



Environmental Monitoring Vehicle

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Project Definition

To design **Environmental Monitoring Vehicle** that will measure environmental variables **inside** and **outside** the water.

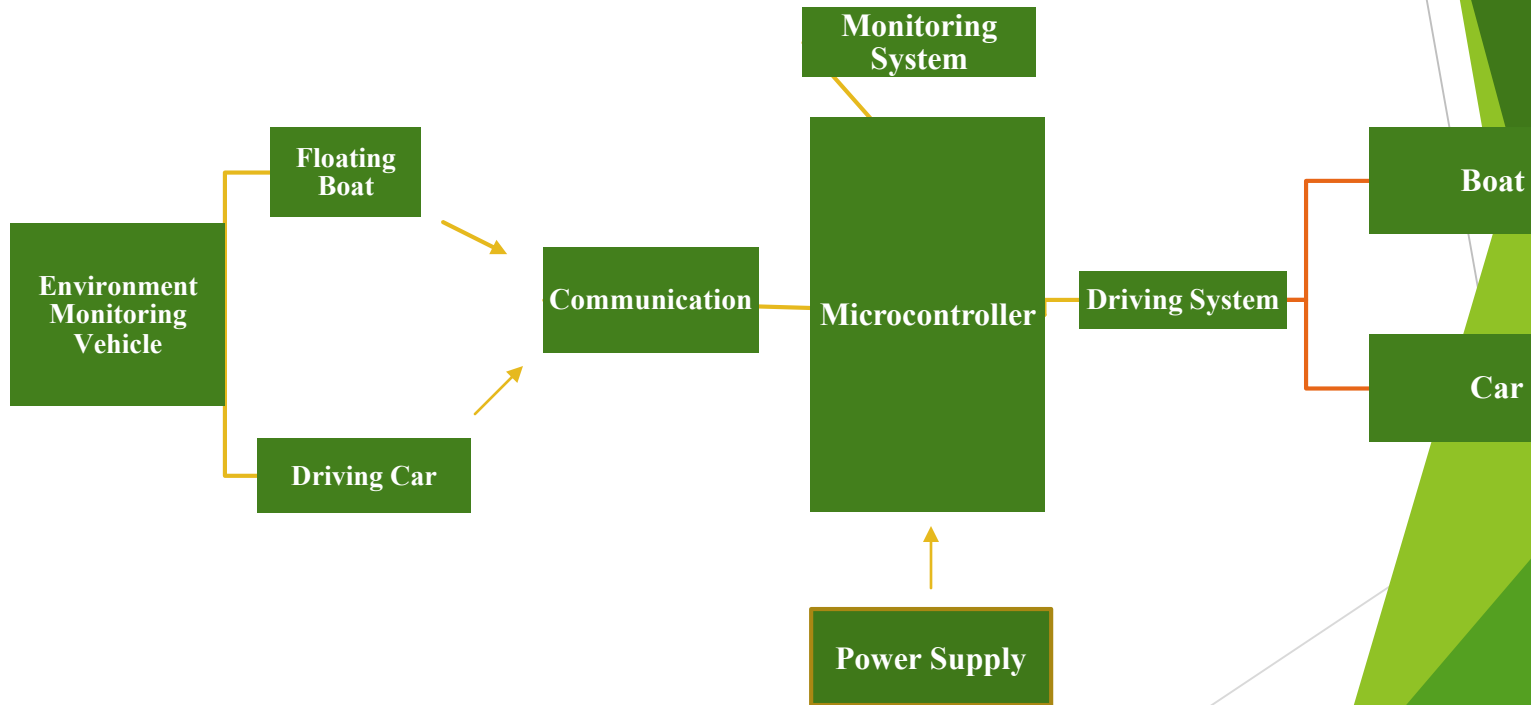
Project Objectives

1. Functioning as an amphibious.
2. Effective for environmental organization.
3. Helps to monitor the pollution.

Project Specifications

1. Input voltage 14.7V
2. Measures Temperature, Pressure and Oxygen
3. 1.5 km wireless connection
4. Operation time up to 15 Minutes

Project Architecture



Background

- ▶ This project to solve some environmental issues.
- ▶ To know the produced O₂ from the plants.(coral reefs).
- ▶ Temperature and pressure, for fishes and plants.

