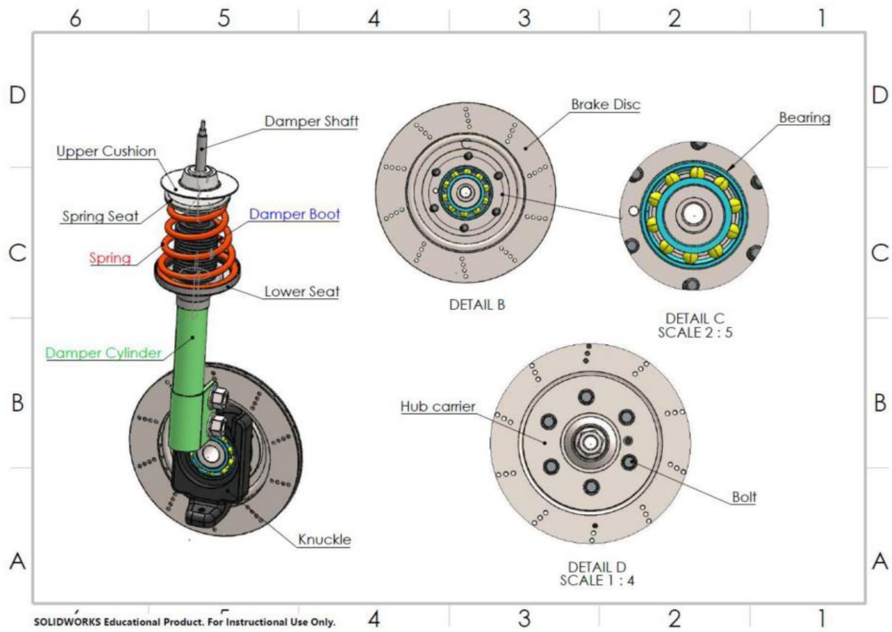


Figure 2. Component of the Suspension System.

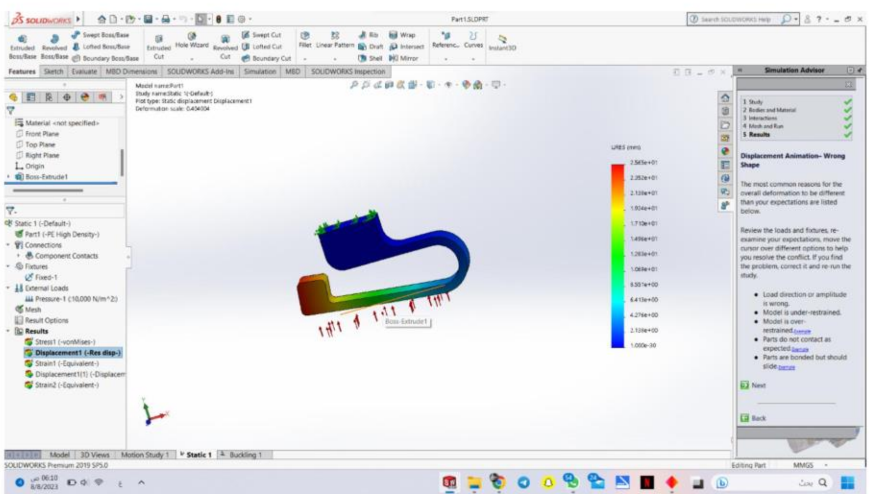


Figure 3. Front Wheel Robot Suspension System.

In terms of new tools and knowledge, I have learned about the various components that make up a suspension system, their roles, and how they interact to ensure a vehicle's optimal performance. I've gained insights into springs, shock absorbers (dampers), struts, control arms (A-arms), ball joints, sway bars (anti-roll bars), bushings, alignment components, torsion bars, and air springs.

2. Internet of Things (IOT) Department Task 3:

I developed an Arduino sketch for ESP8266/ESP32 boards to collect temperature and humidity data using a DHT22 sensor and transmit it via a Wi-Fi network using HTTP POST requests. The code involved libraries for Wi-Fi communication, HTTP requests, and sensor interfacing.

