Technical Report 2014 MATE ROV Competition Macau Pui Ching

Middle School

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Group Name: PCMSROV TEAM
ROV Name: DELPHINUS
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Abstract

Founded in 2012, the PCMS ROV Team is a well-rounded platform for students to do what they are good at, unleash their stronger side, understands their own weaknesses and improve it. Several positions are planned for students from different aspects, such as electronic engineer, programmer, public relations manager, CEO etc. so as to create a team with all kinds of experts.

On the other hand, the aim of chassis team is to discuss, investigate and learn from challenges. No one is born to be perfect, everyone has their own strengths and weaknesses, and this team is to let us discuss and exchange ideas, investigate the problems and solve it together. Team meeting is an important part of our daily routine, we discuss and listen to other teammates thoughts, in order to reach a consensus and let every teammates follow the process. Apart from making ROVs for competition, we also carry out some scientific researches and workshops, so as to advocate the knowledge of ROV and the sense of protecting marine ecology.

Delphinus is designed, built and tested by PCMS ROV Team, designed for investigate and operate underwater tasks. Using Arduino as the central processing unit, Delphinus has a propulsion system with five thrusters, as well as four cameras and three manipulators. Moreover, we use optical fiber to communicate between the ROV and the onboard control system, and PS2 controller to manipulate the ROV.

Design Rationale

This year, we have started a new attempt. We found we should design our Rov base on the mission tasks mentioned by the Mate Centre. They will be the important functions to complete the missions. Therefore, while we were drawing the sketch of our Rov, we considered that the necessary components of it. Because of these, our frame is designed around the efficacy of completing the missions, which needs to be smaller and more efficient than the one we designed before. We have chosen the material which was recommended by most of our teammates, the aluminums. Although they may seem heavy, it is durable. So we use several aluminums to build our main chassis.

Figure 1 Main chassis design

And it is hand made by our teammates.

According to one of the missions this year, we have to get thruogh a hole with a size of 60cmx60cm. If the chassis is too large, we cannot complete the missions which we need to complete in the ship. Therefore, we have designed a smallerand chose a slimmer aluminum which width about 2cmx2cm.

Figure 2 The Aluminum bars

Since we don’t want the robot to look too bulky, we choose a very basic three tiered square structure, with four connecting supports at the angle of the rectangle. It will be easier to carry and to get through the tunnel too. Although a rectangle ROV may seems normal, we think it can be well controlled in the water. A square chassis is neither too big nor too small. Therefore, by considering these factors, we make a square chassis at last.

Vehicle System

Because of the numbers of the thrusters and the manipulators, delphiniums is the heaviest Rov we have ever design. So, while we were designing the holder of the cameras and the LED lights.In order to reduce the weight of our Rov, we use some special materials instead of aluminum to make the holder, which is design in SolidWorks and printed in 3D printer.

housing (structure)

To ensure that the housing is waterproofed, we designed a new housing. The new housing is a circle sharp and we have eight helicoid screw and O-ring can protect it without any water inside. It can fully protect the control system. If we use the 'Lock& Lock Box’, it could not accomplish waterproofed.

Figure 3 New designed housing

size

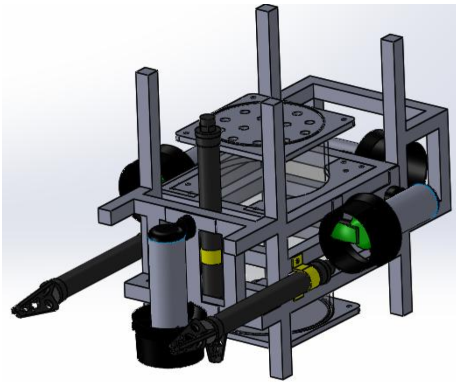
Delphinius has the approximate dimensions of 81cm * 41cm * 49cm and it weighted 12kg

3D CAD software---Solid Works

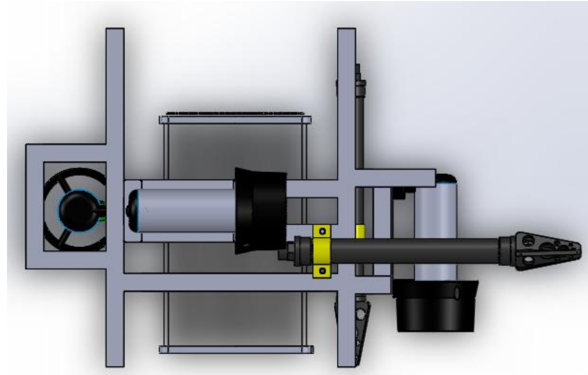
Using the SoildWorks to draw out the script of the ROV. For the SoildWork, we can accurately make up the size of the ROV. We can absolutely determine where the camera, thruster placed.

SoildWork is a 3D CAD design software. We can use it to change the file to the one of the 3D printer. We use 3D printer to print extra elements to help out the ROV. Such as the cam holder. It makes the camera completely stunk on the ROV.

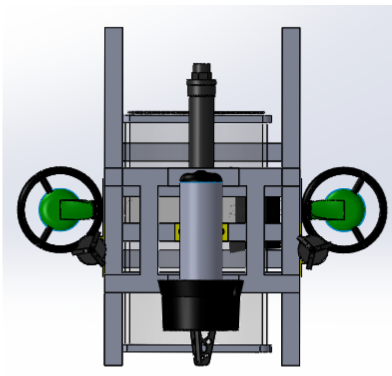
The SolidWork 3D CAD design software also allow to make filet to proof the hardness of the elements so that they would not be broken easily.



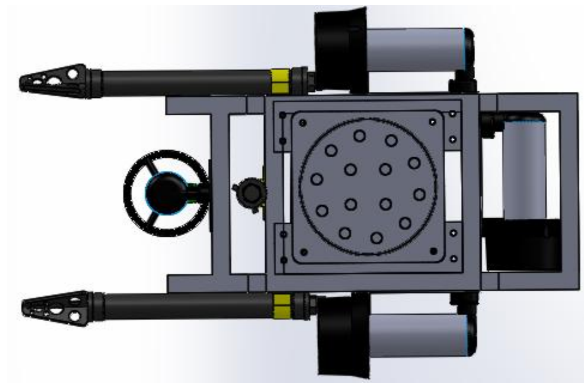
Isometric View



Side View



Front View



Top View

Structure

Propulsion

We use three thrusters to move our ROV. Thruster can operate clockwise and counterclockwise rotation. We have five thrusters to make our ROV operate eight different directions. Such as going forward and getting back. It can also move upward in slower speed. We put T1, T2 in parallel position, so that it will make the ROV go straight. T5 can also be used for panning and T3, T4 to go up & down. T3, T4 put on the front and fear part of the ROV as it would be impeded by T1 &T2. We installed them on those place because we need to put the housing part at the middle part of the vehicle system. So that they are placed on periphery of the ROV.