Previous Projects 1

Remote Controlled Submarine, *Prince Muhammed Bin Fahad University, Spring 2016.*



Fig.1

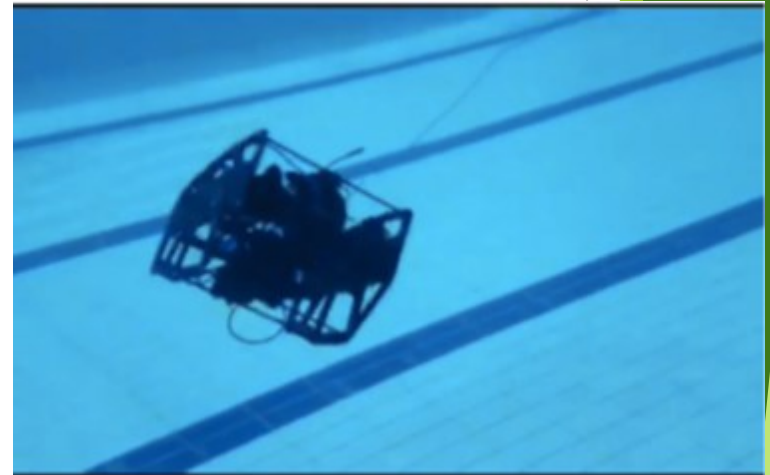


Fig.2

Previous Projects 1

▶ **Project definition:**

To design and build a submarine that will gather data underwater and control station.

▶ **Objectives:**

1. Send live feedback to control station
2. Can measure temperature and measure depth from pressure underwater

Previous Projects 2

Robot to Study Lake Tahoe, *University of Nevada July, 2016*



Fig.3

Previous Projects 2

- ▶ **Project definition:**

To design a platform that can be used on the surface of a lake to quantify the water quality.

- ▶ **Objective:**

Aimed to monitor the environment for water quality
(turbidity and Oxygen)

Previous Projects 3

Autonomous Targeting Vehicle, *Purdue University, Spring 2011*

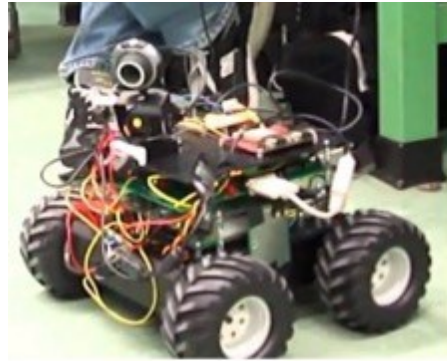


Fig.4

Previous Projects 3

- ▶ **Project definition:**

To designated GPS waypoints and to visually locate and follow targets.

- ▶ **Objectives:**

Sensor data to accurately determine location of the robot

Summary & Comparison

Table 1: Comparison between previous Project

Projects	Remote Controlled Submarine	Robots to Study Lake Tahoe	Autonomous Targeting Vehicle	Our Project
Functionality/serviced	Underwater	Floating on water	On land	Amphibiou s
Controlled	Wired	Wirelessly	Autonomous	Wirelessly
Monitoring system	Yes	Yes	No	Yes
Operating Time	15 Min.	15 Min.	Not Mentioned	15 Min.

