COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**1**
Professors	**Dr. Hazem Hassan Ali**
Project Title	**Design and implementation of a Multi task control using Neural Sensors**
Abstract	A remote multi task control is to be designed and implemented using neural sensors connected to human arm to replace remote controls by pressing buttons. The proposed system is to be designed and implemented using discrete components and IC's.
Required Classes	
Links	
Category	Electronics

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**2**
Professors	**Dr. Hussein El-Attar**
Project Title	**Design and Simulation of Routing Protocols in Mobile ad hoc Networks**
Abstract	Wireless mobile ad-hoc networks are characterized as networks without any physical connections. In these networks there is no fixed topology due to the mobility of nodes, interference, multipath propagation and path loss. Hence a dynamic routing protocol is needed for these networks to function properly. Many Routing protocols have been developed for accomplishing this task. The purpose of this project is to study, understand, analyze and discuss four-mobile ad-hoc routing protocols DSR ,TORA,OLSR and AODV in term of routing overhead, Delay ,Network load and Throughput for different network sizes ,mobility speeds , bandwidth and channel characteristics using MATLAB and/or OPNET in addition to physical connection of heterogeneous devices under the ad hoc mode.
Required Classes	
Links	
Category	Communications

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**3**
Professors	**Dr. Mohamed Hassan** **Dr. Mahmoud Abdalla**
Project Title	**A Compact Ultra Wide band Filter for Wireless Applications**
Abstract	The project discusses the aspects of UWB technology and the concept on which it is based. The project aims to design, simulate, fabricate and measure a planar ultra wide band (frequency range of 3.1 GHz to 10.6 GHz) filter. The designed antenna should be a low profile with small cost, simple in installation as required for many modern applications. The project is scheduled to the following stages: 1- Understanding of the different microwave transmission lines and matching techniques. 2- Design of different types of band pass filter 3- Design verifications using circuit simulator and electromagnetic full wave simulations. 4- Practical realization of the filter in microstrip technology. 5- Experimental measurements of the antenna radiation properties.
Required Classes	
Links	
Category	Microwave & Antennas

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Introduction to Combined Project:

Smart Autonomous Vehicle

This project is planned to be a multi-year project. The objective is to prepare the students to real-life job environment. Student will learn working in multiple teams, project management skills, product design to match exact specifications, product integration techniques, and finally have hands-on practical experience fully operational products.

The project modules will NOT depend on each other. Since we are starting with ready-made electric car, the project plan is that every module will be tested and demonstrated individually first.

Integration of functional modules will be in the second phase of the project. A special team will focus on making sure all modules are going according to plan.

In this project, the students will learn the link between using their background in electronics, DSP, antennas, wired and wireless communication links, different types of sensors and embedded real-time controllers.

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**4**
Professors	**Dr. Mohamed Ali Abuldahab**
Project Title	**Millimeter-Wave Automotive Radar for Smart Autonomous Car**
Abstract	Collision Avoidance and the detection of objects in the environment is an important task for an automated mobile vehicle. This could be achieved by using a radar system mounted on the vehicle. This radar operates in the EHF band (30-300 GHz) which is called the millimeter- wave (MMW) range, More specifically the automotive radar operates within the range77-81 GHz . MMW radar systems are divided into pulsed and continuous wave systems, which are in turn subdivided into frequency modulated continuous wave (FM-CW) and spread spectrum systems. The 77 GHz FM-CW radar systems for example, allow objects to be detected within a range of 1 to 150m. At the same time, their distance and speed relative to the host vehicle—and with the right number of antennas, also their angle to the longitudinal axis of the vehicle—are determined. It is worth mentioning that the following automotive manufacturers are known to be including automotive radar devices on vehicles: Daimler-Benz, BMW, Jaguar, Nissan, Toyota, Honda, Volvo and Ford. Fujitsu, an electronic component manufacturer, is known to be producing semiconductor devices specifically for automotive radar systems. The MMW radar can be integrated with other systems in the vehicle to give an "intelligent cruise control system " **Project Objective** Design, simulation and implementation of an automotive radar **Topics**: • Basic principles of radars • Pulsed Radar and FM-CW radar block diagrams • Measuring the range, velocity and azimuth of a target • Factors affecting performance • Propagation characteristics in the EHF band • Technical specifications of a typical automotive radar • Top- down design an automotive radar: ✓ Transceiver module ✓ Signal Processing module ✓ Antenna ✓ Display presentation module • Bottom –up verification of the designed automotive radar: ✓ Computer simulation ✓ Hardware implementation ✓ Testing the implemented modules
Required Classes	
Links	
Category	Antennas, Communications, DSP

