معهد الإسكندرية العالي
للهندسة والتكنولوجيا
ALEXANDRIA HIGHER INSTITUTE OF
ENGINEERING & TECHNOLOGY (AIET)

مشاريع تخرج

طلاب معهد الإسكندرية العالي للهندسة والتكنولوجيا

دفعة 2025 / 2026

أقسام المعهد

- قسم هندسة الإلكترونيات والإتصالات
- قسم هندسة الميكاترونيات
- قسم هندسة الحاسبات
- قسم الهندسة الصناعية

من قلب معهد الإسكندرية العالي للهندسة والتكنولوجيا
تُولد أفكار تصنع المستقبل

Foreword

AIET is keen to invite prominent Professors and Experts from reputed Egyptian universities and institutions to share in and/or head Project oral Exam Committees. AIET hopes to get benefits of their experience and constructive comments on our students efforts.
The total number of graduation projects adds to projects distributed among our current four B.Sc. engineering programs as follows:

B. Sc. Eng. Program	No. of Projects	No. of Students	No. of Supervisors
Electronics and Communication Eng.(ECE)	10	88	
Computer Engineering (CE)	3	33	
Mechatronics Engineering (EME)	9	100	
Industrial Engineering (IE)	1	15	
SUM		336	

Graduation projects are diversified to cover most of the sub-specialties of a B.Sc. engineering program. Academic staff, from different Universities, other high education institutions, industries, and business; kindly contributed in supervising graduation projects parallel with the academic staff of the AIET.

This booklet gives an overview on B.Sc. graduation projects for the academic year 2025-2026.

AIET student performance is evaluated according to the grade-point average (GPA) system. Student graduates where earning 180 credit hours; among them, graduation project represents 6 credit hours which are equivalent to 3.33% of the total 180 credit hours.

Project grading is: 50% of project grade on Year Work and 50% on Final oral Exam.

AIET deeply acknowledges and appreciates the ample effort of all project supervisors to get the project up to the level which, hopefully, will win the satisfaction of project examiners.

Assistant Professor Dr.Kassem kadry Kassem
Acting Dean of **AIET**

Communication Engineering Department (ECE)

1- Smart Blind Stick AI-Powdered .

2- Design and implementation of a CubeSat satellite for space environment sensing.

3- Auto-Aiming Tank Project – M1A1 Abrams Model.

4- Design & implementation of security Vehicle to detect mine & gas connected to a command station.

5- Smart Traffic System.

6- A Suggested Proposal for tracking system using Kalan filter.

7- A proposal of car charger based on capacitive coupling controlled by a Bluetooth application.

8- Integrated Software Engineering Solutions.

9- Integrated Hardware Engineering Solution.

10- Reception Robot.

1- Smart Blind Stick Ai-Powerded

Supervisors	Students
أ.م.د. محمد الامير د. رشا الخامى	احمد خميس عطيه خميس بلال ارسانى جورج شكرى تادرس احمد مؤمن محمد موسى طارق محمد مصطفى على عبد الجليل الاء ابراهيم احمد احمد يونس ابراهيم بدر ابراهيم احمد سليمه احمد ابراهيم عبد المنعم على عوض محمود زكريا محمد عبد الحميد صفار الاء نصر الحسينى الحنفى ابوطالب احمد محمد عبده البسيونى

Abstract

The development of a smart stick for visually impaired individuals represents an innovative and impactful assistive technology solution. This project aims to enhance the safety, independence, and overall well-being of blind users by integrating multiple sensing and communication technologies into a single system.

The proposed smart stick is designed to detect obstacles in the user's path, helping to prevent collisions and ensure safe navigation. In addition to environmental awareness, the system incorporates several biomedical sensors to monitor vital health parameters, including body temperature, ambient temperature, humidity levels, blood oxygen saturation (SpO_2), and heart rate.

All sensors operate together within an integrated embedded system, where collected data is processed and transmitted wirelessly to a mobile application. The application serves as a user interface that allows real-time monitoring and visualization of the measured data, enabling both the user and caregivers to stay informed about the user's health and surrounding conditions.

This combination of obstacle detection and health monitoring provides a comprehensive assistive solution, significantly improving the quality of life for visually impaired individuals by offering both mobility support and health awareness in a single smart device.

2- Design and implementation of a CubeSat satellite for space environment sensing

Supervisors	Students
أ.م.د. محمد الامير د. عمرو الجندى د. فيروز عماره	محمد محمود محمد متولى محمود مصطفى محمد احمد منسى حبيبه ابراهيم عبد الغنى على ناصر يوسف محمد منير زكى على سما وليد عبد الجواد محمد هاشم محمود عادل محمود عبد اللطيف بربر مريم ياسر حافظ منصور ابراهيم نورين نصر محمود جمعه موسى يارا علاء لطفى الحلوانى ياسمين رافت فتحى احمد الدربى

Abstract

This graduation project presents the design and implementation of a Space Environmental Sensing CubeSat prototype developed as an educational model for studying CubeSat subsystems, environmental telemetry, onboard data handling, and ground-station monitoring. The project focuses on simulating how a small satellite can sense its surrounding environment, monitor its internal operating condition, process mission data, and transmit telemetry to a ground station in real time.

The prototype uses an STM32F401RE microcontroller as the onboard computer responsible for collecting and processing data from the payload sensors. The sensing payload is designed to monitor environmental and mission-related parameters, including temperature, humidity, atmospheric pressure, gas response, carbon monoxide response, flame/infrared level, wind-pulse measurement, motion behavior, and GPS location. These measurements represent a practical model of environmental awareness in a CubeSat-style system, where the satellite must observe external conditions while also monitoring its own health and operating state.