To access the full report page, visit: https://github.com/H16Bw/Internet-of-Things-Department-Task-3

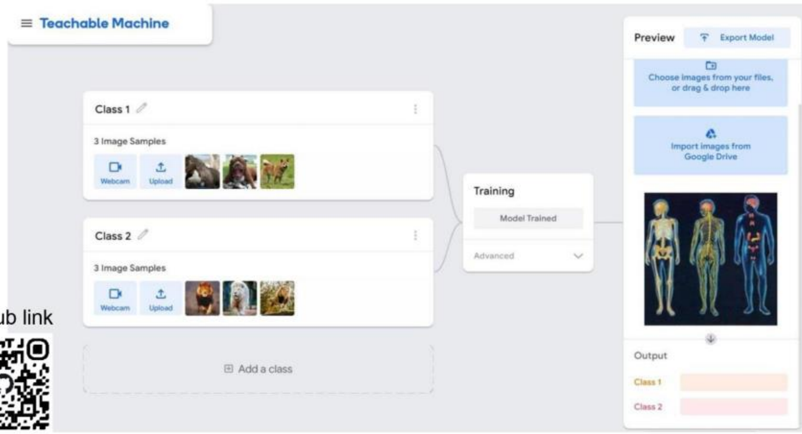
Figure 4. DHT22 Sensor.

While the Arduino sketch and project are primarily focused on electronics and programming, the collected temperature and humidity data can significantly benefit engineers building robots by informing design choices, adaptive behaviors, material selections, energy management strategies, and overall performance optimization in various environments. It adds an additional layer of intelligence and adaptability to the mechanical aspects of the robot.

3. Robotics and AI Department Task 3:

I learned about training machine learning models using Google's Teachable Machine tool. The process included selecting classes, uploading images, training the model, uploading test images, and observing the model's classification results. This provided an introductory insight into machine learning without extensive programming knowledge.

To access the full report page, visit: https://github.com/H16Bw/Robotics-and-AI-Department-Task-3



GitHub link

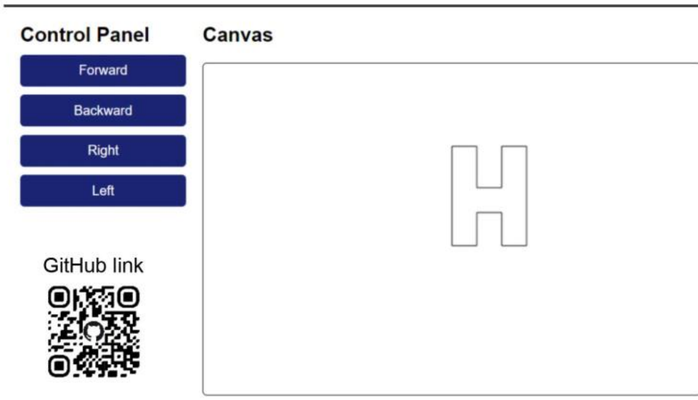
Figure 5. Machine Learning with Teachable Machine.

Learning about training machine learning models using tools like Teachable Machine can empower engineers to create smarter, more adaptable, and efficient robots that can interact with their environment and perform a wide range of tasks. It adds a valuable skill set to their toolkit, allowing them to contribute to the rapidly evolving field of robotics.

4. Software Department Task 2:

I created a webpage with an interactive control panel to manipulate a robot's movement and visualize its path using HTML, CSS, and JavaScript. The code structured the webpage, defined styles, and implemented JavaScript functions for controlling the robot's actions and displaying its path.

To access the full report page, visit: https://github.com/H16Bw/Software-Department-Task-2



GitHub link

Figure 5. Web Page to control the robot by drawing its movement path.

b. In the course of this week's work, I've gained exposure to several new tools, equipment, and skills:

GitHub: Throughout these tasks, I've been using GitHub to host and share my work. This version control platform has allowed me to collaborate effectively, manage different versions of my projects, and showcase my accomplishments.