Budget Estimate

Table 2: Budget Estimate

Items	Quantity	Cost
Battery	3	SR 600
Motors	6	SR 340
Joystick	1	SR 100
Total	19	SR 1640

Planning

- ▶ **Did you verify project feasibility?**

Yes, it is feasible and we can do it

- ▶ **Did you verify that all components will be available locally or can be ordered within a reasonable time?**

Some of the component are available here, and those does not we will order them

- ▶ **Did you verify that the required testing can be performed at PMU Labs (instruments and technical help availability?)**

Absolutely, as a team we have verify that we can test our project here at PMU labs

Design Subsystem 1 (Floating Boat)



Fig.5



Fig.6

Design Subsystem 1 (Floating Boat)

▶ Body

- Weight
- Shape
- Material

▶ Motor

- Performance
- Torque
- Cost

Motor Selection SS1

Table 3: Comparison between Motors

	Brushless	Stepper
RPM/V	3180 rpm	1325 rmp
Water Resistance	Yes	No



Fig.7



Fig.8

Design Subsystem 2(Driving Car)



Fig 9

Motor Selection SS2

Table 4: Comparison between Brushed Motors

	Brushed	Brushed
Performance	High	LOW
Cost	220 SR	150 SR



Fig.10



Fig.11

Design Subsystem 2(Driving Car)



Fig.12



Fig.13

Design Subsystem 2(Driving Car)

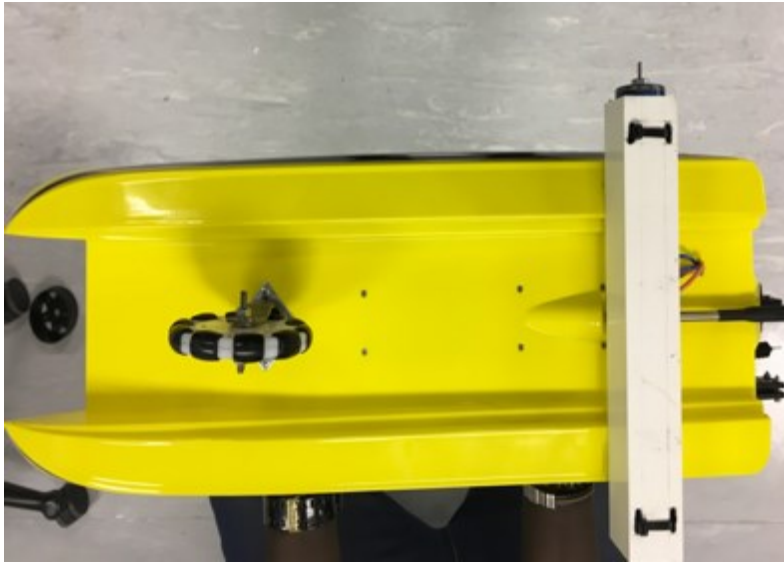


Fig.14



Fig.15

After Integrating SS1&SS2

After Integrating All Parts



Fig.16

Design Subsystem 3 (Control system)

Table 5: Comparison between wireless control system

	Zigbee(Xbee S2)	Bluetooth
Range	1.6 Km	10-15m



Fig.17



Fig.18

Design Subsystem 3 (Control system)

Transmitter



Fig.19



Fig.20

Design Subsystem 3 (Control system)

► Receiver



Fig.21

Design Subsystem 4(Monitoring System)

Table 6: Comparison between Monitoring System

	Pressure sensor	Temperature sensor	Pressure/Temperature sensor
Accuracy	+/-0.25%	+/-0.5%	+/-0.25%

Design Subsystem 4(Monitoring System)

Table 7: Comparison between Monitoring System

	Dissolved Oxygen sensor	Gravity: Analog Dissolved Oxygen Sensor
Response	+/-0.25%	98% full response, within 90 seconds (25°C)

Design Subsystem 4(Monitoring System)

- ▶ Saving the measured data through SD card.



