

KAREEM ABOELMHASEN

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Education

Egypt Japan University of Science and Technology

2021 - 2026

BSc in Mechatronics & Robotics Engineering

3.54/4 CGPA

Work Experience

Maintenance Engineer

August 2024 – September 2024

El-Araby Group

On Site

- Gained hands-on knowledge of the washing machine manufacturing process at El-Araby, including body shaping, mechanical assembly, and electrical component selection.
- Worked with robotic arms in welding, assembly, and body finishing operations, gaining experience in industrial robot control and safety mechanisms.
- Gained hands-on experience in troubleshooting and resolving assembly line issues by identifying errors and implementing effective solutions.

Operations Engineering Intern

August 2023 – September 2023

ADES Company

On Site

- Learned about the drilling operations including **offshore and onshore, and well control equipment and methods** within the operation department.
- Visit ADES 1 rig and engaging with some equipment including **Top Drive, Mud bumps, SCR (Silicon Controlled Rectifier), VFD (Variable Frequency Drive), Diesel Engines, BOP (Blowout Preventer), and others.**
- Spearheaded a team of **11 individuals** to design an **eco-conscious ROV for exploration**, which had the shape of a turtle.

Publications

Fast Object Tracker

November 2024 – On Going

- Worked with a team of 5 to create a 3-DOF device that tracks objects and points toward their center using laser.
- Implemented LabVIEW Vision Control and Vision Assistant to detect objects and isolate their pixels from surrounding frames, enhancing tracking accuracy and enabling movement prediction.
- The research project is currently under development, requiring a Depth Camera and **myRIO FPGA** board to enable highly precise interaction.

Self-Balancing robot

January 2025 – On Going

- Constructed a **50Cm** tall self balancing robot by contriputing in a team of 4 colleagues using **LabVIEW, myRIO FPGA board, Magnetic Encoders, and MPU6050 IMU sensor.**
- Implemented **State-Space Modeling** in place of traditional **PID control**, improving accuracy and enabling the robot to perform rotational and linear movements while maintaining stability.
- Designed the robot body in **SolidWorks**, extracting key parameters (inertia, mass, COG) and conducting force simulations using **Simscape Multibody** to validate the model's performance.
- Currently enhancing the research project by integrating the **Runge-Kutta** numerical analysis method for **trajectory generation** based on any input function, with plans to mount the robot on a **Stewart Platform** to simulate rough environments and validate performance.

Projects

Remotely Operated Underwater Vehicle (ROV)

January 2024 – May 2024

- Worked within the mechanical team of EJUST Robotics club to build a non-ROV buoyancy engine device.
- Contributed with **3 individuals** to the design and production of a buoyancy engine device capable of submerging up to **4 meters underwater**, employing the principle of a **screw nut mechanism.**
- Worked with **4 individuals** to fabricate pneumatic grippers customized for the ROV, enabling it to securely grasp objects with a diameter of up to **15 cm.**

Autonomous Mobile Manipulator

February 2024 – May 2024

- Collaborated within a team of **7 individuals** to make an **autonomous** mobile robot equipped with a 5-DOF arm to detect, pick and place objects.
- Utilized **SolidWorks** to design the mobile robot and its robotic arm, followed by simulation with **Gazebo simulator** integrated with **ROS Noetic.**
- Leveraged **Peter Corke's Robotics Toolbox** to implement forward and inverse kinematics, as well as compute the Jacobian matrix for robotic motion analysis.

Mine-Sweepers Robot

March 2023 – October 2023

- Led a team of **10 members** to build Minesweepers Robot and participate in the **International Alamein Robotics Championship**.
- Designed and manufactured robot parts including chassis, body, and couplers.
- Collaborated with **3 colleagues** to devise the kinematic model of the robot and simulate it utilizing **Gazebo and ROS**.
- Developed the **sensor fusion Extended Kalman Filter (EKF)** to combine readings from **IMU and encoder** for **mapping and navigation**, creating a map of mines' positions in the field.

CNC Router

June 2022 – August 2022

- Designed a **4-axis CNC router** working area of **30Cm x 60Cm** using commercial components in the Egyptian market.
- Get hands on experience in mechanical design using **SolidWorks**, manufacturing processes, mechanical and electrical components selection, maintenance of these parts, and **G-code**.
- Built the electrical and control system using **Arduino and stepper motor drivers**.

Honors and Awards

Drone Challenge in International Competition of Military Technical College

July 2024

2nd Place

- Won the **2nd place** in the 8th edition of the drone challenge in International Competition of Military Technical College among more than 20 team.
- Designed a drone frame using **SOLIDWORKS and CoralDraw**, incorporating safety guards for the propellers and motors, and optimizing weight for smooth flight performance.
- Connected the required circuit to control brushless motors using **SpeedyBee controller and Electronic Speed Control (ESC)**, and adjusted **PID constants** for smooth flight.

JAC-ECC PBL Competition

November 2023

3rd Place

- Won the **3rd place** in the 11th edition of the International Japan-Africa Conference on Electronics, Communications, and Computations Project-Based learning Competition for my project Head Script.
- Developed a Flutter virtual keyboard that tracks head movements by fusing angle readings from two **IMUs** using a **Kalman Filter**, communicating via **Firebase real-time database** connected to **ESP32**, and adjusting the cursor position based on movement angles to assist people with disabilities.

Micromouse Competition

July 2019

2nd Place

- Won **2nd place** in Micromouse competition for juniors in its first edition, organize by IEEE HTI SB at Nile University by solving a maze of 10x10 cell in **23 seconds**.
- Built a **MicroMouse robot** capable of navigating a maze using **Arduino and ultrasonic sensors**, employing a simple **wall-following algorithm**.

Extracurricular Activities

Technical Vice-Chairman @ IEEE E-JUST Student Branch

September 2023 – September 2024

Alexandria, Egypt

- Manage **+10 technical activity** including determining the curriculum of workshops, projects, courses, and other managerial activities.
- Participated in teaching and manage **+10 workshops** of various topics including Robotics, Artificial Intelligence and Machine Learning, Flutter mobile applications, and MATLAB.
- Held the position of technical manager for the event of **Fire Fighting Boats** Competition in its first edition.
- Participated in organizing **+5 event** including IEEE Egyptian Student Branch Officers Meeting and IEEE Next Gen.

Technical Skills

Mechanical: SolidWorks, Autodesk Fusion 360, MSC ADAMS, Ansys.

Programming: Python, C/C++, Embedded C, Flutter, MicroPython, G-Code.

Robotics and Control: ROS, Gazebo, MATLAB, LabView, IoT.

Electrical: Autodesk Eagle, SimulIDE, Tinkercad, Proteus.

Tools: GitHub, Linux, Firebase, OpenCV, Jupyter Notebook.