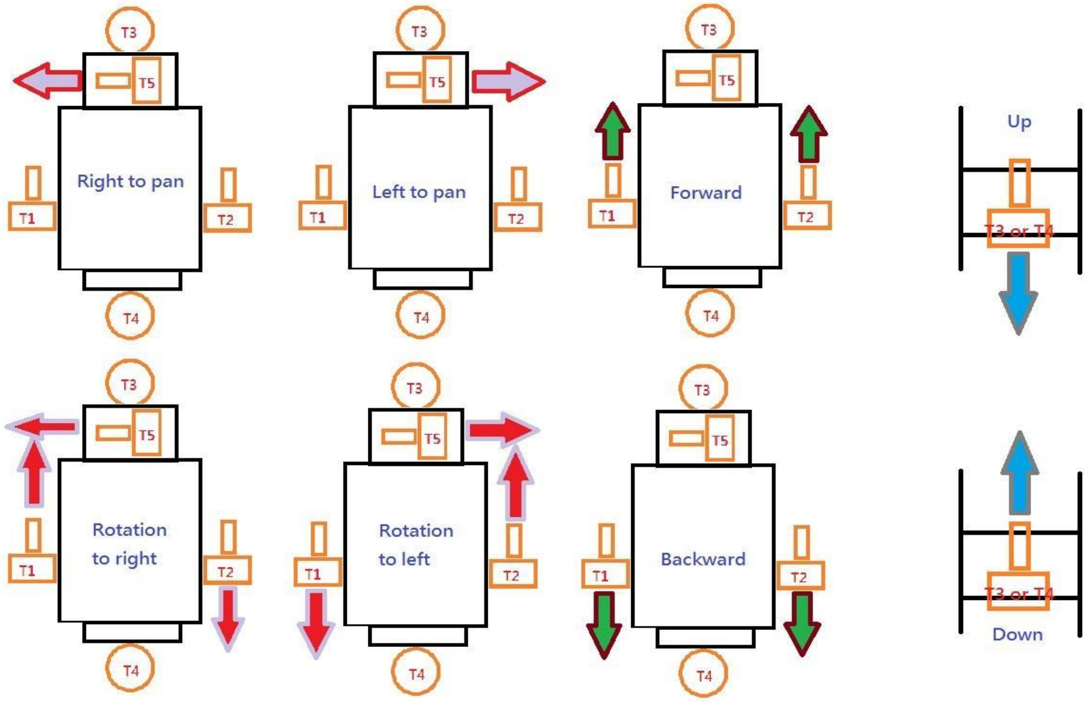
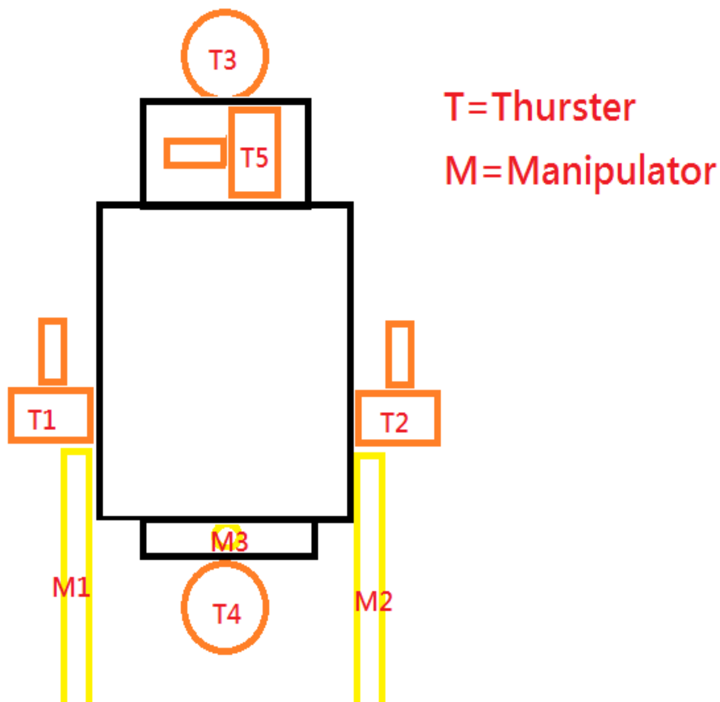


Figure 4 Directions of thrusters and ROV



Thrusters

	BTD150 @Seabotix	rule 500GPH/1890 LPH Bilge Pump
on ground	0.2A	0.6A
underwater	2.8A	2.6A~3.3A

Figure 5 BTD 150

We use BTD150, product of Seabotix, as our thrusters. It weighs 705 grams and can go under water 150 meters. It can operate at 12 volts. The AMP of the thruster was 2.8A when it was underwater. On the other side, there were 0.2A when it was on ground. After test the other thruster. Although the AMP is cheaper, it is likely less steady than the Seabotix thruster. We used these thrusters last year, and we decided to use them this year because they are very stable.

Camera

This time we used four camera for the ROV. First, we need to see all the manipulators and also the back view of the ROV. So, we do not have any camera can see the front side. Because of this, we design a camera holder which can make two of the front manipulator's camera also can see the front view. The third camera which see the vertical manipulator can also show the distance of our ROV and the bottom of the pool. The back camera can show the way out of the ship.

Buoyancy

There are lots of tools that we installed on the rov, the gravity it receives cannot be saddled only by the motors. We decided to build a buoyancy system using PVC pipe which was mounted on the both side of it. For the size of that pipe, we try to calculate it by a buoyancy formula.

Because the density of pool water and water are not the same, we test the density of pool water by putting some water bottles on the rov. It comes out that the density would likely to be 4(g/cm^3) instead of 1(g/cm^3)

$The\ Buoyancy\ Formula:$

$$F = G, P = 4 * g/cm^3, g = 9.8N/kg$$

$$PgV = mg$$
$$\Rightarrow 4V = mg$$
$$\Rightarrow V = \frac{m}{4}$$

The rov weight: 10000g 4

The area of the rov's top view: 48cm33cm

The height of the cylinder: 2500(48cm33cm) =1.578

We used two cylinder, so the size of each cylinder would be:

2(48 • 16.5 • 1.578) = 2500g

(16.51.578)3.14= 2.67(the radius of the buoy)

Therefore, the bulk for each cylinder would be: (2.67^23.1448) cm^3=1250

Another formula for testing the size of the buoy:

Put the rov into a full filled with water container

The bulk of drain away water=the size of the cylinder

Control System

We try to make the control system in a low cost and high efficiency way since it is our aim. Our control system is divided into two parts, a surface control panel and an on board control unit.

