TECHNICAL REPORT

LINTANG SELATAN TEAM

SEKOLAH ROBOT INDONESIA

TEAM MEMBER

AHISTYA PURBOLINTANG (CEO, PILOT, Head Programmer)
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KAISAR NIAFLZA (Programmer Team)
FIRMAN FATHONI (Programmer Team)
NAURAH AURELIA MAHJUDIN (CFO)
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RACHEL YUSRIYAH BILQIS (Design Team Member)

MENTOR

YUDI TRIWIBOWO
DHADHANG SBW

ABSTRACT

LINTANG SELATAN was built by Sekolah Robot Indonesia, a club robotic ROV team from Indonesia competing for their first time in Hong Kong/Asia Regional of the MATE International ROV Competition. The following technical report describes the Remotely Operated Vehicle (ROV) from club Robotic ROV Team.

LINTANG SELATAN was designed over a period of 4 months to to adjust the mission specifications of the 2014 Marine Advanced Technology Education (MATE). The theme for the 2014 competition season is Exploring the Great Lakes: Shipwrecks, Sinkholes, and Conservation in the Thunder Bay National Marine Sanctuary. This is the first time for the team, to make the ROV robot, so it needs a lot of improvement to run this ROV.

Several steps were taken in order to create LINTANG SELATAN (first time build ROV Robot), the first thing our team need was a basic frame to start the robot, We decide to use Aluminum Profile because is easy to use and strong aluminum. We Searching Motor to drive LINTANG SELATAN with Propeller. Next Step we try step by step to trial ROV to adjust the mission MATE 2014

The team solved their technical problems using a trial and error approach allowed them to gain a better understanding of which structural designs work more efficiently than others. There is still some room for improvement, but the team is ready to participate in their first ROV competition.

Fig 1. LINTANG SELATAN ROV Team

1. DESIGN RATIONALE

1.1. ROV CHASIS

Material

Basic of Material for **LINTANG SELATAN** Chasis from Aluminum, we choose the aluminum based on its easy to use, cutting, wide variety assembling and modification. Aluminum is ability to withstand corrosion for very long periode time.

We use Aluminium Profile, because is flexible and can be used for a massive range of applications including machine frames, safety guards, workstations, conveyors, complete turn-key assembly lines and multi-axis positioning systems.

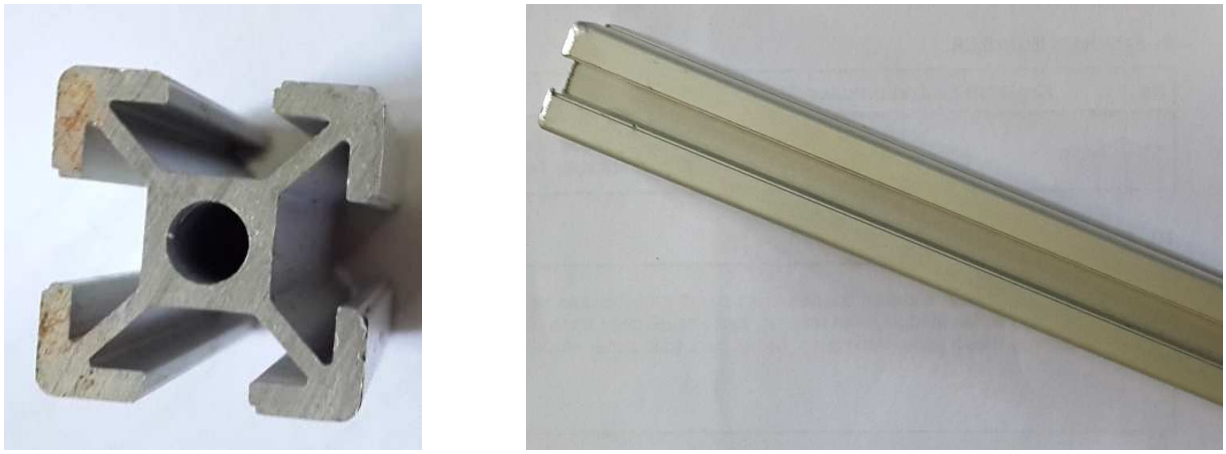

Fig 2. Aluminum Profile

Fig 3. Angle Bracket Diecast and T-nut

With these materials, we can easily create a mechanical form of the ROV robot. Connection by simply connecting between the aluminum profile