An ESP32 DevKit V1 is used as the communication and ground-station interface. It receives structured telemetry from the STM32 through UART and displays the data on a Wi-Fi-based dashboard. The dashboard provides real-time visualization of sensor readings, GPS status, power telemetry, motion data, system health, alarms, and communication-link status. This gives the project a complete telemetry chain from sensing to onboard processing and ground-station display

3- Auto-Aiming Tank Project – M1A1 Abrams Model

Supervisors	Students
د. محمد البوريدى د.رضا الششتاوى	يوسف اشرف محمد عيسى رجب ممدوح صالح سيد احمد صالح سيد احمد على محمد عطيه عبد الباقى مصطفى يحيى بهاء محمد عبد العزيز قطرى اسامه احمد فضل راغب السيد الشافعى اسلام محمد عبد اللطيف الجمل يوسف هانى محمد عبد البارى حسن الحاج محمود ابراهيم ابراهيم محمد (ميكا) مازن صبرى محمد حسين (ميكا) سمير حليم رزق بشاي (ميكا) حسن ياسر حسن امين مخيمر (ميكا)

Abstract

This project presents the development of an AI-powered autonomous tank module specifically engineered for real-world deployment within the Egyptian military framework, utilizing the M1 A1 Abrams concept as its foundational platform. The primary objective is to transcend the limitations of conventional tanks- which require full human crews and manual targeting- by implementing autonomous driving capabilities, independent decision-making, and significantly faster response times with higher targeting accuracy. A cornerstone of this initiative is the development of the AI module from scratch, ensuring full Egyptian sovereignty, data privacy, and the elimination of dependency on foreign systems. The AI training lifecycle involves a rigorous four-stage process: collecting high-quality data under harsh environmental conditions (such as dust, smoke, and low visibility), labelling targets for supervised learning, and utilizing YOLO based architectures on GPU servers for real-time object detection. Technically, the system employs a dual-processing architecture. A Raspberry Pi 5 (8GB RAM) acts as a mini server for high-level tasks like image processing and AI decision-making, while an Arduino Mega provides superior real-time control for driving motors and actuators. The sensory suite includes an IMU (MPU6050) for turret stability, an ultrasonic sensor for obstacle detection, and an ACS712 current sensor for power diagnostics. Mechanically, the prototype is a 1:9 scaled model constructed from 1.25 mm steel sheets with an estimated weight of 15.6 kg. The locomotion system features two DC motors in a skid steering configuration. Engineering calculations, based on a mass of 20.6 kg and a friction coefficient of 0.6, determine that the system requires a torque of kg.cm per motor.

4- Design & implementation of security Vehicle to detect mine & gas connected to a command station

Supervisors	Students
أ.م.د. محمد الأمير د. هانى أرناؤوط د. عمرو الجندى د. ولاء أبوحسين	محمد وجيه محسن مصطفى جمعه جنى محمد مصطفى رمضان احمد حسن حسين عبد الحميد جويده احمد بهاء الدين محمد عبد الوهاب هندى احمد على عبد العزيز على عبد الدايم المعتصم بالله السيد احمد محمود (ميكا)

Abstract

This project presents the design and implementation of a distributed unmanned ground vehicle (UGV) system for integrated landmine and hazardous gas detection in hostile and unstructured environments. The proposed platform incorporates a multi-sensor architecture consisting of an inductive metal detection module for subsurface mine identification and calibrated gas sensors for real-time monitoring of toxic and combustible gases. Sensor data acquisition and processing are performed using an embedded microcontroller unit (MCU), enabling on-board signal conditioning, filtering, and threshold-based decision making.

A bidirectional wireless communication framework is implemented to establish a reliable data link between individual vehicles and a centralized command station. The system utilizes a network topology that supports multi-vehicle coordination and data sharing, enabling cooperative exploration and area coverage optimization. Communication protocols are designed to ensure low latency, fault tolerance, and scalability in multi-node deployment scenarios.

The command station performs real-time visualization, data logging, and threat assessment, allowing operators to monitor field conditions and issue control commands when necessary. The integration of autonomous navigation capabilities with sensor fusion techniques enhances detection accuracy while minimizing false positives. Experimental validation demonstrates the system's effectiveness in detecting buried metallic objects and hazardous gas concentrations under varying environmental conditions, with stable communication performance across the network.

The proposed system provides a scalable, low-cost, and efficient solution for improving operational safety in applications such as military demining, industrial inspection, and disaster response.

5- Smart Traffic System

Supervisors	Students
أ.م.د. يسرا حمدى د. سهى جاب الله د. أميره البطوطى	بيتر جوزيف جرس قلدس توماس احمد جمال السيد الديب حبيبه فتحى رمضان بسيونى حجازى رؤى حسام الدين ياقوت ابراهيم ياقوت ابراهيم محمود محمد محمود الشورى خالد حسن محمود محمد حسين سلمى رمضان محمد بكير محمد (ميكا) مصطفى حسن عسكر على (ميكا)

Abstract

This project presents the design, implementation, and validation of an intelligent traffic management system integrating deep learning computer vision, embedded IoT control, and free-space optical (FSO) laser communication. The system addresses the critical limitation of conventional fixed-cycle traffic signals — their inability to respond dynamically to emergency vehicles or real-time road incidents.