SOLIDWORKS: Through the Mechanical Department Task 3, I've had the opportunity to work extensively with SOLIDWORKS, a powerful CAD software. This tool has enabled me to design and simulate the suspension system, creating visualizations that aid in understanding how different components interact.

Arduino and ESP8266/ESP32 Boards: For the Internet of Things (IOT) Department Task 3, I learned to develop an Arduino sketch for ESP8266/ESP32 boards. This involved interfacing with a DHT22 sensor to collect temperature and humidity data, which can have applications in various robotic contexts.

Teachable Machine: The Robotics and AI Department Task 3 introduced me to training machine learning models using Google's Teachable Machine tool. This tool doesn't require extensive programming knowledge and allows for hands-on experience in creating basic machine learning models.

DHT22 Sensor: In the Internet of Things (IOT) Department Task 3, I worked with a DHT22 sensor to collect temperature and humidity data. Learning to interface sensors with microcontrollers expands my understanding of hardware components used in robotics.

Basic Machine Learning Concepts: The experience with Teachable Machine introduced me to the fundamental concepts of training machine learning models, which can be applied to various robotic applications, such as image recognition and decision-making.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent ☑	**Very Good** ☐	**Good** ☐	**Satisfactory** ☐	**Not Satisfactory** ☐
[90-100%]	**[80-89%]**	**[70-79%]**	**[60-69%]**	**[less than 60%]**

Any other comment:

Eng. Asim Ibrahim — 21/8/2023

Supervisor's Name **Signature** **Date**

مؤسسة الأساليب الذكية للتجارة
س.ت ٤٠٣١٠٦٠٤٨٥
C.R. 4031060485
Smart Methds Teading Est

WEEKLY RECORD OF TRAINING

WEEK NO: 6 **FROM:** 13 Agu. 2023 **TO:** 17 Agu. 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

Write below briefly:

a. The work you have done this week.

b. Any new tool/equipment you have used or something new you have learnt.

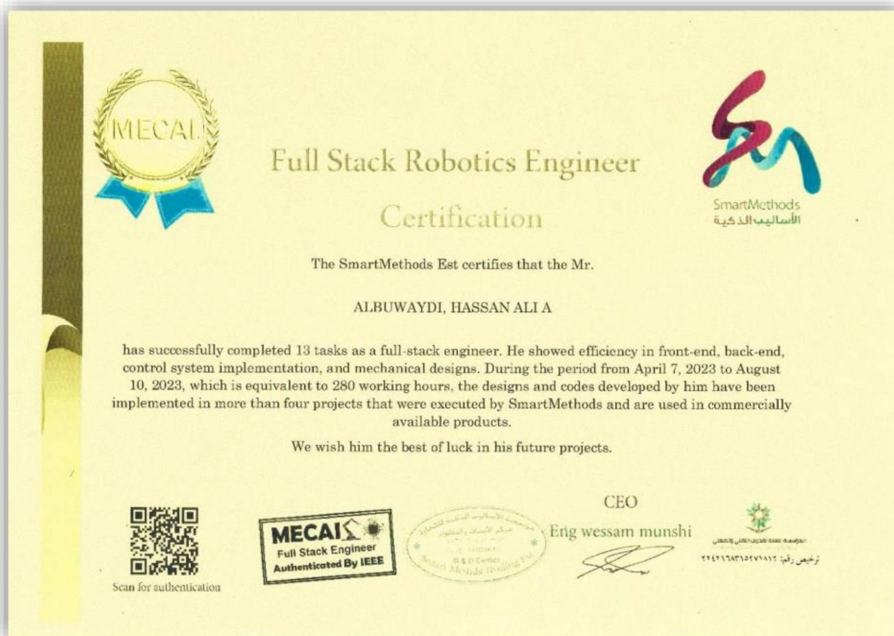
My activities for this week were centered around my participation in the closing ceremony of the Summer Training Program held at "The Code" center in Jeddah. I had the honor of being selected by the Director of Training, to speak in front of the audience, sharing my training experience during the program.