Fig 4. Connection aluminium profile

Design ROV

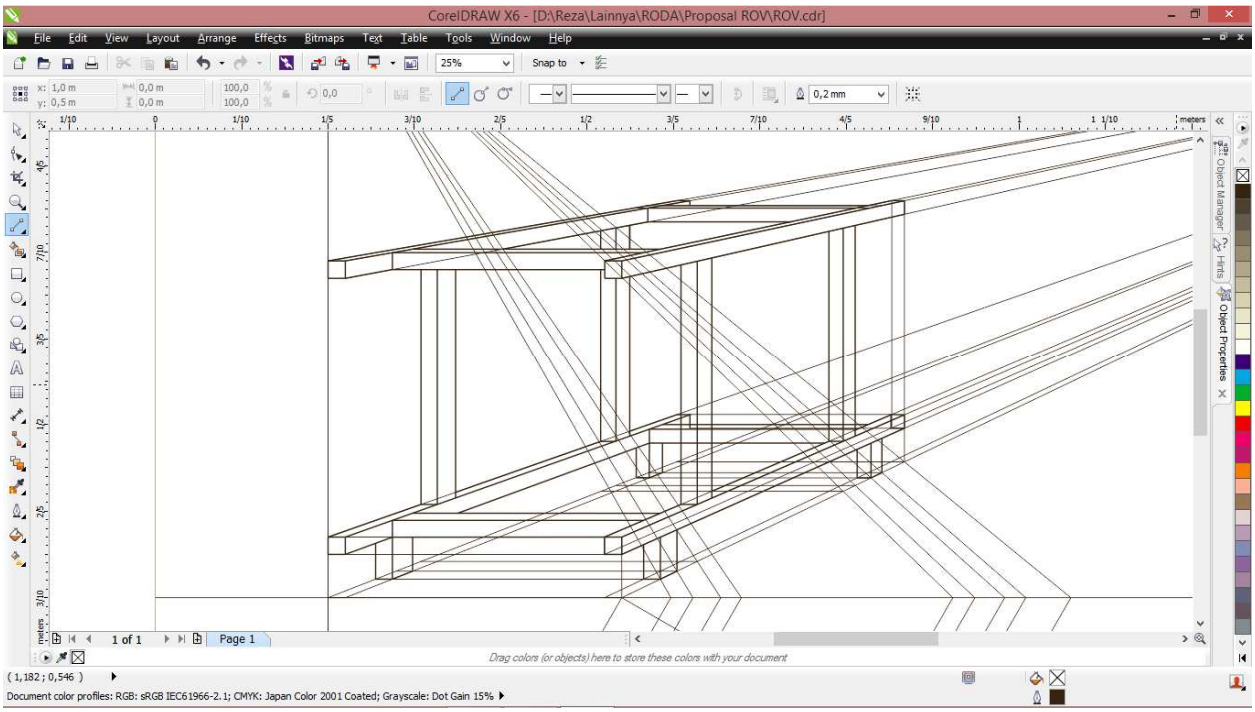

Fig 5. Basic Design

At the beginning of the design, we use corel draw shapes for ROV. after the new scale we created using the actual aluminum profile