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**5**
Professors	**Dr. Khaled Shehata** **Dr. Amr Bayoumi**
Project Title	**Control Unit and System Integration for Smart Autonomous Car**
Abstract	This project is responsible for the system definition of the autonomous car, and the integration of different blocks. The project will start with a readily-available electric car (such as the ones used by children in shopping malls), in order to avoid mechanical problems. Possibilities of larger cars will depend on progress. In the project, all manually-actuated functions such as motors controls, steering wheel, gas accelerator, brakes, lamps,...etc. will be replaced by electrically-controlled actuators. This is the trend in all modern cars. An embedded computer controller board will receive requests from other modules such as GPS navigation or collision avoidance, and use standard digital communications protocols such as CAN to control the different modules.
Required Classes	
Links	Google Car: http://en.wikipedia.org/wiki/Google_driverless_car Electric Cars: http://en.wikipedia.org/wiki/Tesla_Model_S Car Controller Protocol: http://en.wikipedia.org/wiki/CAN_bus Children's Ride-On Cars with all regular car options: link
Category	Electronics, Embedded Computing/Software

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**6**
Professors	**Dr. Amr Bayoumi**
Project Title	**Solar Cell Power System for Smart Autonomous Car**
Abstract	Solar-powered Cars have now reached speeds of up 120Km/hour. The current project targets powering the combined project car from solar energy using high efficiency photo voltaic (PV) cells. In this project, the students will learn the basic operation and installation of solar cells, design the needed power electronics for interfacing the cells to the load, and learn how to calculate the power requirements for an electric car, as well as how the operation of rechargeable batteries and charging circuits. The project will include switching electronics to regular AC chargers The students will learn how to work in a multi-team product. They will interact in particular with "System Integration Project" in order to specify allowed weights and motor specifications. A ready built electric car such as children's Ride-On cars (can carry a child driver) will be used initially, with possible larger models based on progress.
Required Classes	
Links	http://www.hochschule-bochum.de/fileadmin/media/solarcar/SW_GT/Technische_Daten/technical_datasheet1.pdf http://en.wikipedia.org/wiki/Solar_car http://en.wikipedia.org/wiki/List_of_solar_cars_(with_homologation) Children's Ride-On Cars: link
Category	Electronics

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

Project ID	**7**
Professors	**Dr. Bassem Sheta** **Dr. Mohamed El-Mahallawy**
Project Title	**Unmanned Waypoint Navigation and Control for Smart Autonomous Car**
Abstract	Real-time obstacle avoidance and navigation are key fields of research in the area of autonomous vehicles. The primary requirements of autonomy are to detect or sense changes and react to them without human intervention in a safe and efficient manner. Autonomous vehicles are widely used these days to achieve several tasks in different areas such as firefighting, mine detection, farming, …etc. The key point to autonomously control any vehicle is to provide its brain/processor with a reliable data of its location. Motion decision is correctly taken when true coordinates are provided. In open areas, global positioning system (GPS) is the perfect solution. The problem of GPS is that it is very hard to rely on it to achieve heading information which is necessary to build the decision on the required direction. This problem is usually solved by integrating the GPS with another heading sensor such as digital compass or magnetometer. The objective of this project is to develop autonomous waypoint navigation and obstacle avoidance capabilities for an unmanned ground vehicle (UGV). A fully autonomous ground vehicle is built with the capability of detecting and localizing potential obstacles using real-time sensor data, navigation and heading sensors are integrated, and the required software that takes the correct decision and controls the vehicle motion is developed. **Components list**