Fig.22

Testing (Driving Car)



Fig.23

Testing (Floating Boat)



Fig.24

Testing (Monitoring System)

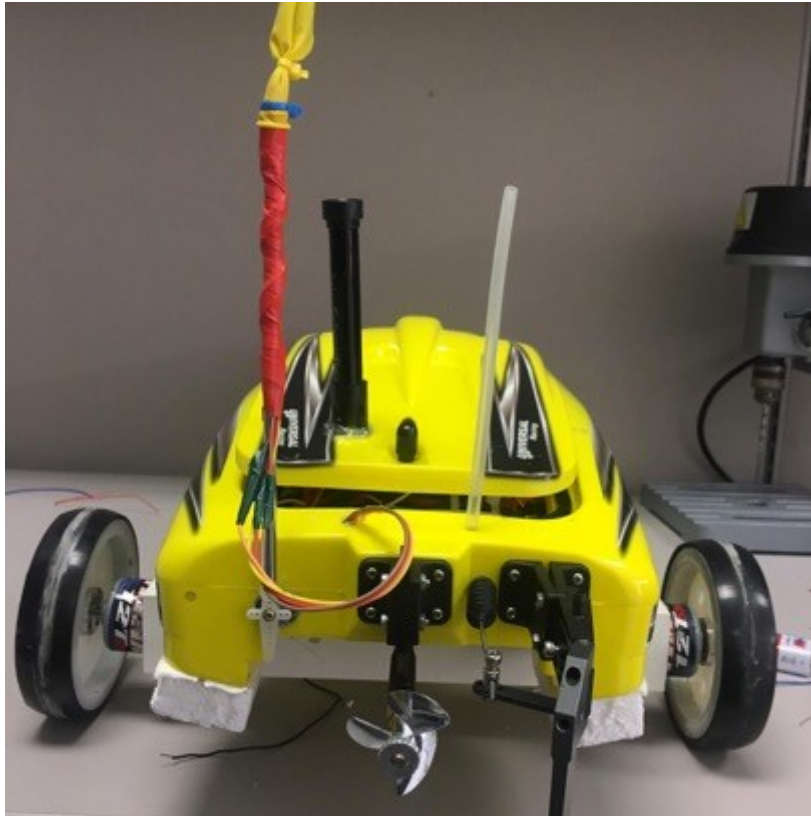


Fig.25

Testing (Monitoring System)

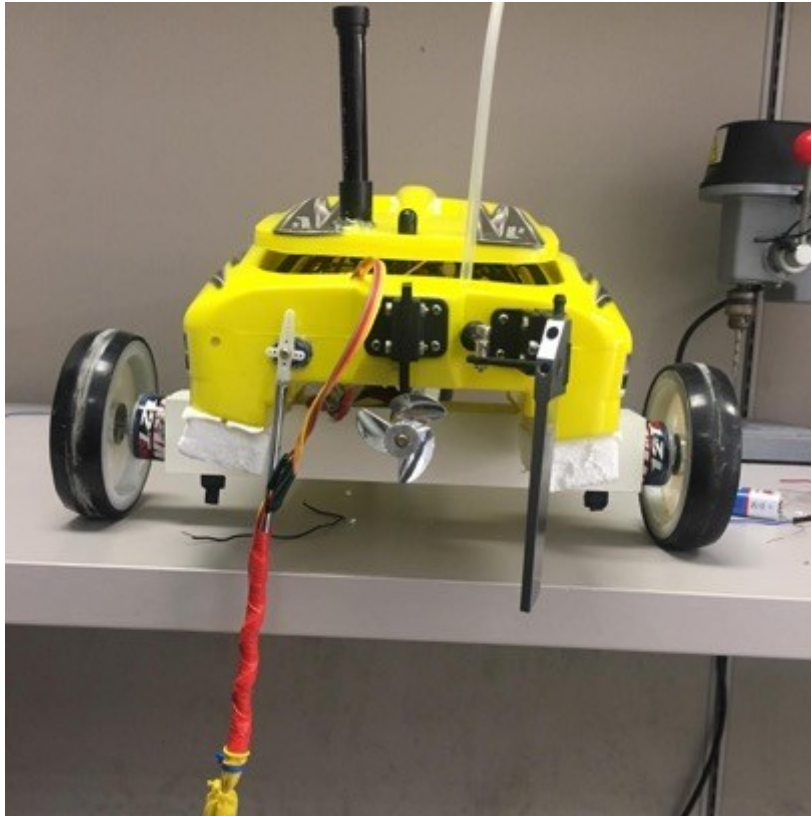


Fig.26

Testing (Monitoring System)