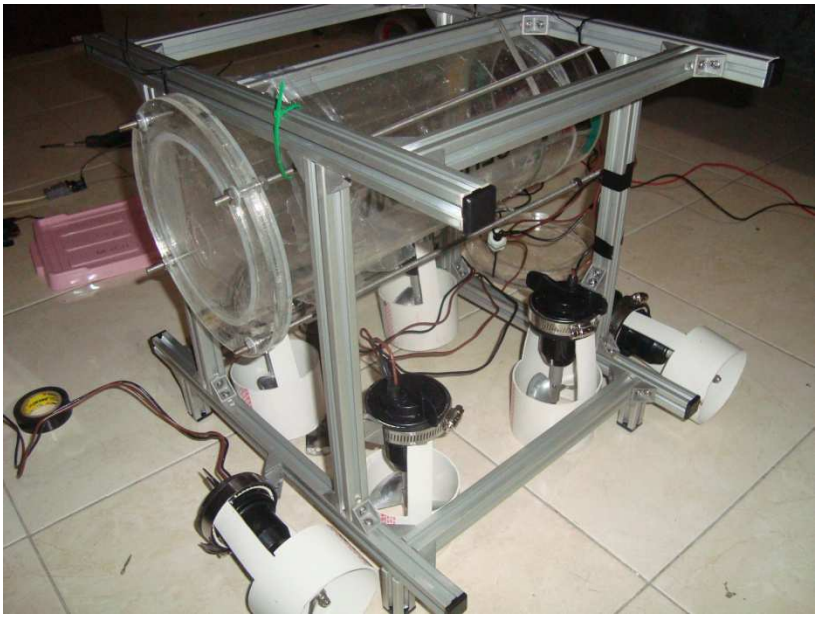

Fig 6. Design LINTANG SELATAN

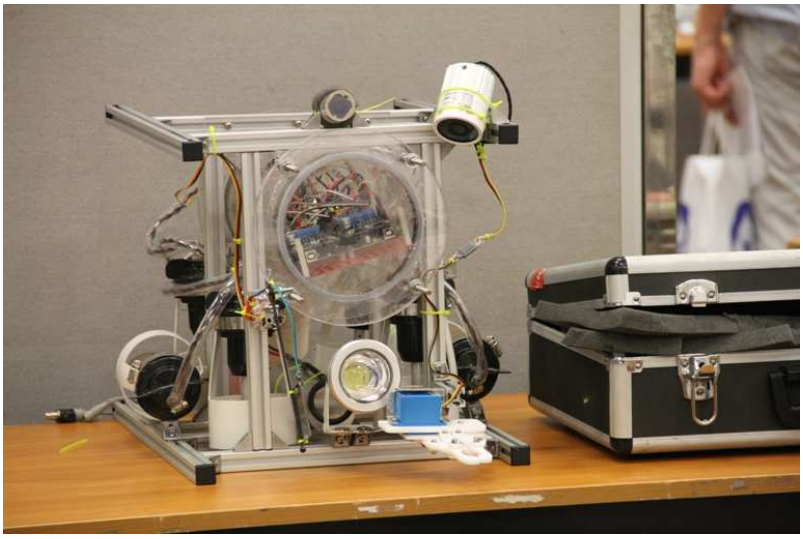

Fig 7. LINTANG SELATAN ROV

1.2. PROPULSION SYSTEM

Making propulsion system is divided into several sections

Section 1

Selection of Motor

The use of motor ROV we choose the motor that has the specs waterproof, after doing a search on the Internet and in forums ROV most recommended motor is Johnson Pump thrust.

Fig 8. johnson motor pump

Section 2

Propeller choices

For Propeller It should be for our design their own and make it, in the CNC cutting machine, but one of the weaknesses in our area is no CNC machines in the rental, so the other alternative is we buy a propeller at hobby stores

Fig 9. Propeller Alu-Alloy 478B

Specification 478B Prop.Alu-Alloy with Dia.A=6.35mm

Section 3

Propeller Holder

Propeller that can be mounted on the motor, should make the first connector, the connector should fit between the end of the motor with the propeller. We draw the propeller holder in google skecthup and going to cutting this aluminum in lathe machine

