Journal paper of ASU RACING TEAM for 2014

ASU RACING TEAM from Ain Shams University, is an undergraduate association that build an AUV to participate in the 17th annual RoboSub Competition at the U.S. Navy's space and Naval Warfare Systems Center in San Diego, California.

The team members improved last year's design with several modifications to reduce mission execution time and enhance overall modularity

Quick Facts:

Dry weight	20 Kg
Dimensions (LWH)	92x64x40
Max speed	0.2 m/s
Degrees of freedom	5 degrees
Thrusters	6 -1000 GPH bilge pump
cameras	2 cameras-PRO F-095C

ASU Racing Team Vision:

''Our aim is to see an advanced Egyptian research entity concerned with automotive science & AUV, creating youth leaders with the passion and skills required for this mission"

Team objectives:

- Correct the last year's mistakes
- Reduce mission executive time
- Develop the underwater robotic research in Egypt
- Utilization of AUV in exploration and extraction of underwater ancient monuments

Team organization:

We are two subgroups leaded by an elected leader, He co-ordinates to main teams; Mechanical team and electrical & control team. The team leader does management and global coordination

Mechanical Design:

The role of the mechanical team is to provide a robust, yet agile platform to the electrical & control team, our objectives:

- Sealing the control and camera box
- Designing and manufacturing of the robotic arm
- Modify the main frame

Design and fabrication:

The main platform was drawn in 3D using Inventor software, Once we complete the design the fabrication begins, the team uses Lathe machines, drilling and milling machine for fabrication
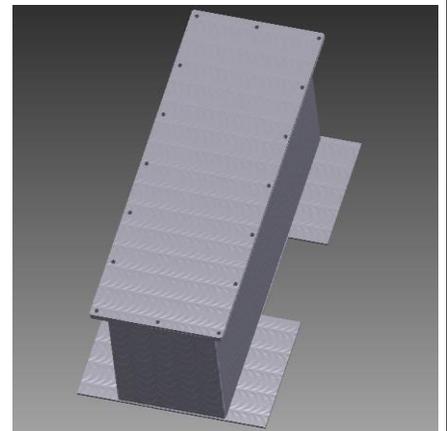
The Frame:

The main frame is made of a sheet of aluminum which is drilled for the assembly of the remaining parts. All the bolts and nuts are made of steel; one of the objectives this year is to make the frame lighter.
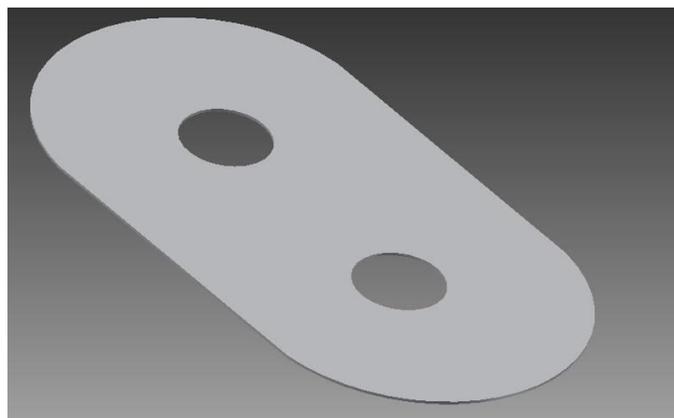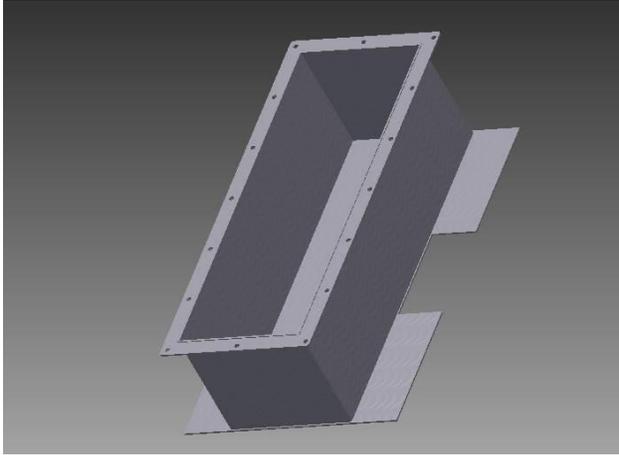
The control box:

