



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering, Cairo

## Graduation Project Description Form

Project Supervisor(s) : Dr Bassem Sheta

Project Title: Unmanned Vehicle Control and Mission Planning

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Duration from 9/2013 \_\_\_till 7/2014 \_\_\_\_\_

### Product Category

Algorithm\_\_\_ Hardware\_\_\_ Software\_\_\_

### Standards:

Safety: UL, CE\_\_\_ IEEE \_\_\_ FCC\_\_\_

Other \_\_\_\_\_

### Practical Realization Form

PCB \_\_\_\_\_ Firmware\_\_ Embedded CPU Kit (ARM, ..etc): \_\_\_\_\_

PC Software \_\_\_\_\_ Ready-made Package\_\_\_ DSP Kit\_\_ FPGA Kit\_

VLSI Schematics \_\_ VLSI Layout \_\_\_ VLSI Silicon (ASIC)\_\_\_\_\_



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#### Language

VHDL/Verilog      Matlab      C/C++/Java \_\_\_\_\_

#### Productization

Finished Product Form:\_\_\_      Possible Commercialization \_\_\_\_\_

Amount of funds needed for buying components: \_\_\_\_\_

IEEE GOLD Made-In-Egypt/Engineering Day: \_

ITAC (ITIDA) or NTRA Funding Application:\_

#### Testing

Functional\_\_\_      Simulation\_\_\_      Parameters\_\_\_      Final Hardware\_\_\_Other:

#### Lab Test Setup

EMC \_\_\_\_\_      Environmental\_\_\_\_\_      Microwave \_\_\_\_\_      Analog Lab\_\_\_\_\_

Other:

CAD Tools *(No unauthentic software is allowed)*:



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Elective Classes Required:



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### Abstract

Autonomous vehicles are widely used these days to achieve several tasks in different areas such as fire fighting, 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 that is necessary to build the decision on the required direction. Integrating the GPS with another heading sensor such as digital compass or magnetometer usually solves this problem.

In this project, a fully autonomous ground vehicle is built, navigation and heading sensors are integrated, and the required software that takes the correct decision and control the vehicle motion is developed.

### **Components list:**

| Part Name   | Quantity |
|---|----------|
| Robot car chassis   | 1        |
| Skylab UART GPS Module (For Microcontroller and Arduino)      | 1        |
| IMU -3 Axis Gyro + 3 Axis Accelerometer (InvenSense MPU-6050) | 1        |
| Color LCD 128x128 (Nokia)                                     | 1        |
| Magnetometer compass  | 1        |
| Lithium Polymer Battery (11.1 V, 2200 mAH)                    | 1        |
| Arduino Xbee Shield with zigbee Module                        | 1        |



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|   |   |
|---|---|
| USB-XBEE Adaptor (Connect Zigbee to PC)                               | 1 |
| Zigbee Pro- 63 mw PCB Antenna Series2 Wireless Module (Long Distance) | 1 |

#### **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- Mission planning (motion path determination and time of flight estimation)
- 5- Mission testing and error reporting.
- 6- Project report submission.



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References and Links