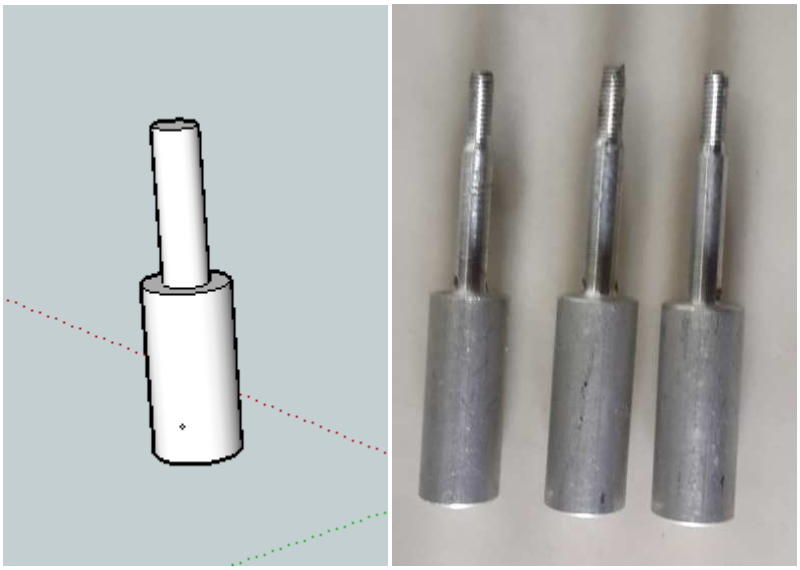

Fig 10. Design and result propeller holder

1.3. MOTOR CONFIGURATION

We use 4 motor to up and down Robot, and 2 motor to forward, backward, left and right . we plan use 8 Motor but, any trouble in 2 motor so we use 6 motor

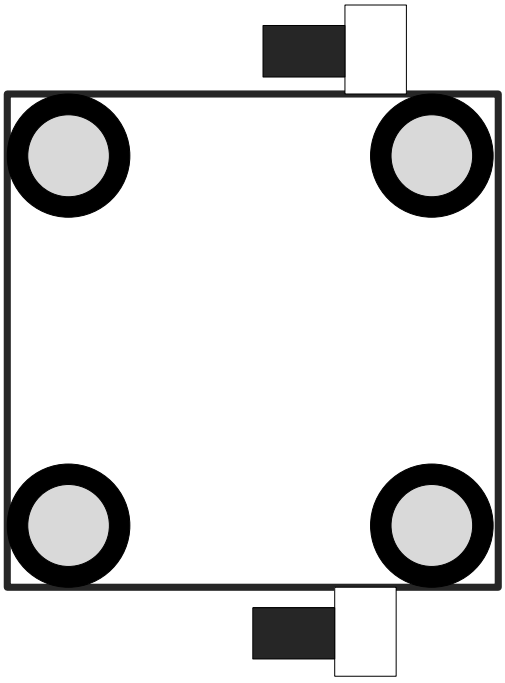

Fig 11. top view Motor Configuration

1.4. GRIPPER

Material gripper from cutting Acrilic, after we design gripper in Corel Draw program, we rent laser cutting.