Pressure: 506.38 hPa	Temperature: 24.27 C	02: 1.40 mg/l
Pressure: 506.27 hPa	Temperature: 24.23 C	02: 1.40 mg/l
Pressure: 506.20 hPa	Temperature: 24.22 C	02: 1.45 mg/l
Pressure: 569.36 hPa	Temperature: 73.17 C	02: 1.55 mg/l
Pressure: 481.05 hPa	Temperature: 20.40 C	02: 1.40 mg/l
Pressure: 481.17 hPa	Temperature: 20.40 C	02: 1.40 mg/l
Pressure: 481.15 hPa	Temperature: 20.42 C	02: 1.45 mg/l
Pressure: 481.28 hPa	Temperature: 20.41 C	02: 1.45 mg/l
Pressure: 481.36 hPa	Temperature: 20.44 C	02: 1.40 mg/l
Pressure: 481.13 hPa	Temperature: 20.44 C	02: 1.55 mg/l
Pressure: 482.44 hPa	Temperature: 20.40 C	02: 1.40 mg/l
Pressure: 0.00 hPa	Temperature: 0.00 C	02: - mg/l
Pressure: 0.00 hPa	Temperature: 0.00 C	02: - mg/l
Pressure: 0.00 hPa	Temperature: 0.00 C	02: - mg/l

Fig.27

Project

Project Management: Plan					
Electrical Engineering Department					
EEEN4311: Design Methodology & Project Management					
Instructor: Dr. Chedly B. Yahya			Spring 2018		
Project Title: Environmental Monitoring Vehicle					
Team:		Hassan Al Rumaych (HA) Abdullah Al Bubumaidah (AS)	Mahdi Al Nasir (MN) Baker Al Takroni (BT)		
SN	Tasks & Responsibilities		Begin**	End**	% Completion
1	Test and refine design of SS2 (Driving car)	HA, MN	Sep 2	Sep 15	100%
2	Design SS3 and verify equipment for (Wireless Control System)	BT, AS	Sep 16	Sep 19	100%
3	Implement SS3 (Wireless Control System)	MN, BT	Sep 24	Oct 1	100%
4	Test and refine SS3 (Wireless Control system for Motors)	HA, AS	1 Oct.	Oct 6	100%
5	Implement design subsystem SS4 (Monitoring Natural Variables)	ALL	8 Oct.	Oct 15	100%
6	Test and refine design for SS4 (Monitoring Natural Variables)	MN, HA	Oct 16	Oct 22	100%
7	Integrate SS1 (Driving Car), SS2 (Float Boat) and SS3 (Wireless Control system for Motors)	AS, MN	Oct 31	Nov 3	100%
8	Test and troubleshoot SS1 (Driving Car), SS2 (Float Boat) and SS3 (Wireless Control system for Motors)	MN, BT	Nov 5	Nov 10	100%
9	Prepare midterm presentations	ALL	Nov 11	Nov 12	100%
10	Integrate and test SS3 & SS4	HA, AS	Nov 15	Nov 16	100%
9	Test and troubleshoot	HA, BT	Nov 16	Nov 20	100%
10	Integrate all subsystems	ALL	Nov 21	Nov 26	90%
11	Test and make final changes	ALL	Nov 27	Dec 7	100%
12	Writing final report	ALL	Nov 21	Dec 6	100%
13	Prepare Demo. (prototype)	ALL	-	-	100%
14	Prepare a video	ALL	-	-	100%
15	Write progress reports (Bi Weekly)	ALL	-	-	100%
** Dates: From week 1 Sep2 until week 14 Dec6			% Completion by set end date		

Fig.28

Challenges

- ▶ Isolating the Boat.
- ▶ Coding
- ▶ Placing the Monitoring System.

Thank you for listing