Furthermore, I am delighted to announce that I was awarded the "Best Engineer" accolade. However, my accomplishments didn't stop there. I also attained the "Full Stack Robotics Engineer" certification and acquired five accredited experience certificates across various domains: Mechanical Design Path, Electronics & Power Systems Path, Robotic & Artificial Intelligence Path, Web Development & Natural Language Processing Path, and Internet of Things Path.

It was a remarkable period where I engaged in a significant event, received recognition and meaningful awards, and enhanced my skills and knowledge through the attainment of multiple certificates. I look forward to more challenges and opportunities in the coming weeks.

Figure 1. While speaking in front of an audience about my internship experience

Figure 2. Best Engineer Award.



MECAI

Full Stack Robotics Engineer

Certification

SmartMethods
الأساليب الذكية

The SmartMethods Est certifies that the Mr.

ALBUWAYDI, HASSAN ALI A

has successfully completed 13 tasks as a full-stack engineer. He showed efficiency in front-end, back-end, control system implementation, and mechanical designs. During the period from April 7, 2023 to August 10, 2023, which is equivalent to 280 working hours, the designs and codes developed by him have been implemented in more than four projects that were executed by SmartMethods and are used in commercially available products.

We wish him the best of luck in his future projects.

Scan for authentication

MECAI
Full Stack Engineer
Authenticated By IEEE

CEO
Eng wessam munshi

Figure 3. Full Stack Robotics Engineer Certification.

Figure 4. Mechanical Design Certification.

Figure 5. Electronics & Power Systems Certification.

SmartMethods
الأساليب الذكية

MEÇAI

Robotic
& Artificial intelligence

Certification

The SmartMethods Est. certifies that Mrs.

ALBUWAYDI, HASSAN ALI A

Performed 4 successful missions in the Robotics and Artificial Intelligence path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

شهـــــــادة خبرة

تشهد مـــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ 4 مهام ناجحة في مســـــار الروبوتات والذكاء
الصناعي خــلال الفترة ٤ / ٧ / ٢٠٢٣م إلى
١٠/٨ /٢٠٢٣ م وبمعدل ٢٨٠ ســـاعة عمل وقد تم
استخـدام الأكواد والتصـــاميم التي تم إنجازها في أكثر
من أربعة مشاريع منفذة في المؤسسة ومتاحة بالأسواق

CEO
Eng wessam munshi

Scan for authentication

Figure 6. Robotic & Artificial Intelligence Certification

SmartMethods
الأساليب الذكية

MEÇAI

WWW.

Web development
& Natural language processing

Certification

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 2 successful missions in the Web Development and Natural Language Processing path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

شهـــــــادة خبرة

تشهد مـــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ 2 مهام ناجحة في مســـــار برمجة المواقع
ومعالجة اللغات الطبيعية خــلال الفترة ٤ / ٧ / ٢٠٢٣م إلى
١٠/٨ /٢٠٢٣ م وبمعدل ٢٨٠ ســـاعة عمل وقد تم استخـدام
الأكواد والتصـــاميم التي تم إنجازها في أكثر من أربعة مشاريع
منفذة في المؤسسة ومتاحة بالأسواق

CEO
Eng wessam munshi

Scan for authentication

Figure 7. Web Development & Natural Language Processing Certification.

SmartMethods
الأساليب الذكية

MECAI

IoT

Certification

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 3 successful missions in the Internet of Things path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

شهـــــادة خبرة

تشهد مـــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ 3 مهام ناجحة في مســــار انترنت الأشياء خــلال
الفترة ٤ / ٧ / ٢٠٢٣م إلى ٢٠٢٣/٨/١٠ م وبمعدل ٢٨٠ ســـاعة
عمل وقد تم استخـدام الأكواد والتصـــاميم التي تم إنجازها في
أكثر من أربعة مشـاريع منفذة في المؤسسة ومتاحة بالأسواق
ونتمنى لها دوام التوفيق والسداد.