Two ESP32 microcontrollers form a Sender-Receiver pair. The Sender hosts a Wi-Fi SoftAP receiving HTTP triggers from a host computer running a custom-trained YOLOv8 model via a 1080p USB camera on a servo pan-tilt mount. Upon ambulance detection the Sender overrides the traffic signal. Upon collision detection it repositions the camera and transmits a structured alert over a proprietary dual-channel laser link at 16.7 bps to the Receiver, which drives a 16×2 I2C LCD dashboard with priority-cascaded alerts.

The Sender is powered by a 2S 18650 Li-Ion battery supplemented by a 6V/3W solar panel via an MPPT charge controller. The system is validated on a 2m×1m physical road model with custom-built Bluetooth RC vehicles and an RF-controlled RC ambulance.

6- A Suggested Proposal for tracking system using Kalman filter

Supervisors	Students
د. طارق عبد الشهيد د. أمنه الأنصارى	احمد ماجد احمد فؤاد الجنيدى عزه ابراهيم محمد عبد الغنى حبيبه انجى حازم عبد الحميد محمد دياب محمود علاء محمود الحداد محمد عبد الفتاح عبد المنعم عبد الحق محمد عصام صلاح الدين عبد الفتاح احمد محمد محمود عبد القوى النجيلى القبيلى نشات عادل سعيد محمد شتا روان اسامه عبد القادر احمد عبد الحافظ يحيى عادل رجب مصطفى بركات

Abstract

The proposed system aims to improve the accuracy and reliability of object tracking by combining noisy sensor measurements with a mathematical prediction model. The Kalmar Filter continuously estimates the state of a moving object, including its position and velocity, by minimizing the mean square estimation error. Through a prediction and correction process, the filter provides optimal estimates even in the presence of measurement noise and system uncertainties.

The project includes the mathematical modeling of the tracking system, the design of the Kalmar Filter algorithm, and the simulation of object motion under different operating conditions. Various scenarios involving random measurement noise and target movement are analyzed to evaluate the performance of the proposed approach. The simulation results demonstrate that the Kalman Filter significantly reduces tracking errors, improves state estimation accuracy, and provides smooth tracking trajectories compared to raw sensor measurements.

The proposed system offers a cost-effective and computationally efficient solution that can be integrated into real-time tracking applications. The study highlights the effectiveness of Kalmar Filtering techniques in enhancing tracking performance and provides a foundation for future developments involving advanced filtering methods and multi-sensor data fusion systems.

7- A proposal of car charger based on capacitive coupling controlled by a Bluetooth application.

Supervisors	Students
د. طارق عبد الشهيد د. هدير رجب	محمد شريف عبد الفتاح شبل عماد عبد السلام محمد ابو عوف محمد عبد العزيز ابراهيم محمد السبعاوي فاروق خالد فاروق الغول محمد اسامه رزق بركات احمد محمد عبد الجليل عمر عبد الجليل كبكاب عبد الرحمن احمد عبد الفتاح احمد سليمان علاء ابراهيم محمد ابراهيم البدوى محمد طارق محمد السعيد سلامه الصماد خالد السيد محمود محمد الديباني (ميكا)

Abstract

This project presents the design, simulation, and hardware implementation of an innovative 1.0kW Wireless Power Transfer (WPT) electric vehicle (EV) charging system based on Capacitive Power Transfer (CPT) technology, integrated with an automated control framework managed via a custom mobile application. While traditional Inductive Power Transfer (IPT) systems are widely researched, they suffer from high manufacturing costs, heavy magnetic shielding cores (ferrite tiles), and severe safety risks such as intense localized eddy-current heating when foreign metallic debris enters the magnetic field path. To overcome these structural limitations, the proposed system leverages alternating high-frequency electric displacement fields established between a balanced four-plate horizontal aluminium coupling matrixes to transfer power across a nominal 20 mm air gap. To counteract the high reactive impedance characteristic of the Pico farad-range mutual capacitance (65 pF to 85 pF) without exceeding safe voltage limits, a symmetrical double-sided LCLC resonant compensation network is designed and optimized at an operating switching frequency of 250 kHz. The primary power stage utilizes wide-bandgap Silicon Carbide (SiC) power MOSFETs to minimize switching and conduction losses, achieving clean Zero-Voltage Switching (ZVS) configurations across varying load parameters. Control, diagnostic monitoring, and automation are handled by an embedded dual-core ESP32 microcontroller architecture. Core 0 executes time-critical tasks including a high-speed asynchronous safety monitoring loop that provides a < 50 µs hardware-level pulse-width modulation (PWM) shutdown in the event of overcurrent, overvoltage, or thermal threshold breaches. Core 1 manages a secure Bluetooth Low Energy (BLE) GATT server. A cross- platform user dashboard mobile application, developed using the Flutter framework, connects seamlessly via an encrypted AES-128 cryptographic handshake protocol. This application provides the user with real-time telemetry visualization (including input voltage, charging current, power delivery, and thermal status), automated charging schedules based on off-peak utility pricing, and active plate alignment diagnostics.

8- Integrated Software Engineering Solutions

Supervisors	Students
د. علا حسين د. فاطمه أحمد	ايمان احمد ابراهيم عبد الغنى غيث الاء رضا محمد ابراهيم ابومهنا روان علاء عبد المقصود احمد محمود على ايمن محمد جمال الدين القالع كيرلس هانى سعيد فهيم جرجس محمد الشاذلي عبد العزيز مبارك رويدا احمد عبد الوهاب عباس ابراهيم ايه احمد مختار خطاب محمد احمد محمد محمد على حسن مروان سامى مصطفى كمال الزواوى (حاسب)

Abstract

This project presents a prototype for a company that provides integrated Software Engineering Solutions through a single specialized technical team. The company focuses on delivering a complete set of modern digital services including network solutions, cloud solutions, web development, and mobile application development.