The control box is divided into two layers. First, the upper layer, with all the smaller size electronic component such as Arduino UNO and MAX485.Then, the under layer, with larger size component such as optical fiber converter. For the purpose of arranging the wires neatly, we chose the shortest path from the component to the side of control box and drill the hole to let the wires to pass through. Arduino sent the signal though the tether to control five thrusters and three manipulators.

Our control system is composed by Arduino, PS2 signal receiver and MAX485. First, we have two controlling methods. They are PS2 and Processing. Both of them send same commands and are able to control our ROV. We receive commands from PS2 through PS2 receiver, and receive processing commands through Arduino build-in serial. On the other hand, we also had the other control system. It were Processing and Arduino. We use processing to send the data to Arduino. We have a switch to switch controlling methods.

Second, when Arduino receives commands from them, it will transfer the commands to in-water Arduino through MAX485 board.

Finally, in-water Arduino will turn on different thruster via motor control board according to received-commands.

Figure 6 Control System

MAX485

We use MAX485 for long-distance communication between Arduino Serials. MAX485 read the Serial signal and changed it to the port A and B to communicate between Arduino. It can avoid signal attenuation while communicating. If we use Arduino Serial and communicate directly, the data may lose because signal weakened. MAX485 can communicate between long distance up to 2km. That's why we choose it.

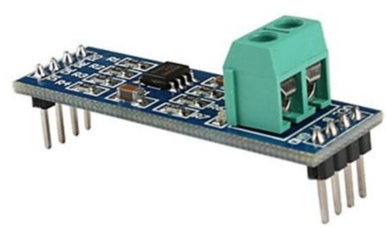


Figure 7 MAX485

Arduino

We use the Arduino Uno to receive the PS2 or Processing commands and send it to the Arduino Mega via serial communication. We use Arduino UNO in the control system because it is small and its port number is enough for the control system.

We decided to use the Arduino Mega 2560 to control Motor control boards because Arduino Mega has more output ports. It is also cheaper than other

Figure 8 Arduino

programming hardware's. Arduino can receive the input data and output signals to control different hardware. We also use the Arduino Mega Sensor Shield to expand more VCC and GND ports so that it can support more hardware power.

Motor control board

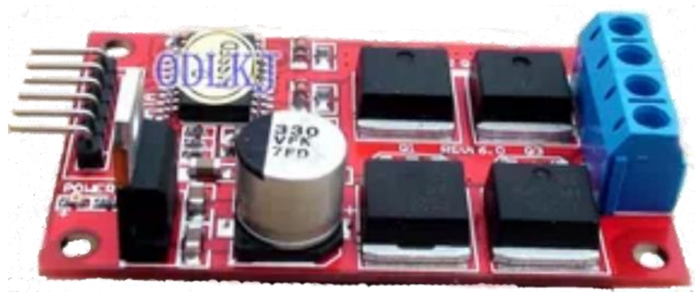


Figure 9 Motor Control Board

We use motor control board to control the thrusters. We have two kinds of motor board, one is smaller and the other one can output the max power. The first one is smaller and it can control two motor on one board, but it cannot output the max power. The second one is a little bit bigger and it can only control one motor on one board, yet it can output the max power so that it may move faster.

Housing

As figure, this is the underwater tank---housing. The 12V power supply was inserted through the main electric tether into the housing. Then it was separated into four main wires, two of them are connected to the motor board, one to the cameras and the last wire to the voltage stabilizer. Then the voltage stabilizer will reduce the voltage to 5V and supply it to Arduino Mega and optical fiber converter. The housing is mainly separated into two parts, one side for the Arduino Mega and thruster controller board, other side for the optical fiber converter, MAX485 and the voltage stabilizer.

The component of Housing

Figure 10 The top

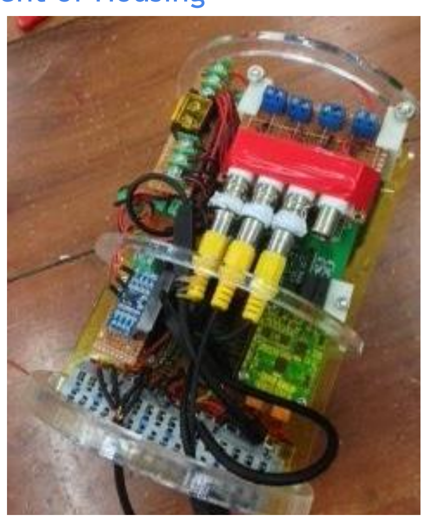


Figure 11 the bottom

Tether

As we use Arduino and Processing, the tether is much slimmer than the one we use in the last year. There was just two optical fiber, one power cord, one network cable and one steel cable which can protect the optical fiber. And it is detachable by using the aviation plug so it can tidy up easily.

Tools

Manipulator

Based on our last year's competition experience, we found that using one or two manipulators are not enough for us to do the missions, thus we are going to use three manipulators for our competition this year. We manage to use Seabotix manipulator because they're very stable, and we used epoxy to do the water proofing, since we want to use the aviation plug to combine the manipulator and the wire.

At first we made some U-shaped holder to hold the manipulators, but there are too fragile, so that we bought some pipe holders and they hold the manipulators well. We put two manipulators flat beside the ROV, and put one vertical between the others, this placement can help the ROV to do the missions easily.

Figure 9 mount of manipulator

Camera

Most important part of a ROV, it is the only way that we can know the position of the ROV from the cameras during the competition. The placement of the camera influences the controlling of the ROV. One was placed above the manipulator while the other was placed on the front. One was to inspect the situation of it and the other is to look forward. The other one is placed facing down. We use 3D printer to print the holder so that the cameras can be fixed firmly.