CEO
Eng wessam munshi

Scan for authentication

Figure 8. Internet of Things Certification.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent [90-100%]	Very Good [80-89%]	Good [70-79%]	Satisfactory [60-69%]	Not Satisfactory [less than 60%]
☑	☐	☐	☐	☐

Any other comment:

Eng. Asim Ibrahim		21/8/2023
Supervisor's Name	**Signature**	**Date**

WEEKLY RECORD OF TRAINING

WEEK NO: 7 **FROM:** 20 Agu. 2023 **TO:** 24 Agu. 2023

STUDENT NAME: Hassan Ali A Albuwaydi **I.D. No.:** 391 900 538

NAME OF THE COMPANY: Smart Methods

Write below briefly:

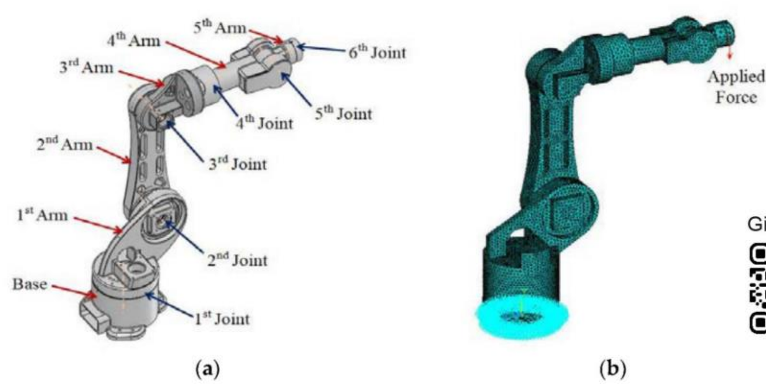
a. *The work you have done this week.*
b. *Any new tool/equipment you have used or something new you have learnt.*

This week, I completed two different tasks:

In the Mechanical Engineering Department:

I finished the fourth task as part of the summer training program in the Mechanical Engineering Department at Smart Methods. The task involved designing a robotic arm for carrying a shield. I went through several stages of the process, including determining the shield's dimensions, selecting suitable joints (revolute and prismatic), designing the arms for stability, analyzing kinematics, ensuring shield protection and comfort, creating a robust and lightweight overall structure, and designing a secure clamp for holding the shield. The project aimed to achieve precise engineering and optimal material selection for the robotic arm's performance.

To access the files page, visit: https://github.com/H16Bw/Mechanical-Department-Task-4



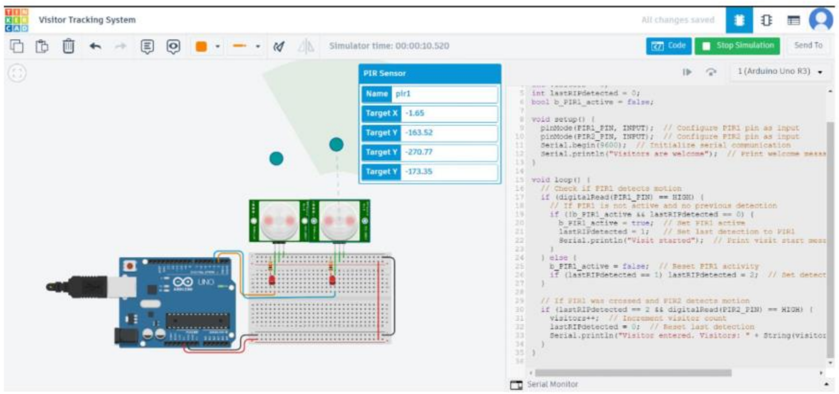
GitHub link

Figure 1. (a) Schematic description of the robot architecture; (b) Finite element analysis FEA model.

In the Electronics and Power Department:

I completed the fourth task. The task involved creating a visitor tracking system using Passive Infrared (PIR) motion sensors. The system aims to track the number of visitors entering a specific area. I connected the PIR sensors to the microcontroller (such as Arduino) and uploaded the required code to make the system operational.