The goal of the project is to demonstrate how one professional team can design, develop, and manage multiple software and infrastructure services efficiently under one organization. By combining these services together, the company can provide clients with a unified technological solution instead of relying on multiple vendors.

To demonstrate the implementation of these services, a hospital environment was selected as a case study. The prototype shows how the company can design and implement the required systems for a hospital including network infrastructure, cloud-based data management, web systems, and mobile applications.

In addition, the project introduces a second phase that extends the company's services to include hardware solutions, such as networking devices, and other physical infrastructure required to support the software systems. This creates a complete technological ecosystem that integrates both software and hardware solutions within one company.

Developed a prototype of a Software Engineering Solutions company providing multiple integrated technology services.

Provided a complete set of services through a single technical team including network solutions, cloud solutions, web development, and mobile application development.

Demonstrated how different software and infrastructure services can be managed and delivered efficiently within one organization.

Used a hospital as a case study to illustrate how the company can implement its services in a real-world environment.

9- Integrated Hardware Engineering Solution

Supervisors	Students
د.عمرو يسن د.علا حسين د. محمد عادل	عمر محمد عرفات حسين مازن عبد المنصف خميس احمد النقلى احمد محمد احمد عبد الستار امين (ميكا) كريم ابراهيم عبد المنعم حداد (ميكا) كريم محمد فرج ابو النصر (ميكا) أحمد خالد محمد كامل الخولى (ميكا) محمد أحمد سالم أبو العلا (ميكا) مؤمن إيمن مبروك جلهوم (ميكا)

Abstract

The project presents an integrated engineering solution for a hospital environment. It combines a smart hardware prototype for sensing and automatic response, an electrical distribution design for hospital power systems, and a fire fighting design to improve building protection and safety. The main idea is to show how different engineering systems can work together in one coordinated healthcare project rather than being treated as separate parts.

The smart hardware part focuses on monitoring important conditions inside a hospital room and responding automatically when a risk appears. The prototype uses Arduino and ESP32 as the main controllers. Arduino reads the local sensors and controls direct outputs, while ESP32 is used as the main smart controller for communication, display and future integration.

Fast local detection for gas leakage, fire and movement conditions.

- Clear separation between sensor reading, decision making and output control.
- Practical integration between low-power control circuits and higher-power devices.
- A simple demo path that can be explained easily: sense, decide, respond and display.
- Hospital-oriented thinking by combining safety response, room monitoring and service support.

10- Reception Robot

Supervisors	Students
د. أميره جمال د. هشام عابدين	احمد ابراهيم عبد الله على (ميكا) محمود السيد رمضان محمد الديب (ميكا) الحسن عثمان أحمد عثمان (ميكا) بيشوى عماد عياد سعد جبرائيل (إتصالات) محمد جلال جويده القصاص (حاسب)

Abstract

The proposed system is based on a dual Arduino Nano architecture to improve task distribution, processing efficiency, and system reliability. The robot integrates multiple sensors and electronic modules to achieve autonomous navigation, environmental monitoring, obstacle detection, wireless communication, and intelligent motion control.

The navigation system utilizes TCRT5000 line-following sensors to enable accurate path tracking, while the HC-SR04 ultrasonic sensor provides real-time obstacle detection and collision avoidance. The MPU-6050 IMU sensor improves movement stability and orientation tracking during robot operation. Additionally, the MQ-2 smoke sensor enhances environmental safety by detecting smoke and hazardous gases.

Wireless communication between the robot and the user is achieved using the HC-06 Bluetooth module, allowing real-time interaction and robot control through a tablet application. The robot movement system is driven using high-torque DC gear motors controlled by the BTS7960 high-power motor driver module, which provides stable bidirectional motor control and PWM speed regulation.

The electronic circuits and PCB were designed using professional embedded system design techniques to ensure stable operation, efficient power distribution, reduced electrical noise, and reliable communication between all subsystems. Mechanical analysis and motion calculations were also performed to verify motor suitability, movement stability, and torque requirements for the robot platform.

Computer Engineering Department

(CE)

1- Vision-Based Autonomous Hospital Assistant Robot .

2- Design and Implementation of Smart Platform for Student Freelancing and Internships.

3- Drago – AI-Powered Educational Platform for Dyslexia Support .

1- Vision-Based Autonomous Hospital Assistant Robot

Supervisors	Students
د. عمرو يسن د. مروه سماره د. نهال مبروك	عمر وليد محمود ابراهيم محمود دياب ابراهيم محمد عطيه محمد عبد الرحمن محمد على سلامه خلود على على تاج الدين عبد الله محمد عبد الله شحته متولى محمد مصطفى ابراهيم عبد الوهاب عمر سامح محمد محمد على شوشان (ميكا) احمد عبد الفتاح عبد الفتاح محمد (ميكا) ابراهيم محمد صبرى هلال الخواصه (ميكا) احمد فتحى بيرم حسين محمد (إتصالات) حمدى سعيد فتح الله نعيم ابوسعد (إتصالات)

Abstract

This project presents the design and development of an autonomous hospital assistant robot intended to reduce the workload of healthcare personnel and minimize direct contact with patients in situations involving infectious diseases. The robot is capable of performing routine tasks such as conducting basic patient checkups, delivering medical supplies, and autonomously navigating hospital environments without continuous human supervision.