Isometric View Side View

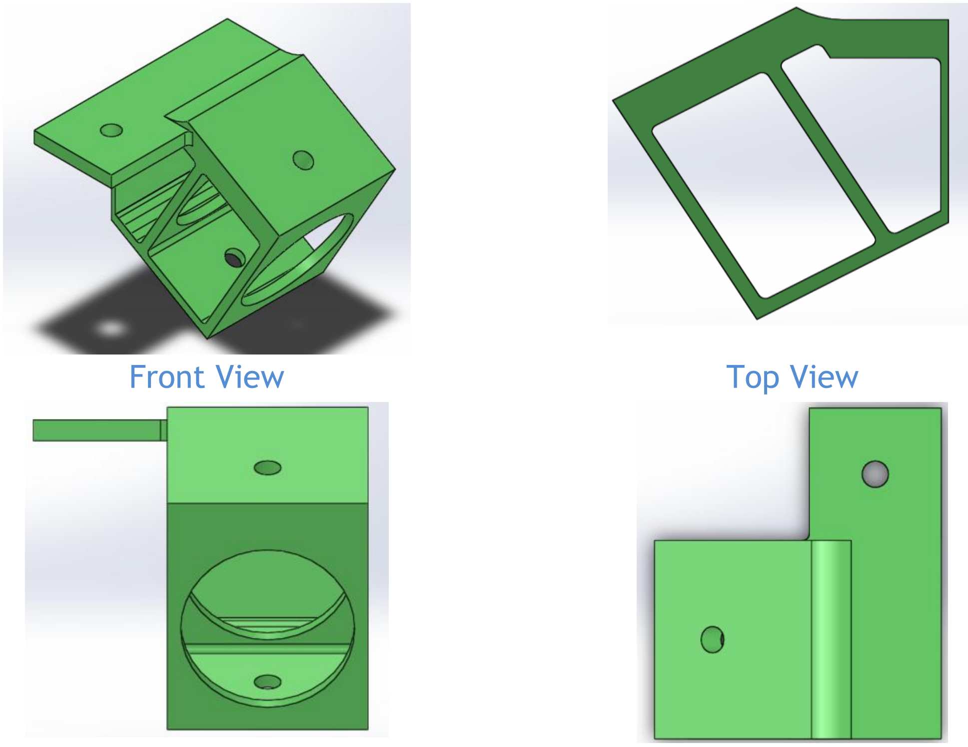


Figure 13 The holder for camera

We used water pipes with multi-part adhesives to make waterproofing. We cut the water pipes into pieces to put the camera in it, and filled it with multi-part adhesives.

The cameras are connected with housing through the navigation dead end line of the four core cable to make it can be removable. The image from those cameras can be seen on the computer.

Figure 10 Navigation dead end line

Sensor

According to the sample of the Internet, we made our sensor by myself. The principle of the sensor is used the induction of the sensor to read the data which is the resistance value of the liquor, send it to the Arduino, and then display the value on the LCD shield so that we can determine which liquor is it.In the induction of the sensor, there have two wire to detect the resistance value of the liquor.

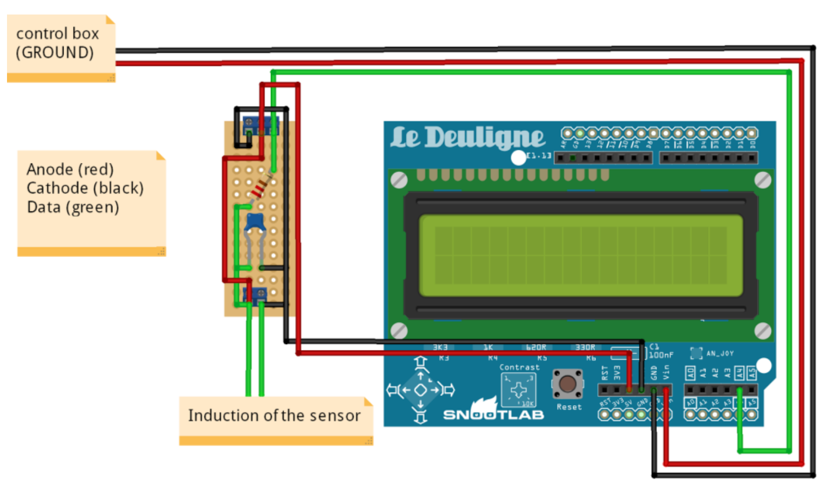
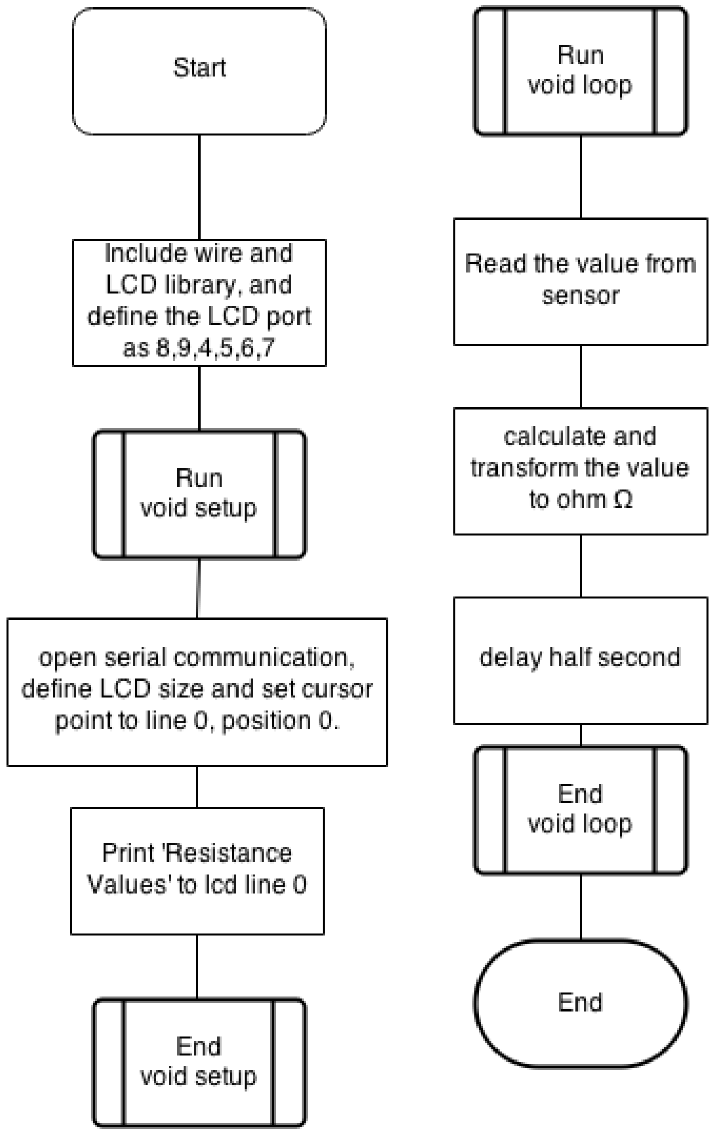