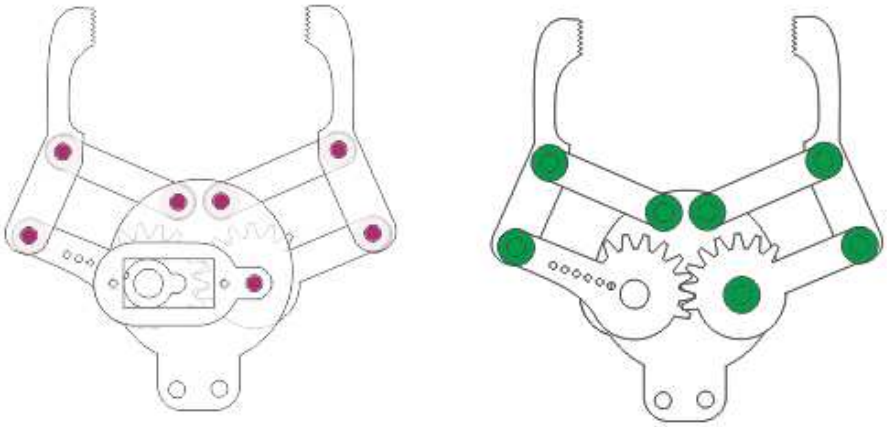

Fig 12. Design Gripper

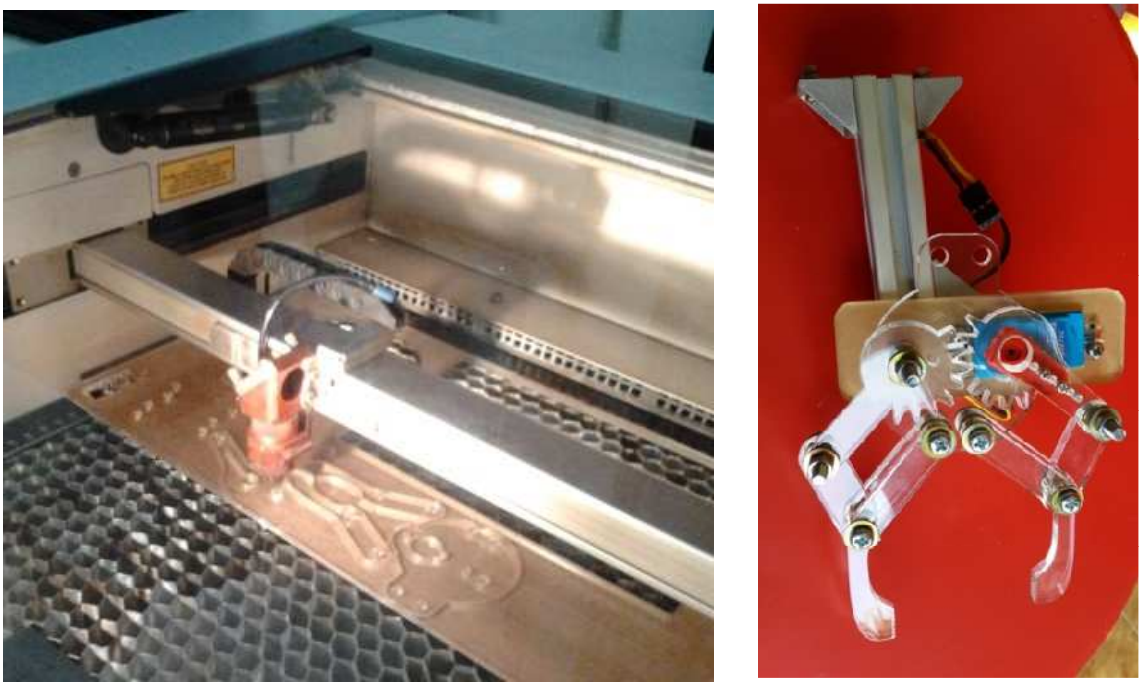

Fig 13. Laser Cutting and gripper

The gripper is built on the parallelogram principle in order to use all the provided gripping force effectively in parallel motion. For this reason, the manipulator has two moving joints (a single-jointed manipulator loses some of the gripping force to forward motion, and is therefore less effective). And to drive the gripper using a waterproof servo motors.

Fig 14. Waterproof Servo Motor

1.5. ACRILIC TUBE

We design acrilyc tube for buoyancy ROV and for containing acrylic.

Fig 15. Acrylic Tube

1.6. CAMERA

For camera we use cctv camera, and we use frame self for waterproof. Our cameras are housed inside 1-inch PVC unions, cable entries are epoxy-potted / resin to prevent water intrusion through wiring. We use 2 model camera, 1 camera for wide view and other for focus view.