The robot employs a software-driven architecture that combines localization, path planning, behavior management, and computer vision techniques. Localization is achieved using AprilTags, visual markers similar to QR codes, and a preconfigured environment map, with which the robot can determine its position and orientation within the hospital. Autonomous navigation is performed through grid-based path planning using the A* algorithm, while onboard sensors provide motion feedback and obstacle avoidance capabilities during operation. A behavior-based control system coordinates task execution and decision making, allowing the robot to respond appropriately to changing environmental conditions.

During patient checkup, the robot utilizes computer vision models for face and hand detection to assist in positioning an articulated arm equipped with vital-sign sensors. Collected readings are associated with patient records and analyzed for abnormal conditions, enabling timely alerts when necessary. Assigning tasks to the robot is done through voice commands or a desktop application. When power levels become low, the robot is capable of automatically returning to a charging station and docking for battery recharging.

By integrating autonomous navigation, computer vision, human-robot interaction, and self-maintenance capabilities into a unified platform, the project demonstrates the potential of intelligent robotic assistants to improve operational efficiency and support healthcare services in modern hospital environments.

2- Design and Implementation of Smart Platform for Student Freelancing and Internships.

Supervisors	Students
د. محمد البوريدى د. رضا الششتاوى	عمر خليفه حامد محمدين ابراهيم ادهم محمد سمعان عبد الله ناصف امنيه مصطفى محمد فاضل يوسف احمد مصطفى سعيد مصطفى الصباغ على محمد على محمد على الطوبجى عمر ابراهيم عطا الله ابراهيم عطا الله ضحى حسن على على محمود بدر هبه محمد عبد العزيز أمان محمد سعيد محمد منير بدوى القارح تسنيم جاسر امين منصور يوسف يوسف احمد محمد معروف ابراهيم

Abstract

This project provides a dedicated environment that connects students with freelance projects, internships, and training programs. Ultimately, the platform empowers students to build their portfolios and professional networks while providing companies with a streamlined avenue to discover fresh, emerging talent.

Core Objectives

- **Facilitate Connections:** Create direct, reliable channels between university students and potential employers, clients, or training institutions.
- **Enhance Employability:** Improve students' practical skills by providing accessible pathways to participate in real-world projects and professional environments before graduation.
- **Secure & Efficient Management:** Deliver a robust backend system capable of securely handling user data, opportunity postings, and platform transactions.

System Scope & Architecture The project is divided into distinct interfaces tailored to different user roles, supported by a centralized, secure backend infrastructure

• Mobile Application (Students): Engineered to provide a smooth, engaging user experience where students can easily browse, filter, and apply for available opportunities.

• Web Portal (Employers & Admins): A dedicated management dashboard allowing companies to post opportunities and administrators to monitor overall platform activity.

• Backend System: A centralized architecture handling data processing, secure authentication, and system logic.

3- Drago – AI-Powered Educational Platform for Dyslexia Support

Supervisor	Students
د.مروه سماره د. نيهال مبروك د. أسماء محمد على	الاء مصطفى عبد الحكيم عمر الشيخ ايمى ايمن جاد شحاته بخيت حبيبه محمد عبد الرزاق عبد الله حامد ماريا عماد بولس مسعود بطرس مازن محمد السيد على احمد محمد احمد محمد مرسى صالح ساره مدحت محمد عبد المعطى محمد سامى جورج جاد السيد عشم الله استيفن عدلى عبده ابو الخير تقى ياسر محمد ابو اليزيد شهاب يوسف حسين احمد محمد علي

Abstract

Drago is an AI-powered educational platform designed to support children with dyslexia through interactive and adaptive learning experiences. The system focuses exclusively on **Arabic language learning**, aiming to improve reading, writing, and spelling skills through gamified content and intelligent assessment tools.

The platform also includes intelligent evaluation systems to determine each child's learning level and provide personalized learning paths.

Dyslexia is a common learning difficulty that affects reading, writing, and spelling abilities, leading to challenges in academic performance and self-confidence. In Egypt, there is a lack of Arabic-focused digital tools that provide structured, adaptive, and engaging support for dyslexic learners. This creates a gap in early diagnosis, proper assessment, and personalized intervention.

Project Objectives

- Developed an interactive Arabic-only learning platform for children with

Built a pre-test system to determine the child's initial learning level.

Implemented gamified learning modules to enhance engagement.

-Provided a doctor's dashboard to monitor children's performance and progress.

Enabled progress tracking for parents and educators.

-Integrated AI-based analysis to support adaptive learning paths.

Mechatronics Engineering Department

(EME)

1- Design and implementation of smart homes based on AIoT .

2- Ankle Injury Rehabilitation.

3- AI Self-Driving Firefighting Robot Using Robotic Operating System(ROS).

4- A proposal for a Lidar system for object detection and three - dimensional modelling.

5- Anti-Phobia: A Real -Time Biofeedback- Driven VR System for Phobia Therapy.

6- The Medium Voltage Distribution Network System.

7- B.A.M.S (Building Automation & MEP Systems).

8 - Solar collector with dish reflector and PCM.

9- Smart Agricultural Robot .

1- Design and implementation of smart homes based on AIoT

Supervisors	Students
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Abstract

The rapid convergence of Artificial Intelligence (AI) and the Internet of Things (IoT) has given rise to AIoT — a transformative paradigm in which connected devices are empowered to learn, reason, and act autonomously. This project harnesses this paradigm to deliver a fully integrated, intelligent residential system that goes far beyond conventional home automation, providing proactive responses to occupant needs and environmental conditions.