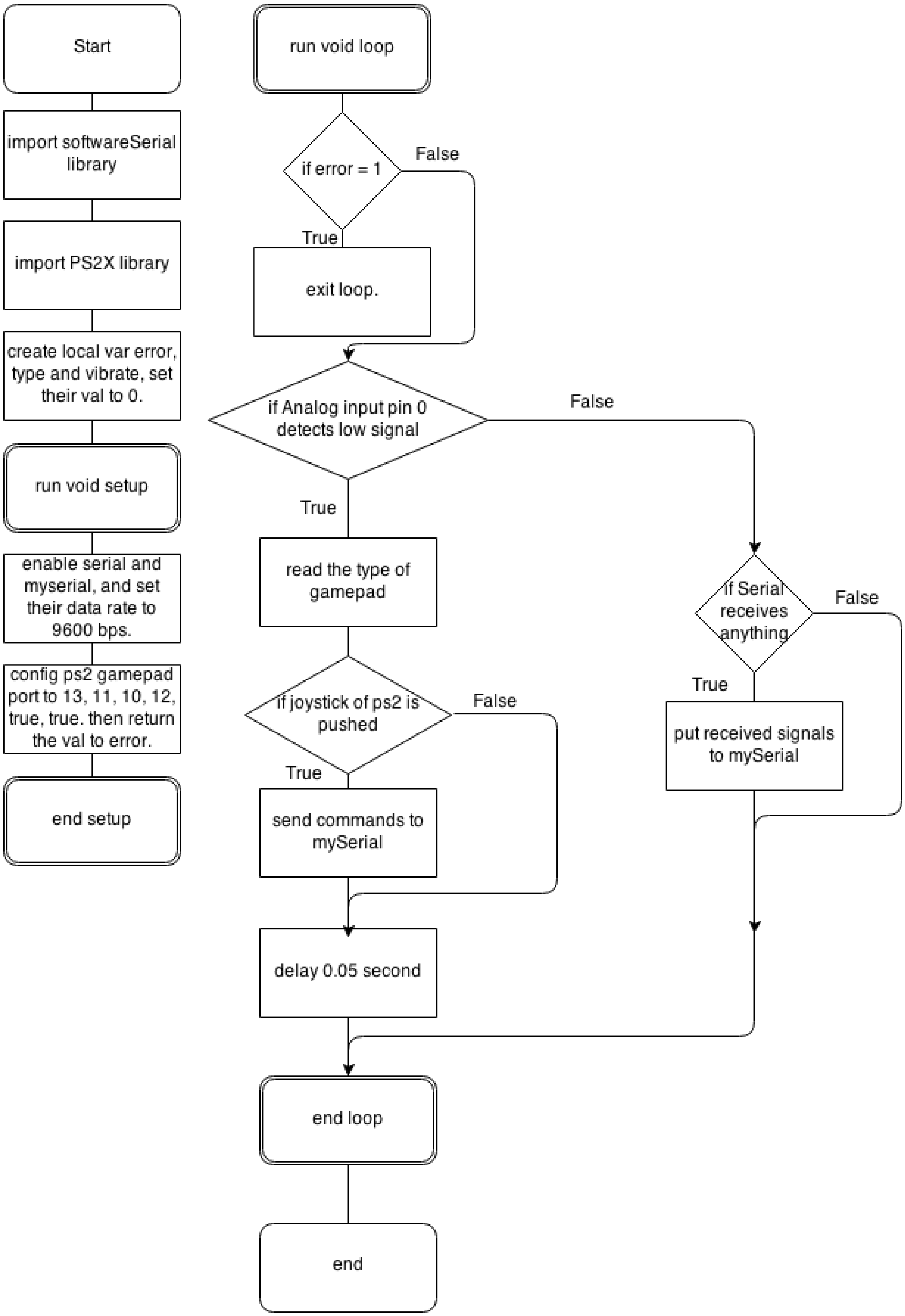
Figure 11 Sensor

Programming

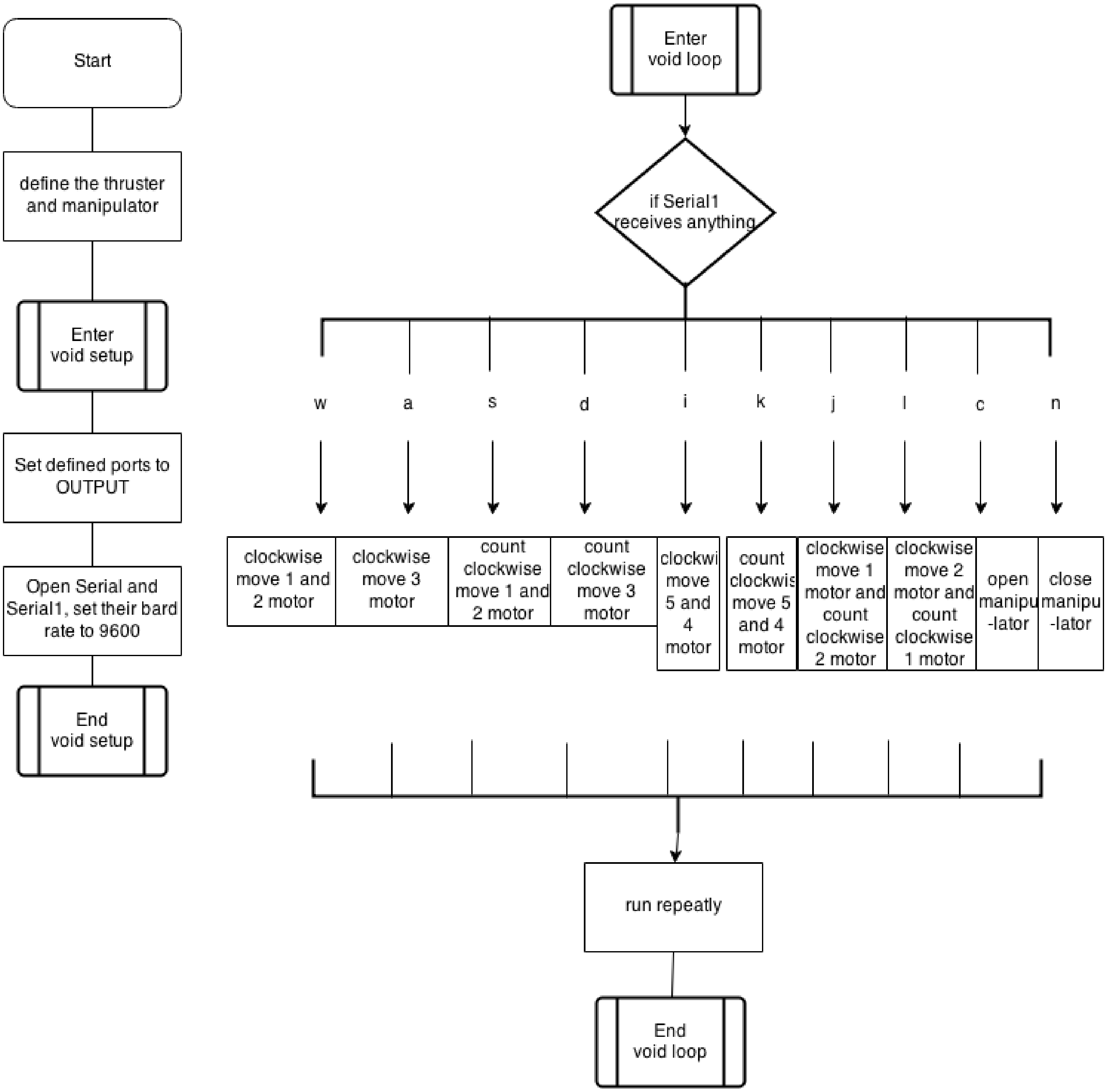
We write both Processing and Arduino programs. Arduino has a great support of hardware and Processing can communicate with Arduino easily. So we chose Processing as one of the control method. PS2 is one of the control method and we use PS2 library to make programming more easily. We also use “Software Serial” library because it is easier to communicate when using Processing. We have three programs. They are on-land control box program, sensor program and in-water housing programs. Here are the diagrams.