To access the files page, visit: https://github.com/H16Bw/Electronics-and-Power-Department-Task-4



GitHub link

Through completing these tasks, I learned to use SolidWorks software for mechanical structure design and how to interface PIR sensors for motion detection with a microcontroller. I gained hands-on experience in hardware setup and programming for real-world applications like entrance monitoring and occupancy tracking. This enhanced my understanding of sensor integration and data processing in electronic systems.

Training Supervisor's Assessment of the Student's Performance this Week:

Excellent ☑ [90-100%]	**Very Good** ☐ [80-89%]	**Good** ☐ [70-79%]	**Satisfactory** ☐ [60-69%]	**Not Satisfactory** ☐ [less than 60%]

Any other comment:

____

____

____

Eng. Asim Ibrahim		9/2/1445
Supervisor's Name	**Signature**	**Date**

9 CERTIFICATES

9.1 Best Engineer 2023 Award:

Figure 9.1 Best Engineer 2023 Shield Award.

9.2 Full Stack Robotic Engineer:

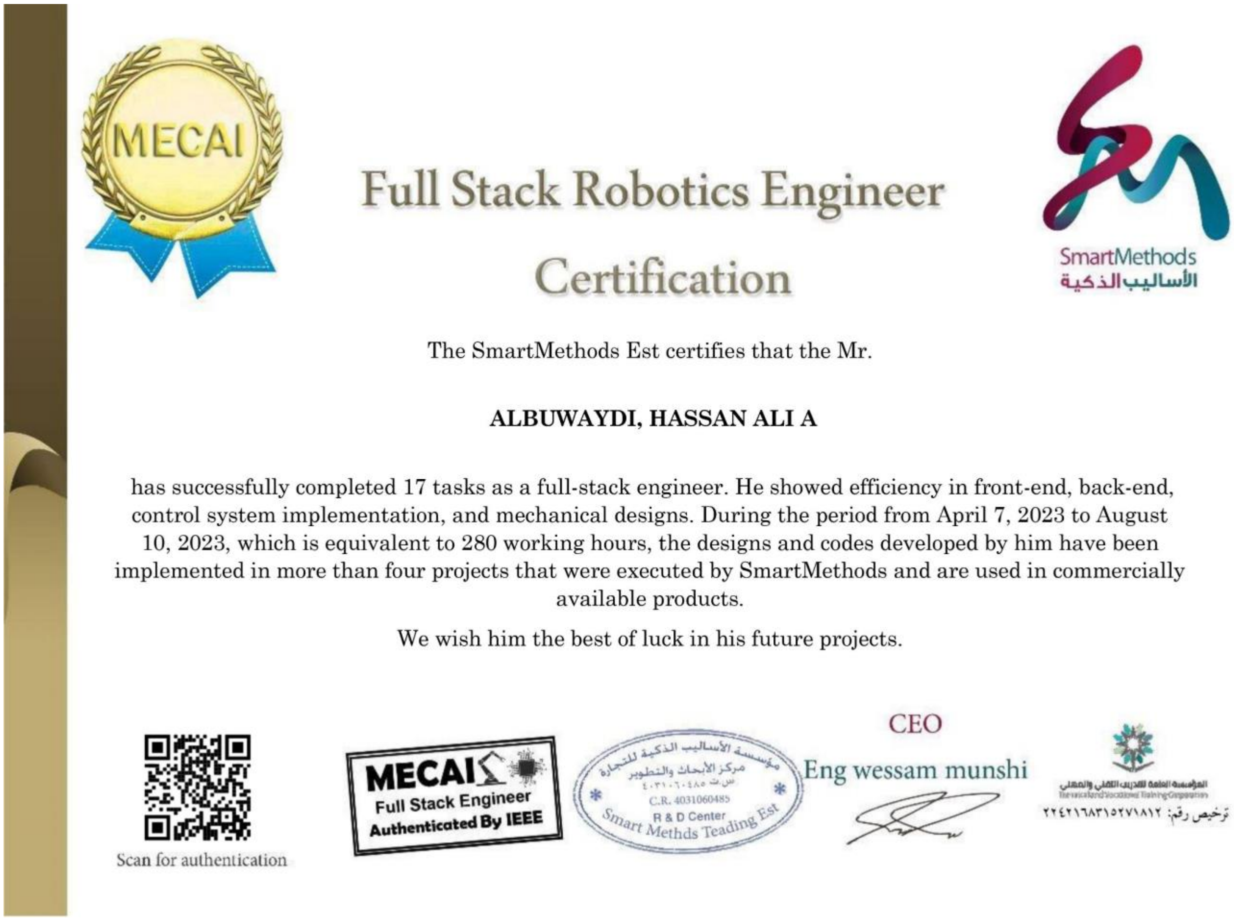


Figure 9.2 Full Stack Robotic Engineer Certification.

9.3 Robotics Industry Engineering:


المؤسسة العامة للتدريب التقني والمهني
Technical and Vocational Training Corporation
الإدارة العامة للتدريب الاهلي

Smart Methods
الأساليب الذكية

شهادة حضور دورة تطويرية

يشهد مركز الأساليب الذكية للتدريب بأن المتدرب/ ـة

حسن بن علي بن احمد البويدي

سعودي/ ـة الجنسية بموجب الهوية رقم ١٠٩٩١٩٧٠٣٨ حضر/ت دورة

هندسة صناعة الروبوتات الشاملة

المعتمدة برقم (٢١٦٨٣١٨٢) بعدد (٦٠) ساعة لمدة (٢٠) يوم ابتداءً من تاريخ ١٥-٠٨-٢٠٢٣ م

رقم الشهادة:
23092168315271812819409
(الشهادة معتمدة ولا تحتاج إلى توقيع أو ختم)

منــار mnar

تدريبك

Figure 9.3 Comprehensive Robotics Industry Engineering Certification.

9.4 Mechanical Engineering Department:

Summer Internship 2023

SmartMethods
الأساليب الذكية

MECAI

Mechanical Design

Certification

شهـــــادة خبرة

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 4 successful missions in the Mechanics Design path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

تشهد مـــــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ ٤ مهام ناجحة في مســــــــار التصميم
الميكانيكي خــــلال الفترة ٤ / ٧ / ٢٠٢٣م إلى
١٠/ ٨/ ٢٠٢٣ م وبمعدل ٢٨٠ ســــاعة عمل وقد تم
استخـدام الأكواد والتصـــاميم التي تم إنجازها في أكثر
من أربعة مشاريع منفذة في المؤسسة ومتاحة بالأسواق
ونتمنى له دوام التوفيق والسداد

Scan for authentication

C.R. 4031060485
R & D Center
Smart Methds Teading Est

CEO
Eng wessam munshi

Figure 9.4 Mechanical Design Certification.

9.5 Electronics and Programming Department:


Summer Internship 2023

Electronics & Power Systems

SmartMethods الأساليب الذكية

MECAI

Certification

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 4 successful missions in the Electronics and Power System path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

شهـــــادة خبرة

تشهد مـــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ 4 مهام ناجحة في مســــــار الإلكترونيات
والقوى الكهربائية خـــلال الفترة ٤ / ٧ / ٢٠٢٣م إلى
١٠ /٨ /٢٠٢٣ م وبمعدل ٢٨٠ ســـاعة عمل وقد تم
استخـدام الأكواد والتصـــاميم التي تم إنجازها في أكثر
من أربعة مشاريع منفذة في المؤسسة ومتاحة بالأسواق
ونتمنى له دوام التوفيق والسداد

Scan for authentication

مؤسسة الأساليب الذكية للتجارة
مركز الأبحاث والتطوير
س.ت ٤٠٣١٠٦٠٤٨٥
C.R. 4031060485
R & D Center
Smart Methds Teading Est

CEO
Eng wessam munshi

المؤسسة العامة للتدريب التقني والمهني
ترخيص رقم: ٢٢٤٢١٦٨٣١٥٢٧١٨١٢

Figure 9.5 Electronics & Power Systems Certification.