The system is built on a three-layer architecture: a Perception Layer composed of heterogeneous sensors and actuators — including ESP32 and ESP32-CAM microcontrollers, DHT22 temperature/humidity sensors, and MQ135 air-quality sensors; a Network Layer utilizing MQTT over Wi-Fi for real-time bidirectional communication backed by Firebase as the cloud database; and an Application Layer offering a mobile-first control interface alongside a Three.js-based interactive Digital Twin for immersive, real-time home visualization and diagnostics.

A suite of Python-powered AI modules forms the intelligence backbone of the system: (1) Face Recognition grants secure, contactless access only to pre-enrolled authorized individuals; (2) Fire & Smoke Detection analyzes live video feeds to trigger immediate alerts and automated safety responses; (3) License Plate Recognition (LPR) manages intelligent vehicle access at the property perimeter; and (4) an LLM-based AI Agent interprets natural-language commands, enabling fully conversational control of the entire smart home ecosystem.

A Smart Solar Tracking System driven by servo motors continuously orients photovoltaic panels toward maximum sunlight exposure to substantially improve energy yield. Occupancy-based automation of lighting and appliances, paired with real-time power-consumption monitoring, further reduces energy waste and minimizes the household carbon footprint — contributing directly to sustainable living.

Beyond access control, intelligent surveillance cameras monitor the premises around the clock and respond autonomously to unauthorized activities. All security events are logged and pushed as instant notifications to the homeowner's mobile device, ensuring continuous situational awareness and rapid incident response.

2- Ankle injury Rehabilitation

Supervisors	Students
د. أحمد هانئ د. اسماء عطيه د.عمرو نصر	احمد غريب فاوى محمد مروان رائد احمد ابوزيد محمود محمد محمد قنديل يامن محمد هلال ابوالعز يحيى ابراهيم محروس عبد الحميد ابوريه منصور ياسر محمد منصور محمد محمد على انور جميعى محمد طارق ابراهيم الشناوى الفوال يوسف ابراهيم حسن على يوسف الحسن محمود حسن على عبد العاطى

Abstrac

The proposed project is a ankle rehabilitation device designed to assist patients recovering from ankle injuries through controlled therapeutic movements. The system enables the four main ankle motions: dorsiflexion, plantarflexion, inversion, and eversion, which are essential for restoring joint mobility, muscle strength, and balance.

The device consists of a lightweight aluminum structure with a steel base for enhanced stability. The mechanical components were designed using SolidWorks and fabricated using CNC cutting technology to ensure high precision and manufacturing accuracy. Motion is achieved through the integration of a high-torque servo motor and a worm gear motor, providing smooth, stable, and safe operation

The proposed design offers a cost-effective rehabilitation solution that combines mechanical reliability, precise motion control, user safety, and ease of manufacturing, making it suitable for physiotherapy and ankle recovery applications.

3- AI Self-Driving Firefighting Robot Using Robotic Operating System(ROS)

Supervisors	Students
د. أحمد هانئ د. أسماء عطيه	عبد الرحمن علاء رجب سالم الطيار عاصم عبد المنعم على حسن عبد الرحمن سعد على على زغلول عبد الله خالد مصطفى محمد محمد ابراهيم لينه ابراهيم عبد السيد ابراهيم روان فتحى عبد المقصود فتحى محمد شدو بلال محمد مصطفى محمود اسماعيل رويدا محمد ابراهيم النجار عبد الحليم احمد عبد الحليم السيد (إتصالات) احمد محمد سعد عيد شمخ (صناعيه) شادى محمد فتح الله عبد المجيد (حاسب)

Abstract

This project presents the design and implementation of a Self-Driving Fire Fighting Robot capable of autonomously detecting, locating, and extinguishing fires. The proposed system integrates multiple sensing technologies, artificial intelligence, embedded systems, and wireless communication to provide an intelligent and reliable firefighting solution.

The robot utilizes an ESP32 for fire detection while additional sensors including flame sensors, gas sensors, temperature sensors, ultrasonic sensors, and water level sensors are employed to improve detection accuracy and operational safety. An Arduino Nano serves as the main control unit, responsible for sensor data processing, navigation control, obstacle avoidance, and fire suppression operations.

The firefighting mechanism consists of a high-pressure water pump, water tank, servo-controlled nozzle system, and a movable spraying mechanism capable of directing water toward the detected fire source. The robot is also equipped with wireless communication capabilities, allowing real-time monitoring and control through a mobile application.

The proposed system is designed to navigate autonomously toward fire locations, avoid obstacles, verify fire presence using multiple sensors, activate the firefighting system, and return to standby mode after completing the suppression process. Experimental evaluation demonstrates the effectiveness of the robot in fire detection, navigation, and extinguishing operations, highlighting its potential as a low-cost and intelligent firefighting solution for indoor environments.

4- A proposal for a Lidar system for object - detection and three -dimensional modelling.

Supervisors	Students
د. طارق عبد الشهيد د. أمل صالح	محمد على احمد احمد النقيب ابراهيم احمد محمد جبر حسين مبروك حسين ابراهيم حسن خالد عبد الرؤف عبد الجليل زعير عبد الرحمن السيد جابر مصطفى ابراهيم اياد امجد محمد فتحى بيومى مروان محمود احمد محمد عبد العال (ميكا) يوسف حسين السيد احمد حسين (ميكا) يوسف احمد ابراهيم خليفه عبد العال (ميكا) محمود احمد اسماعيل محمد عبد الكريم (ميكا) زياد عبد الرحمن محمد عبد الرحمن محمد (ميكا)