السعرللوحدة	المواصفات	الصنف
600	Robot car chassis	
240	Skylab UART GPS Module (For Microcontroller and Arduino)	مستقبل جي بي إس
320	IMU -3 Axis Gyro + 3 Axis Accelorometer (InvenSense MPU-6050)	وحدة استشعار بالقصور الذاتي
90	3 Ultrasonic Sensor (Range Finder) SEN-ULTR01	وحدة استشعار بالموجات فوق الصوتية
325	Magnetometer compass	
150	Lithium Polymer Battery (11.1 V, 2200 mAH)	بطارية
300	Arduino Xbee Shield with zigbee Module	وحدة لاسلكي
100	USB-XBEE Adaptor (Connect Zigbee to PC)	وحدة لاسلكي
300	Zigbee Pro- 63 mw PCB Antenna Series2 Wireless Module (Long Distance)	وحدة لاسلكي
120	Color LCD 128x128 (Nokia)	شاشة الوان LCD
300	Arduino MEGA	ميكروكونترولر

Tasks

1- Theoretical background on microcontrollers, GPS, IMU, magnetometer
2- GPS receiver Connection to the appropriate microcontroller and develop the required software to read its data.
3- IMU and magnetometer connection to the appropriate microcontroller and develop the required software to read its data and calculate the vehicle orientation and heading.
4- Ultrasonic sensor range finder connection to the UGV through the appropriate microcontroller and develop the required software to read its real-time sensor data to detect and localize potential obstacles.
5- Mission planning (motion path determination and time of flight estimation)
6- Mission testing and error reporting.
7- Project report submission.

Required Classes	
Links	
Category	DSP, Embedded & Software, Instrumentation, Wireless

COLLEGE OF ENGINEERING & TECHNOLOGY- Cairo

Electronics and Communications Engineering

Sept. 2014- June 2015 Graduation Projects

<table>
<tr><td>Project ID</td><td>8</td></tr>
<tr><td>Professors</td><td>Dr. Bassem Sheta
Dr. Mohamed El-Mahallawy</td></tr>
<tr><td>Project Title</td><td>Real-Time Object Detection and Tracking Using Image Processing for Smart Autonomous Car</td></tr>
<tr><td>Abstract</td><td>
The use of video is becoming prevalent in many applications such as monitoring of traffic, detection of pedestrians, identification of anomalous behavior in a parking lot or near an ATM, etc. While a single image provides a snapshot of a scene, the different frames of a video taken over time represents the dynamics in the scene, making it possible to capture motion in the sequence.
Tracking is the problem of generating an inference about the motion of an object given a sequence of images. Good solutions to this problem can be applied to many applications. For example, off speed limit car tracking, aerial targets tracking...etc.
In this project, a real–time tracking systems is required to be designed and developed. The developed system will be used detect an object entering the field of view (FOV) of a camera and execute tracking of the detected object.
To accomplish this requirement, a real time image processing software such as "OPENCV" is used and interacted with a microcontroller that controls the motion of a camera platform that has two degree of freedom to move it in pan and tilt motions.
Successful development of this project will enhance the capabilities of the candidate in many aspects such as image processing, real time programming, and microcontroller based applications.

<u>Components list</u>
<table>
<tr><th>السعرللوحدة</th><th>المواصفات</th><th>الصنف</th></tr>
<tr><td>600</td><td>Robot car chassis</td><td></td></tr>
<tr><td>150</td><td>Lithium Polymer Battery (11.1 V, 2200 mAH)</td><td>بطارية</td></tr>
<tr><td>300</td><td>Arduino MEGA</td><td>ميكروكونترولر</td></tr>
<tr><td>90</td><td>Ultrasonic Sensor (Range Finder) SEN-ULTR01</td><td>وحدة استشعار بالموجات فوق الصوتية</td></tr>
<tr><td>200</td><td>2 Servo motors</td><td></td></tr>
<tr><td></td><td>Web Camera or arduino compatible camera</td><td></td></tr>
<tr><td></td><td>Pan –tilt chassis for camera</td><td></td></tr>
</table>
<u>Tasks</u>

Image processing theoretical background.
Image filtering and tracking techniques.
Real time image processing software.
Camera interfacing with microcontroller
Generating libraries responsible for processing each frame and locating the object in each frame.
Design of motors control algorithms.
System integration.
UGV testing and error reporting.
Project report submission.

</td></tr>
<tr><td>Required Classes</td><td></td></tr>
<tr><td>Links</td><td></td></tr>
<tr><td>Category</td><td>DSP, Embedded & Software, Instrumentation, Wireless</td></tr>
</table>