sensor diagram



The Programming diagram, on-land control box diagram



, housing diagram program.

Waterproofing

Since using epoxy is a troublesome and also an irreversible way to waterproof the housing, this time we eliminated all the epoxy and use only O-rings to waterproof the housing. Two big O-rings are installed into the both ends of the cylinder, also each cable glands is added with a small O-ring between it and the cover of the housing. In addition, in case of water infiltrated into the housing, we

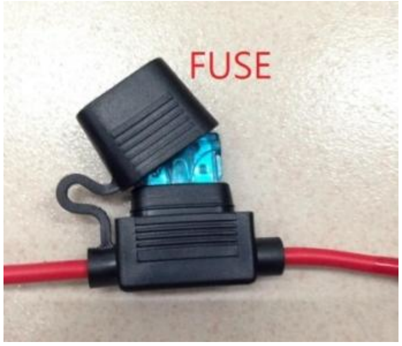
Figure 12 Gland

installed the components a little higher from the bottom of the housing, avoiding the water to damage the components.

Safety

For the personal safety, we would prepare a safety gear such as goggle, ear protector to protect our eyes, ears and also bodies. For the ROV safety, there are shrouds and caution marks on the hood of the thrusters to remind people to keep high safety awareness constantly while working with thrusters and propellers. A 25-amp fuse is also installed on the control panel. We used Makarov to make the wire protesters, to protect the wires in the heat shrink tubes. We put some caps on the corners of the aluminum, to make the corners become round, this can prevent our hands being thorn by the sharp corners. And we make a checklist to ensure it is safe enough to pass the missions, such like:

1. Connect the tether to the ROV
2. Check if there are any sharp corners and edges in ROV
3. Double check all waterproof connector whether it is tightened or not
4. Check whether all the cables had been properly sealed
5. Using Digital millimeter, check whether the 12V input and ground is connected or not
6. Check the fuse in the emergency button
7. Connect power supply with the tether
8. Clear the area around ROV before test the motor on the ground
9. Check whether all the motors can be rotated
10. Turn on the power and see whether the ROV is functioned properly
12. Put the ROV in the water carefully
13. Check the electronic tube water proofing
14. The ROV is ready for the mission



Caution marks on the hood of the thruster

In order to safety, control box installed a 25-amp and a capacitor to protect the whole control box and housing, to make sure that the control box won't be exploded.

Testing

Before we put our rov into the pool, we first need to check all the safety of the rov. It is important as we once accidentally connect the power source by mistake and make the optical fiber transmitter out of order.
Other problems which we often make are:
1. The buoy problem
2. Programming problem
3. We didn't bring enough power for the rov's electricity
4. The wire's arrangement
5. We forget to put drier into the housing
6. We insert the wire wrongly to the pot

The new housing we make is well waterproof which means we have a great successful of the waterproofing section.
The time that we have test is 9 hours

Figure 13 While testing the ROV

Challenges

Engineering challenges

We made many mistakes when we built the ROV:
1. When we estimate the length and the width of the materials, we always consider wrongly
2. We often drill holes in wrong position.
3. We always lose screws.

Technical challenges

When we try to use two methods to control our ROV, we need to face some problems. First, we need to face delay problem. PS2 needs delay but Processing doesn't, so we added a switch to switch mode to solve it.

Non-technical challenges

Communication---Team members just do their own work and didn't communicate with each other. So we don't know the overall progress of our team. Such as the programmer didn't communicate with the engineer so there are always misunderstanding.
Time management---We have ample time to finish our ROV originally. We also planned a time schedule for teammates to complete their works within the specified time. But everything unlike

the expected. Some of the teammates always absence without any reason. Our progress of work behind the schedule.

Mechanical challenges

Structure--- It is hard to design the chassis as we shouldn't make a large size rov. However, the number of tools we fix on the rov will not decrease. Therefore, we need to make good use of every space we have.

Buoyancy--- We often calculate the buoyancy incorrectly, so the rov is either the float age is too high or too low. Before we test the controlling of our rov, we first have to make sure whether it is balanced or not. If the density of the water are not 4(g/cm^3). We can just change the other pipe which is bigger or smaller. So we can make our ROV's buoyancy again.

Housing---Housing is the main part of our ROV. In order to employ the space efficiently. We should put all the component into a little box. It make us can only put in two layers. So that we should more provinces position exquisitely. It is difficult to make the Housing be safety and it won't smash the water in it.Finally we design a cylinder box to protect the electronic component.

Troubleshooting

Techniques

Before testing, we need to set all the thrusters and cameras. 3Dprinter and the laser cutters are the best instrument to make the camera holder and to cut the board to hold the thruster.

We use the SoildWorks to draw the camera holder, send it to the 3Dprinter and print it. For the laser cutter, we use CorelDraw to draw the board.

When testing the ROV, we have come across many problems to solve with, such as the camera didn't get any signal, the thruster can't switch on,etc. We put them into three types of problem always got wrong. They are connected the sign of camera and connect the sign of control system.

When we can't concert the sign of camera, we will check the fiber to see whether it has gotten any problem and the optical fiber, whether it has become useless or not. If the truth come out is yes, we will change the prepared optical fiber.

If the control system cannot control thruster in the correct direction or can't move, we will check whether the Arduino mega and motor control board is well connected, and for the motor control board and the thruster connection as well. We use different colors to note different pin. The brown is connected Arduino power port, green is connected Arduino GND port. It can prevent the election components from being short circuit.