Abstract

This project presents a proposed LiDAR-based system for object detection and three-dimensional modelling. The proposed system utilizes laser pulse transmission and time-of-flight measurement techniques to determine the distance between the sensor and surrounding objects. By continuously scanning the environment and collecting distance data from multiple angles, the system generates a dense point cloud representation that can be processed to create accurate three-dimensional models of detected objects and environments. The project includes the design of the LiDAR sensing architecture, data acquisition methodology, signal processing techniques, and algorithms for object detection and 3D reconstruction. The collected point cloud data are filtered and analysed to improve measurement accuracy and reduce the effects of noise and environmental interference. Furthermore, visualization tools are employed to convert the acquired spatial information into detailed three-dimensional models suitable for analysis and navigation purposes. Simulation and performance evaluation are conducted under different operating conditions to assess the effectiveness of the proposed system. The results demonstrate the capability of the LiDAR system to accurately detect objects, estimate their positions, and generate reliable three-dimensional representations with high spatial resolution. The proposed design offers a scalable and efficient solution that can be integrated into various real-world applications requiring precise object detection and environmental modelling. The study concludes that LiDAR technology provides a powerful platform for advanced sensing and mapping applications and serves as a foundation for future developments in autonomous systems, intelligent transportation, and smart environmental monitoring.

5- Anti-Phobia: A Real -Time Biofeedback-Driven VR System for Phobia Therapy

Supervisors	Students
د. سميه أحمد د. أسماء محمد على د. حسن الشوباشى	حسين احمد حسين عبد القادر الحسين محمد محمود ابراهيم احمد احمد عرفه محمدحلمى احمد احمد حسن على حسن السعدنى رؤى احمد فتحى نعيم محمود رحمه ابو السعود حموده خليل الخولى اسلام خميس محمد سالم احمد السيد عبد الرحيم محمد عطا الله (إتصالات)

Abstract

Anti-PhobiaXR is a Virtual Reality Exposure Therapy (VRET) system designed to improve the diagnosis and treatment of phobias and anxiety disorders. The system integrates an immersive virtual reality environment with a custom wearable device that monitors the patient's physical stress responses in real-time.

The core innovation is its closed-loop biofeedback architecture. As the patient experiences the VR scenario, their vital signs—such as heart rate and skin response—are continuously tracked and sent instantly to a therapist's monitoring dashboard. This allows the clinician to dynamically adjust the intensity and pacing of the VR experience based on the patient's immediate physical reactions, all without interrupting the therapy session. Furthermore, the system operates completely offline, ensuring stable and uninterrupted therapy in any clinical setting.

Anti-PhobiaXR has proven to be highly responsive, visually stable, and medically accurate. By utilizing affordable and accessible technology, the system aims to democratize evidence-based exposure therapy for the millions of people worldwide who suffer from specific phobias.

6- The Medium Voltage Distribution Network System

Supervisors	Students
د. سميه أحمد د. نهال مبروك د. أحمد شطا	اسامه محمد على عطا الله موسى خالد فتحى محمد عبد المنعم محمد عبد الرحيم عمر حسن عبد المنعم عبد الرحيم عمرو خالد درويش مصطفى على الحمدونى عمرو محمد فكيه طه محمد مازن احمد رمضان عبد الرحمن محمد حلمي احمد محمد مجاهد الطملاوي محمد رجب شحاته احمد ابوسته محمد صبرى محمد عبد الغنى النمكى محمد عبد القادر عبد المنعم محمد الصفتى محمد عبد المنعم غيط راغب حجازى

Abstract

The graduation project presents a comprehensive study and an empirical automation simulation of a Medium Voltage Distribution Network System, focusing on the architecture and operational safety of Medium Voltage Switchgear (MVSG). The theoretical framework of this research evaluates the structural design principles governing modern switchgear, deeply analyzing the IEC 62271 standard series with a specific focus on Loss of Service Continuity (LSC2B) and Partition Class (PM) classifications. It explores the mechanical and thermal characteristics of primary components—comparing traditional arc-quenching technologies with modern Vacuum Circuit Breakers (VCBs) and investigates how instrument transformers feed real-time analog parameters into micro-processor protection relays for rapid fault isolation. To bridge the gap between theoretical electrical design and practical industrial automation, a functional hardware-in-the-loop simulation model was engineered. The control layer deploys an embedded automation topology featuring an Arduino Mega 2560 co-designed with a NodeMCU ESP8266 for high-speed, wireless telemetry via non-blocking UDP streaming. A critical achievement of this implementation is the successful coding and physical validation of a "2 Out of 3" industrial interlocking logic scheme, eliminating human error by preventing the parallel connection of unsynchronized incoming power sources. For the supervisory layer, a symmetric and modular Human-Machine Interface (HMI) was developed using Node-RED architecture, allowing operators to safely demultiplexer incoming telemetry arrays and monitor individual substation bays remotely. In addition to its technical execution, this project aligns directly with Egypt's Vision 2030 and the United Nations Sustainable Development Goals (SDGs). By optimizing MV grid efficiency, mitigating electrical faults, and considering environmentally friendly (SF6-free) alternatives, this work actively contributes to SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 11 (Sustainable Cities and Communities). Ultimately, the methodologies and automated systems developed herein provide a reliable, scalable roadmap for modernizing electrical distribution infrastructure in developing smart cities.