Fig 16. Camera

2. ELECTRONIC SYSTEM

2.1. Electronic schematic

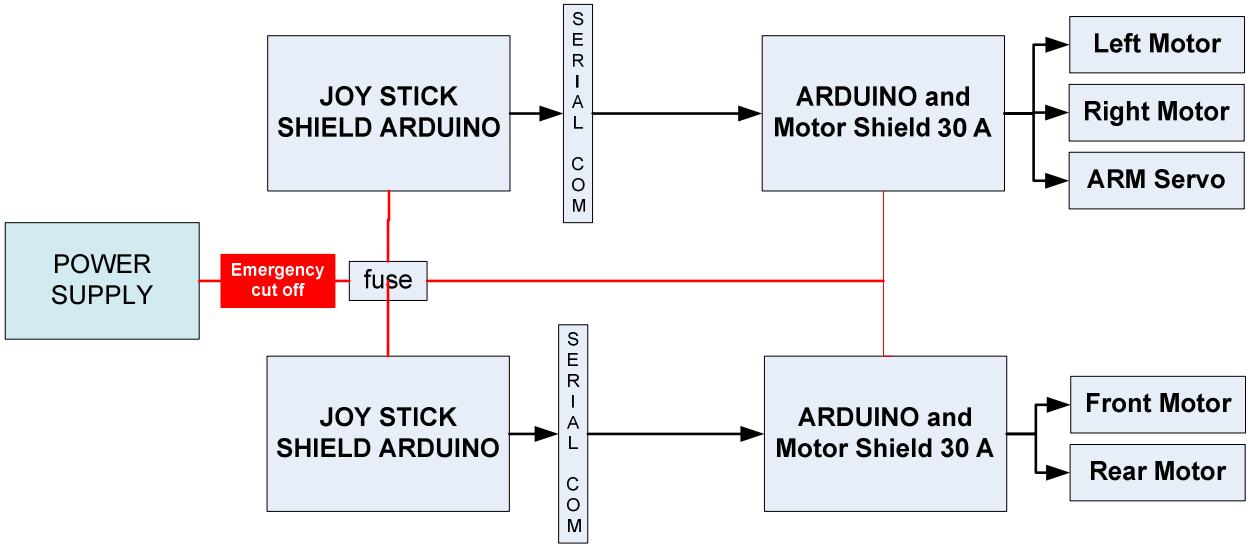

Fig 17. Diagram System

2.2. Arduino Board

Arduino is a single-board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller.

2.3. Control System

Our team use joystick game and conect to PC to drive ROV,

Fig 18. Joystick

And our team alternative to use 2 arduino joystick shield, serial communication with rs232 and motor driver 30 A arduino shiled to drive ROV.