Non-technical

For the communication of each members, we set a meeting session to our timetable. Everyone have to report what they are doing or they are going to do. It helps us know more about what the rov is going on. We set a schedule which tells us what we need to do in a particular time.

Engineering

The main problem of our control box is welding. We always welded the positive and the negative electrode wrong. For instance, it must be the positive electrode, but we always welded it to the negative electrode. So we used some symbols to mark down the positive and the negative electrode. And the wires which we welded was broken off easily. Therefore, we checked it repeatedly after we welded the wires.

Mechnical

According to the experience we have, we found that maybe it will be more accurate to put the rov into the water and found the buoy rather than calculate it by a formula.

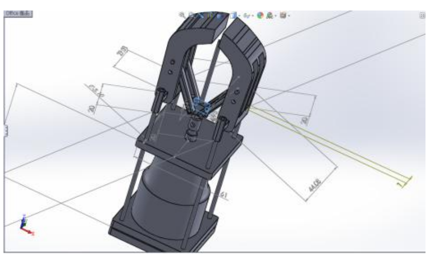
Since we have to make the rov as small as possible, the structure we make is based on the housing. As the housing is a round tube, we designed a cube surrounded by the housing. We do not have space to put all the tools such as motors, manipulators. As a result, we place

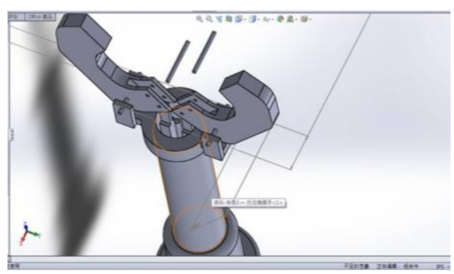
Lessons learned

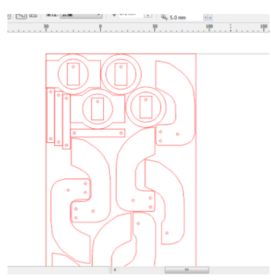
Technical

We have learnt to use the Arduino Mega and to write programs. We have also learnt using processing to make connection with Arduino. In addition, our tutors taught us how to use CorelDraw, SolidWorks, Fritzing etc.to create pictures. Connecting the cameras and wires and using epoxy to make waterproofs are our biggest challenges. Making the manipulator is also a very difficult part for us because we need to use a lot of tools to make it.

Manipulator







The manipulator is an important part of the ROV, so we spend a lot of time working in it.First, we searched some other manipulators from other ROV teams for some ideas. Then we wrote our ideas on our note book, after that we created a file by using SolidWorks which can show us objects in 3D, then we wrote the parts by using CorelDraw, to put it in the laser cutting machine and cut the parts into acrylic, at last we use chloroform to combine them up.

This is the first design of our manipulator, but we thought that it was too big, so we made it smaller in our second design and using Corel Draw to draw the parts of the manipulator

Interpersonal

Interpersonal has improved after we joined this team. A team cannot be raised up by only one person, so we are still improving the communication between each other. When we first joined this team, we don't know each other well because we are not at the same class in school, so that we seldom talk to our teammates. This made us did our works very slowly, and we always don't know what to do when we are at our workshop. Our tutor saw it and they helped us to know each other better, after that we became familiar and we became very rally.

Reflections

Garrick As the CEO of the team, I have the responsibility to look after my teammates and control the team. At the beginning, I was chosen to be the CEO since I am the highest grade student in the team. At first, I am not really used to it and sometime did some decisions poorly. But after several failure and attempts, I am evolving gradually and trying my best to be a competent CEO.

Kenny After I join this team, I learnt that teamwork is very important. Without teamwork we can do nothing! And I need to make a time allocation to let my study result do not get down. I am the CEO of this team this year. I need to allocate my team members many works, so I need to know all the detail of our ROV.I think this is a big challenge for me. And I will try to do my best.

Kathy This year, I've learnt more knowledge about the electronic part. Although I'm not good at electronic, being in charge of the control box is an instructive experience for me. Also, there are many difficulties such as soldering and arranging wires. Solder seems easy but hardly to make it firm. But after repeated attempts, I finally resolve the difficulties. The arrangement of wires is an important work. All it needs to do is to drill holes on the control box so that wires can go through the holes and connect with the ROV. This is not a work which can finish it alone. And I also found that we should communicate more to work more efficient.

Kristy Nothing is perfect. We need to work harder and communicate with each other more often so that we know what is going on. Being a PR is interesting. Such as searching for pools to do our testing. It was not easy to organize letters to the association of pools. To contest the staff is especially a tough work for a shy person.

Teamwork

Figure 14 Teamworking

At first, we only work twice a week. But we found that it is not enough time to finish our ROV. So we wrote a work list, assign each one's work and followed it. We don't use the manipulator and cameras which were bought in the shop. Every single parts of our ROV is designed by us. During the design, building and testing, we found that the ROV had many problems, such as waterproofing. If it is not well enough, the water will infiltrate to the housing and the motor control board will be out of order. Frame, the size of our ROV is too big. Buoyancy, there is much more buoy that the ROV can't go down to the water .As we need to focus on study, working together with the teammates made us closer and we were able to set aside time to meet, enabling us to participate in this competition.

Future Improvements

We often think that there are plenty of time for making the ROV. The result comes out that we are behind the schedule. Thence catching up the progress makes we feel very stressful and we have to pay more attention to the time management next year. Beside the time grasping, the teammates didn't communicate with each other and we do not what is really going on with the ROV. It will be much better if we communicate with others more often cause arguments always happens in our team.

We also want to promote ROV to the society and make it more popular. Let them know that ROV is a good instruction for developing the ocean in the future.

Testing the ROV in the lake is also another function we would like to deal with. Discover more natural resources and then make some investigative. This is the main effort that a ROV works and the real purpose that we make our ROV.

Acknowledgement

Marine Advanced Technology Education (MATE) Center

Thank you for holding the competition and gathering the ROV builders from different countries.

Macau Pui Ching Middle School

Thank you for donating the money for building material and the supplement of the tools.

SoildWorks

Thank you for offering this software to us.

Macau foundation & DSEJ of Macau

They sponsor our travelling fee.

HKUST Robotics Team

Provided the advanced rov workshop.

Robin Bradbeer

Help us to join the ROV competition.

LONG TOU Life Saving Club

Thank you for your support and request the lifeguards to us.

Thomas Lao and his lovely family

Thank you for giving us opinions, the support from the spirit and giving up his time after school

Bevis Leong &Chongman Leong

Thank you for spending such a long time on teaching so much valuable technique for us.

Our families

Thank you for the support from the spirit.