7- B.A.M.S (Building Automation & MEP Systems)

Supervisors	Students
د. أسماء عطيه د.عمرو نصر	عاطف تامر عاطف على حسن عبد الرحمن بكرى عبد الفتاح صالح النشار عبد الرحمن صلاح الدين منصور سعد تاعب احمد عمرو محمد عبده محمود بكار احمد عمرو محمود عبد الفتاح محمود احمد على صابر على سليمان الجوهرى على السيد فتح الله محمد درباله ايه بليغ علي عبد الرازق علي شهد عبد الهادي محمود محمد العيسوى محمد عزت مصطفى محمد عمر زياد هشام عبد المجيد محمد خطاب

Abstract

This graduation project presents the design of an integrated Building Automation and MEP (Mechanical, Electrical, and Plumbing) system for the Admissions Building at King Saud University. The project covers HVAC, Firefighting, Plumbing, Electrical Distribution, Booster Systems, and Building Automation. The proposed design aims to provide thermal comfort, fire safety, reliable water services, electrical stability, energy efficiency, and smart building operation while complying with international engineering standards and sustainability requirements.

Project Scope

- HVAC System Design and Cooling Load Calculations
- Firefighting System Design according to NFPA Standards
- Plumbing Network Design
- Booster Pump System Design
- Electrical Distribution System Design
- Building Automation and Control System (PLC)
- Performance Analysis and Energy Efficiency Evaluation

8 - Solar collector with dish reflector and PCM

Supervisors	Students
أ.م.د.قاسم قدرى د. هانى أرناؤوط د. مروه خضرى	محمد تامر محمد زكى ابراهيم احمد عصام صابر السيد حسن محمد صلاح السيد محمد عبد الرحمن فؤاد جلال فؤاد محمد القاضى فؤاد محمد فؤاد محمد عثمان عبد الله على محمد عزت امين عبد الحافظ مارك سمعان مرقص حنا ميخائيل محمود ابوبكر متولى طه احمد خالد عادل محمد الدروى (صناعيه)

Abstract

Referred to the Egyptian Plan 2030, the present project deals with a solar collector used for domestic water heating. The use of solar energy for water heating contributes to increasing the utilization of renewable energy resources, reducing dependence on conventional energy sources, and achieving energy saving through the use of clean and sustainable solar energy.

Parabolic dish is used to reflect the incidence solar radiation to the heating vessel increasing the temperature of its contents. It may take different shapes such as parabolic or spherical. The dish reflector needs continuous tracking with the sun since its performance fall rapidly as the angle between the solar rays and the axis of the system increases. The tracing with the sun should have three degree of freedom. Some collectors have been designed with a fixed reflector and moveable receivers.

The project is consists of a Parabolic dish reflector mounted with a fixed carriage. The incident radiation on the proposed dish reflector is reflected to focus the solar ray into a phase change material (PCM) heating vessel. The phase change material inside the vessel is melted just exposed to the reflected radiation where the heat is extracted from the PCM vessel by a serpentine coil heat exchanger by flowing water inside a copper tube passing inside the vessel. The warmed water is stored inside small storage tank for the domestic use and load conditions.

There is a tracking system mounted with the collector to direct the reflector continuously with incident solar radial along the day.

The performance of the system including the measurements of temperature of flowing water at inlet and outlet, the PCM absorber temperature and finally the efficiency of the whole system.

9- Smart Agricultural Robot

Supervisors	Students
د. سهى جاب الله د. أميره البطوطى د. أحمد فؤاد	حمدى اشرف محمد بصله يوسف محمد يوسف النمر حبيبه احمد عز الدين عباس حسين صافى ايمن الصافى فهيم محمود بسمه احمد شندى زيدان شميس يوسف محمد هشام خليل محمد (إتصالات) مصطفى حمدى محمد ابراهيم الزغدى (إتصالات) مصطفى اسماعيل محمد اسماعيل محمد (إتصالات) رنيم احمد عبد السيد محمد الجنبيهى (إتصالات)

Abstract

This project presents the design and implementation of an **Smart Agricultural Robot**, a smart robotic platform developed to assist farmers in monitoring environmental and crop conditions in real time. The system integrates multiple technologies including embedded systems, environmental sensors, artificial intelligence, mobile robotics, and wireless communication. The robot is equipped with several sensors such as temperature and humidity sensors, soil moisture sensors, gas sensors, flame detection sensors, and water level sensors to continuously measure environmental and agricultural parameters. In addition, an AI-enabled camera module is used to monitor plant conditions, detect abnormal patterns, and assist in identifying potential crop diseases. The collected data is processed by a microcontroller-based control unit and transmitted wirelessly to a mobile application, allowing farmers to monitor farm conditions remotely. The system also includes mobility and obstacle-avoidance mechanisms, enabling the robot to navigate agricultural environments safely and efficiently. By providing continuous monitoring and early detection of environmental changes or potential hazards, the proposed system helps improve irrigation management, optimize resource usage, reduce crop losses, and support data-driven decision-making. The robot is designed with a modular and scalable architecture, allowing it to be adapted for various agricultural applications such as greenhouses, open-field farming, hydroponic systems, and agricultural research. Overall, the Smart Agricultural Robot represents a step toward intelligent and automated farming systems that contribute to the advancement of precision agriculture and sustainable agricultural development.

Industrial Engineering Department

(IE)

1- Automated fume extractor

1- Automated fume extractor

Supervisors	Students
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Abstract

Industrial activities such as welding, laser cutting, and metal fabrication produce harmful fumes, smoke, and gases that can negatively affect workers' health and safety.

Traditional ventilation systems are often inefficient because they depend on manual operation and lack intelligent monitoring. With advancements in automation, sensors, embedded systems, and artificial intelligence, smart fume extraction systems can now automatically detect hazardous conditions, remove pollutants at their source, and continuously monitor performance.

This project aims to develop an intelligent and reliable solution that improves workplace safety through automated fume extraction and real-time monitoring.

معهد الإسكندرية العالي للهندسة والتكنولوجيا

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