9.6 Robotics and AI Department:


SmartMethods
الأساليب الذكية

MECAI

Summer Internship 2023

Robotic
& Artificial intelligence

Certification

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 4 successful missions in the Robotics and Artificial Intelligence path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

شهـــــادة خبرة

تشهد مـــــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ ٤ مهام ناجحة في مســـــــار الروبوتات والذكاء
الصناعي خـــلال الفترة ٤ / ٧ / ٢٠٢٣م إلى
٢٠٢٣/ ٨/١٠ م وبمعدل ٢٨٠ ســـاعة عمل وقد تم
استخــدام الأكواد والتصـــاميم التي تم إنجازها في أكثر
من أربعة مشاريع منفذة في المؤسسة ومتاحة بالأسواق
ونتمنى له دوام التوفيق والسداد.

Scan for authentication

مؤسسة الأساليب الذكية للتجارة
مركز الأبحاث والتطوير
C.R. 4031060485
R & D Center
Smart Methds Teading Est

CEO
Eng wessam munshi

المؤسسة العامة للتدريب التقني والمهني
ترخيص رقم: ٢٢٤٢١٦٨٣١٥٢٧١٨١٢

Figure 9.6 Robotic & Artificial Intelligence Certification.

9.7 Software Development Department:


Summer Internship 2023

WWW.

Web development

& Natural language processing

SmartMethods

الأساليب الذكية

MECAI

Certification

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 2 successful missions in the Web Development and Natural Language Processing path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

شهـــــادة خبرة

تشهد مـــــؤسسة الأساليب الذكية بأن السيد

حسن بن علي بن احمد البويدي

قام بتنفيذ 2 مهام ناجحة في مســـــار برمجة المواقع ومعالجة اللغات الطبيعية خـــلال الفترة ٤ / ٧ / ٢٠٢٣م إلى ٢٠٢٣/ ٨/١٠ م وبمعدل ٢٨٠ ســـاعة عمل وقد تم استخـدام الأكواد والتصـــاميم التي تم إنجازها في أكثر من أربعة مشـاريع منفذة في المؤسسة ومتاحة بالأسواق

ونتمنى له دوام التوفيق والسداد.

Scan for authentication

C.R. 4031060485

R & D Center

Smart Methds Teading Est

CEO

Eng wessam munshi

ترخيص رقم: ٢٢٤٢١٦٨٣١٥٢٧١٨١٢

Figure 9.7 Web Development & Natural Language Processing Certification.

9.7 Internet of Things (IoT) Department:


Summer Internship 2023

SmartMethods
الأساليب الذكية

MECAI

IoT

Certification

شهـــــادة خبرة

The SmartMethods Est. certifies that Mr.

ALBUWAYDI, HASSAN ALI A

performed 3 successful missions in the Internet of Things path from July 4, 2023 to August 10, 2023, at a rate of 280 working hours. His design, codes, and implementation have been used in four projects that are commercially available products. We wish him the best of luck in his future projects.

تشهد مــــــؤسسة الأساليب الذكية بأن السيد
حسن بن علي بن احمد البويدي
قام بتنفيذ 3 مهام ناجحة في مســــار انترنت الأشياء خـــلال
الفترة ٤ / ٧ / ٢٠٢٣م إلى ٢٠٢٣/٨/١٠ م وبمعدل ٢٨٠ ســـاعة
عمل وقد تم استخـدام الأكواد والتصـــاميم التي تم إنجازها في
أكثر من أربعة مشـاريع منفذة في المؤسسة ومتاحة بالأسواق
ونتمنى له دوام التوفيق والسداد.

Scan for authentication

C.R. 4031060485
R & D Center
Smart Methds Teading Est

Eng wessam munshi

ترخيص رقم: ٢٢٤٢١٦٨٣١٥٢٧١٨١٢

Figure 9.8 Internet of Things Certification.

-- END OF THE REPORT --