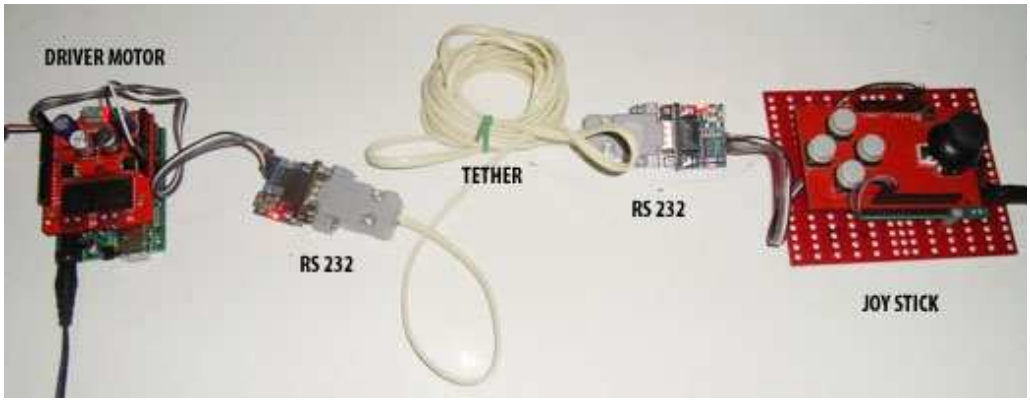

Fig 19. Board Control

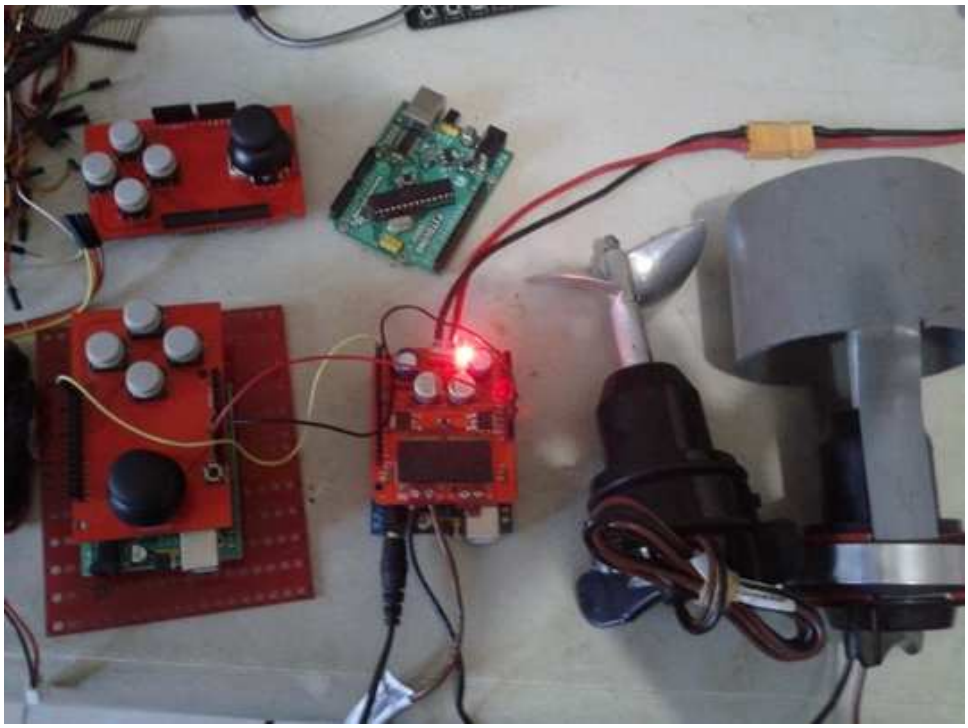

Fig 20. Motor Tested

So Our ROV can be controlled two mode, first controlled with joystick and PC, second manual with remote without PC.

2.4. Tether

Our tether was designed to be thin, flexible, and maneuverable. Our control scheme is such that it only requires 3 cable category for control of the whole ROV, data cable from RS 232, Power Supply Cable, Mini RCA Cable for video

Fig 21. Cable

2.5. Sensor

In Task 2 Mission, Measuring the conductivity to determine which area is venting groundwater we use sensor

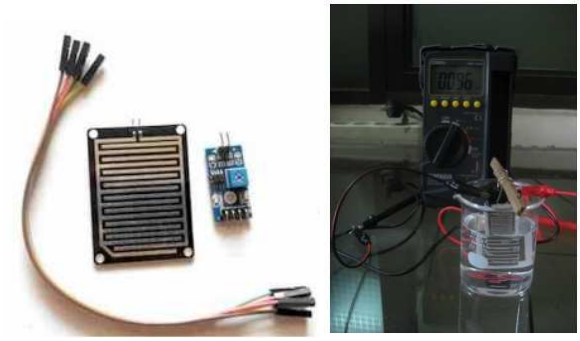

Fig 22. Sensor

3. SAFETY

Safety is priority number one in the process of making the ROV,

3.1. Mechanical Safety

- Using Propeller guard to each motor

Fig 23. Motor with propeller guard

- ROV design doesn’t have any sharp edges

Fig 24. Doesn’t sharp edges

3.2. Electrical Safety

- Safety Fuse 20 A

Fig 25. Fuse 20 A

- Placing Electronic circuit in acrylic Tube
- Emergency Cut Off Saklar

Fig 26. Emergency Cut

4. Future Improvements

As the team has never previously competed in an ROV competition, they had no prior knowledge of which components would work and which would not. As a result of this, improvements were made on the ROV, on almost a daily basis. In the future, the LINTANG SELATAN Team hopes to make several improvements to enhance the capabilities and agility of the ROV and to make maintenance of the ROV less of a problem. The team would like to reduce the size and weight of the ROV and have a better and more efficient buoyancy system, a system that can control buoyancy.