The control box contains most of the electronics of the vehicle and was designed with the objective of having an easy access to the electronics, it is fabricated using aluminum.
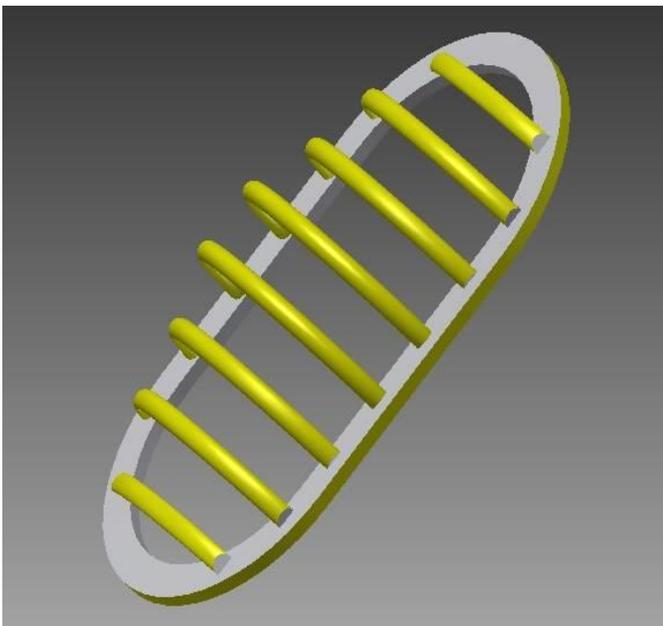
The box dimensions are   …….. which will contains the drivers of the thruster, the battery and so on.

Dropping mechanism:

One of the tasks is to drop the marker, so we will use an electromagnet to carry the marker during the mission and drop it at a specific time.

The Torpedo:

We have used a solenoid valve to shoot the torpedo at a certain object at a specific time; we used ANSYS for designing the torpedo to reach an appropriate velocity.

The ribs:

The ribs are inspired from the ribcage of the whale, it maintain the balanced flow underwater.
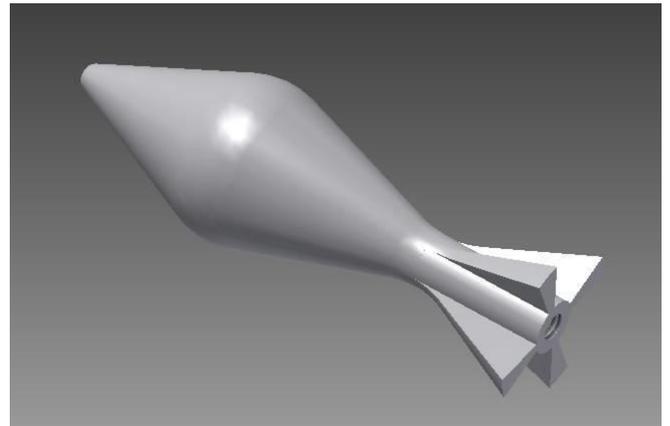
AUV block diagram:
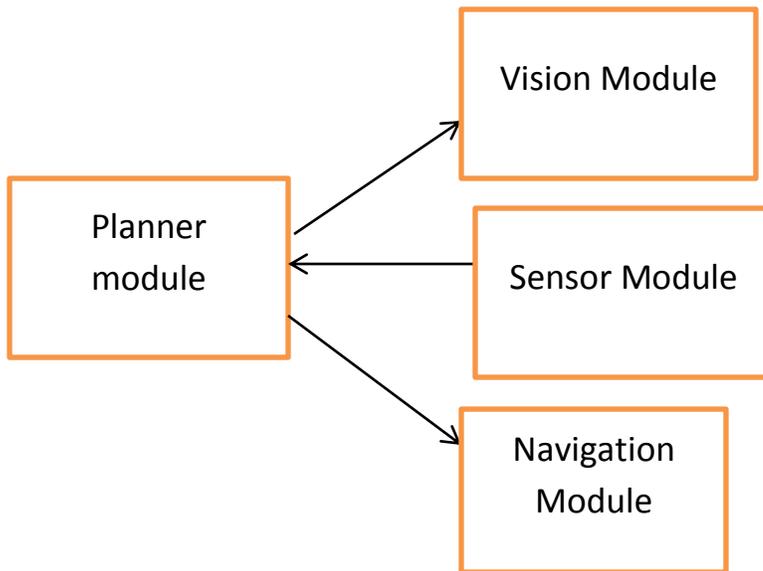
Vision Module: the module that contains the 2 cameras (front camera and underneath camera) it also contains all the vision and image processing algorithms and execute one of them based on the current task (sent from the main module)

Vision Module

Planner module

Sensor Module

Navigation Module

Sensors Module: it contains all the sensors of the AUV the data is sent to the module that requests it.

The system will use Linux based OS (e.g. ubunto)

Navigation Module: it contains the pumps and the motors it controls the movement of the AUV

The communication between the modules will be through TCP/IP.

and controls the stability of the AUV, it receives the destination form planner module.

Planner Module: the main module of the AUV it determines what task we are in now, and receives data from sensors module and vision module and control the destination of the AUV and sends it to the Navigation module.

Acknowledgments:

''We would like thank Dr. Mohamed Abdel-Aziz for his support and technical advises ''

2014 Team members:

Team leader: Hussein Khaled Zahran

Mechanical team members:

- Abdelrahman Saad El-din Sokkar
- Ali Ahmed Abdel-Hady
- Hussein Khaled Zahran
- Maha Moustafa Mohamed Elziady
- Mahmoud Salah El-din Hashem

Electrical & control team members:

- Amr Mohamed Reda
- Ahmed Abdel-hay
- Eslam mounier
- Sara Zahran

Technical Advisors:

- Mohamed Adel El-Shaarawy
- Omar shehata