References

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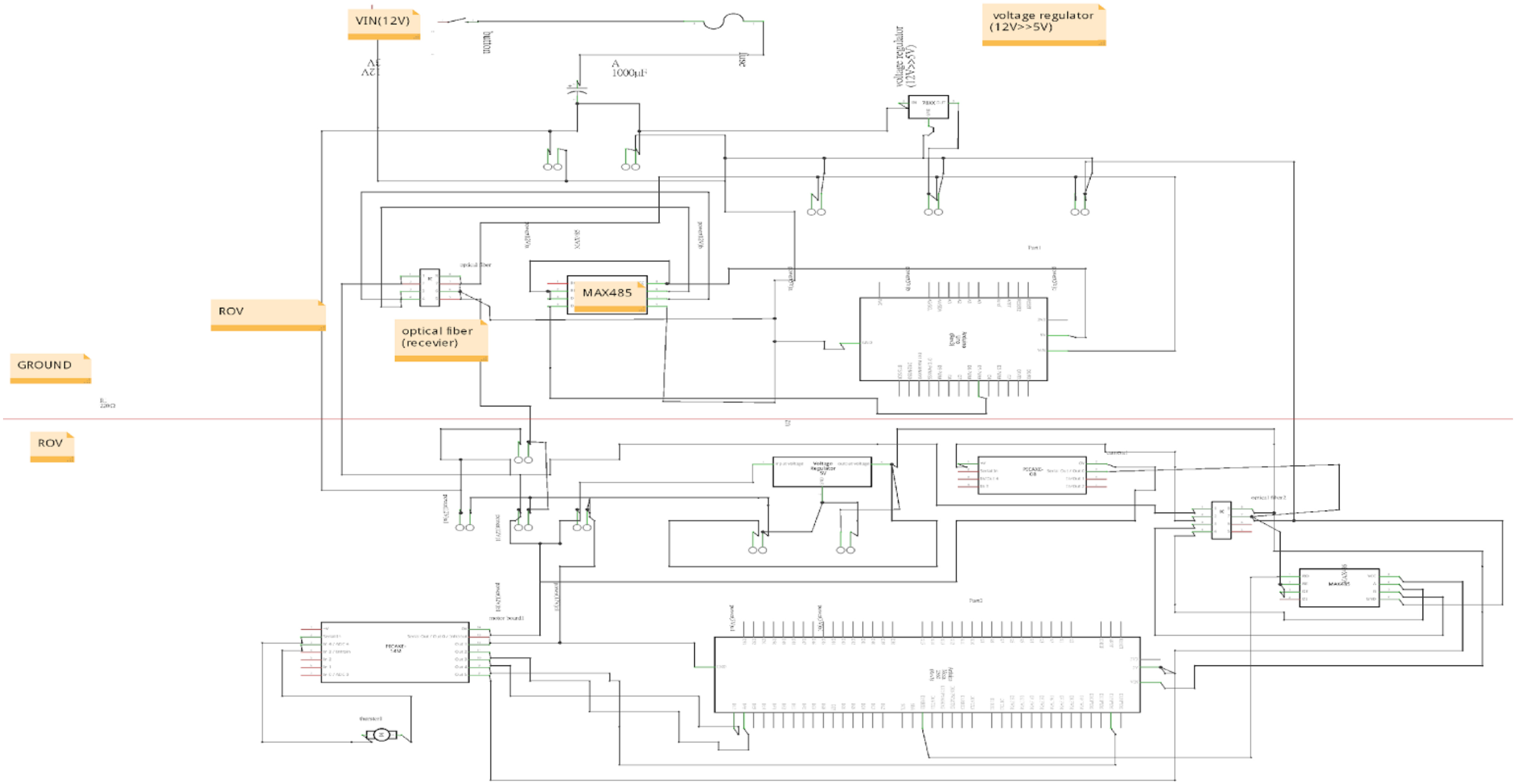
Appendices

Appendix 1:SID



Appendix 2:Schedule

month	10	11	12	01	02	13	04	4	incharge
thinking									all
Teach New Members to Use Electric Tools									kenny
Sketch and Design the Kraken									all
Specs Released									simon daniel
Build Frame									girls
make the camera and motors									daniel,cia
make the tools									girls
electronic system									kenny
Welding									daniel
Control System									tom
Water Proofing									kathy,simon
Borrow the pool									sally,cia
Test ROV in the Water and Fix Any Bugs									all
technicial report									all
presentation									all
poster									sally
solidwork									all
Program Software									

Appendix 3: Budget Sheet

School Name:	Macau Pui Ching Middle School		From:	2013/10/1
Instructor/Sponsor	Macau DSEJ , Macau FDCT, Macau Pui Ching Middle School and Macau Foundation..		To:	2014/5/29
Category	Description	Notes	Expense	**Balance**
ROV Structure	Aluminum Bars and Aluminum Angles	Use for building up the frame	$25.00	donation
	Screw Hooks,J-Bolts		$ 3.75	donation
	PVC Pipes	Buoyancy material	$12.50	reused
	Zip Ties		$ 2.50	reused
Propulsion	Seabotix Truster x5	Use for moving the Rov	$3,437.50	reused
	Three Core Wire	Replace the connector of trusters	$50.00	donation
	Arduino Mego Board	Conncet to the thrusters	$25.00	donation
	Mega Sensor Shield		$12.50	donation
	AQMH2403ND		$ 3.75	donation
Sensors	SPY-HOLE Camera x3	Look at view under water	$37.50	reused
	Video Multiplexer	Connect to the camera	$37.50	donation
	Optical Fiber x2	Deliver the signal to the video mutiplexer under water	$36.25	donation
	Four Core Wire	Replace the connector of cameras	$18.75	donation
	MAX 485	In/Out put	$11.25	donation
	Light Bump	To make the view become brighter	$11.25	donation
Control System	Transformer	To change the volt from 12 to5	$ 6.25	donation
	Wires	Connect to all the objects	$18.75	donation
	Input Cable with Fuse	Conncet to control box	$ 2.50	reused
	Motor Control Box	Include the control system of PS2 Controller	$31.25	donation
	Sensor	To do the mission task	$11.25	donation
	PS2 Controller	Control the Rov	$10.00	reused
	Output Cable x16m	To supply power to the Rov	$15.00	donation
	Steel Cable	Increase the stability of the Wires	$15.00	donation
	Network Cable	Communicate with the system under water	$10.00	donation
Mission Props	Seabotix Claw x3	Complete the missions	$2,500.00	reused
	Arduino Uno Board	Connect to the claw	$18.75	donation
Mics Items	Acrylic Sheets		$12.50	donation
	Poster Board		$18.75	donation
			Total:	USD$6395