5. Budget List

Al l values are in approximated USD.

Item	Quantitiy	Expenditures	Donation	Re-used
Electronics (on ROV)				
Arduino	3	62.5		
driver motor	2	83.33333333		
sensor conductivity	1	8.333333333		
Kamera	3	150		
RS 232	6	17.5		
waterproof servo	2	100		
Electric valve	1	8.333333333		
Electronics (topside)		0		
joystick arduino shield	2	26.66666667		
Arduino	2	41.66666667		
Monitor TV	2	83.33333333		
Acrylic ROV Body Sheets	1	83.33333333		
		0		
Motor + shipping + tax	6	1000		
propeller	6	125		
propeller ducted	6	50		
propeller guard + mounting	6	75		
Tether	1	33.33333333		
Body Frame (aluminium profile)	1	250		
Baterai	1	83.33333333		
TOTAL		2281.666667		

6. Schedulle

Schedulle Regional competition

No	Description	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
1	MATE Mission Review								
2	Budgeting								
3	Initiate Design Concept & Research								
4	Frame , Control R & D								
5	Electronic R & D								
6	Build ROV								
7	Finalize ROV								
8	ROV Testing								
9	Regional Competitions								

Schedulle International Competition

No	Description	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
1	Review Regional competition								
2	First Testing								
3	Finalizing ROV								
4	Testing								
5	International Competitions								

7. Team Reflection

AHISTYA PURBOLINTANG

It was the first time made underwater robot, how to design a robot, try and learn to control. Absolutely fantastic. Previous 4 years ago I had a race of robots (mobile robot) the international level

MUHAMMAD REZA ARRAZI

Robot compotition that follow are my first underwater robot competition now, I began to learn from zero, and finally I managed to survive to work in teams

ADNA MUMTAZA FADLURROHMAN

I often go to the competition robot, january yesterday I participated in the Singapore Robotic competition games, and I won. The previous year I also participated in at RoboCup Singapore Open. But for me the experience to make this underwater robot was my first experience

NAURAH AURELIA MAHJUDIN

This is a first time experience to the competition robot, in fact has always been interested in robots, but has not been accomplished for his competition. And now my first experience

MUCHAMAD ILHAM SYARIFULLAH A.M.

Initially I was interested in seeing underwater robot, I often see on youtube, and now my friend and a friend managed to make it, although it is still far from perfection but I am very happy, thank you friend

FIRMAN FATHONI

I often followed the robot competition at the local level and 3 times for the international, but to make this underwater robot experience the first time. I am very happy and can not wait to compete at the regional level ASIA

KAISAR NIAFLZA

I several times following robot competition, but for the new underwater robot now, this was my first experience in the field of underwater robots

RACHEL YUSRIYAH BILQIS

This is my first time to join and make an underwater robot, though my role here is not too much, just as an assistant, but I am very happy. Thanks I finally can create a robot

References and Acknowledgements

References

MATE ROV website, MATE ROV HK website, for scoring information and task information:

http://www.rovcontest.hk/

http://www.marinetech.org/

The Arduino Reference Library, which provided software programming details (http://arduino.cc/en/Reference/Libraries)

PHOTO JURNAL



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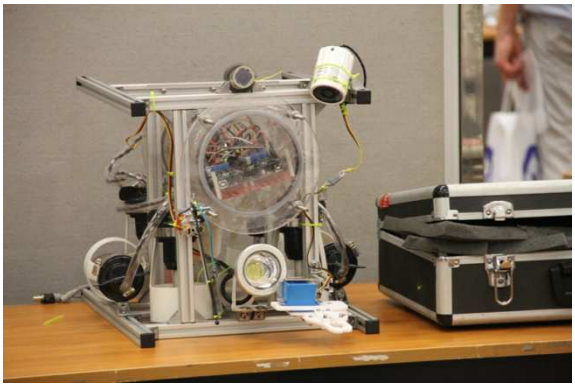
Lintang Selatan Team Build ROV



Hong Kong Regional Competition