

Si Se Puede Underwater Robotics Team

Si Se Puede Robotics
Remotely Operated Vehicle
National Underwater Robotics Challenge 2008
Grade School Level



Team Members

Alexander Williams, Cody Duncan, Marcos Garciaacosta
Jr., Ruy Garciaacosta, Craig

Mentors

Roberto Mancera, Alberto Esparza, Marcos Garciaacosta
Sr.

Marcos Garciaacosta Jr. is the writer of the technical report

* Craig was added to our team when we had finished the robot and almost all of the technical report. We had him and Ruy be the tether men.

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A Short Biography

Si Se Puede is a Chandler organization which provides several programs for young people such as soccer, dance, after school tutoring and most recently robotics. All three of us (Cody, Marcos, and Alex) have been mentoring Lego robotics and all four of us (Cody, Marcos, Alex, and Ruy) have participated in FIRST Lego League. Cody and his team got 12th place in a regional final, and Marcos, Alex, and Ruy were 15th place in the same regional.

All four of us have never participated in a robotics competition that involved wiring, soldering or cutting metal. However, that dose not mean that we didn't have a clue what we were doing. Cody, Marcos and Alex have had experience with working with tools and electrical components. Cody is a genius with wiring and is the main electrical technician. Alex is very good with the actual wiring and is a fast learner. Marcos has a large ability to think outside the box and to show the teams how to work with others in different forms such as movies, documents, posters, and power points.

We hope to do our best and will cherish this experience because after this, all three of us will leave for different high schools. We also want to prove that even a bunch of Jr. High students can compete and work on something difficult and be able to show results.

Building the Robot

To be able to participate in a competition such as this, we need to have been the highest ranking teams in our robotics group, Cody decided to join us so our team was formed. Mr. Esparza bought several ROVs-in-a-box and gave one to us to work on. The ROV setup is quite simple, PBC body, water proofed wires that are attached to either the motors, camera or LED.

Since this is our first major robotics project, we didn't want to do anything that would either be costly or end up jeopardizing our robot.

So that being the case, we decided to follow the instructions. We built the robot and painted it and wired up the motors, the camera, and the LEDs. Next, we worked on the control box. We would have loved to use joysticks instead of the switches, but we didn't really have any money with which to use. We usually had a person soldering and a person holding the wires together, while two other people basically checked the ROV and made sure that everything was in place.

Well we had several problems with the control box. First when we began to solder, Mr. Garciaacosta said that it would be best if we checked that the switches were good and when we connected switches, to make sure that each one would work. We checked the switches and saw that they were short-circuited. So we decided to rewire. We discovered two things, the fuse had burnt out and while soldering wires, we had not been very careful and that two different wires had their plastic covering melted off and the exposed wire was touching.

After that, we were more careful and checked each switch when we connected switches together. Again, we were receiving a reading that showed that the switches were short-circuited. The two team members working on the switches made sure that the fuse wasn't burn out and that no wires were melted together like last time. All the switches were all tested and all showed up as short-circuited. We bought new switches and this time they worked. After that we attached the control panel to the ROV via tether.

Building the Robot



As we were testing out the ROV, two of the propellers came off, the propeller on the left side and the vertical propeller. We decided to take a risk and solder the propellers. The motor on the left went on and is working normally. However we didn't take the laws of gravity into play and so when we attached

the vertical motor, all the solder came running down. We had to replace the propeller because of our countless tries to attach it. We bought a new propeller from a hobby store and since they had a wide variety of propellers, we bought a larger size propeller and we tested it. It seemed to be a lot better for the middle propeller and gave us more power and lift.

We finally had everything were ready to just practice. Or so we thought.....

Problems with the Robot

Anytime you make something, you are always going to have problems that need to be fixed. In making this robot, we had several different problems with it. At the beginning we decided that we were going to follow the instructions that were included with the ROV in a box kit. So we followed the instructions for the actual robot and the robot looked like it was supposed to. But as we began to work on the wiring of the control panel, we began to run into some problems. First, the On/Off indicator light would not turn on so we had to work on that for a while until we could get that to work. Next, there was no response when we attached the tether wires to the control panel and switched the switches. We checked the switches and saw that the fuse was out and that several wires had lost their plastic covering and the exposed wire was touching and messing up the circuit.

After finding that out, we decided to rewire. As we were rewiring, we tested the switches to see if they were functioning properly. We checked to see if the switches



were short circuited with a continuity meter. The meter showed that the switches were short circuited. Two team members then went to buy three more switches and a different type of wire because the wire that we were given in the kit was too thick and it was hard to work with and the most probable cause of the wires that were exposed.

When we wired for the last time, we got the motors to respond and were very overjoyed. We later attached the video cords and we were able to get video underwater. We had one problem though, the control panel on/off switch didn't work. We discovered that we had essentially hotwired the switch and wouldn't regulate the other switches. Cody, our main wire man, in his genius bypassed all the wires into a switch. Problem solved.

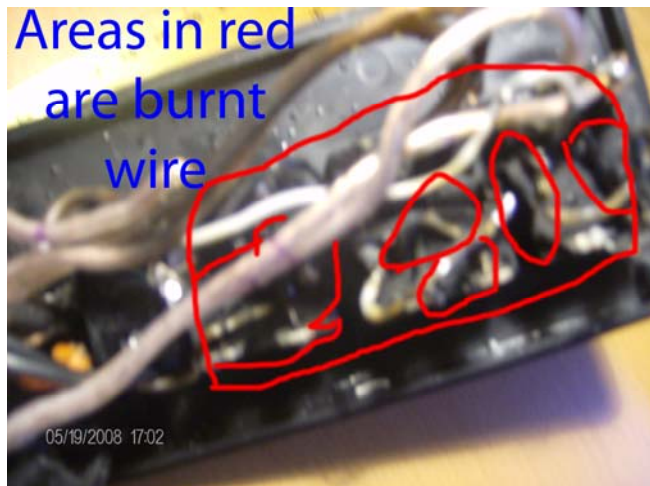
Problems with the Robot (Continued)

The team and I began to work and finish the intro video and the technical report while Alex, our driver, and Ruy, one of our tether men, were practicing in the pool. After a while Alex reported that the right motor had been acting weird and it seemed as if it was not working and not wanting to respond to the switch. Cody and I left the computers to go check on that and to see if we could fix it. It was around 7pm on Monday and while Alex and I didn't have school, Cody did the following day so we were going to pack up when Alex reported the bad motor and switch. Cody was leaving and told Alex and I to open the control box and check if any of the wires were not touching or if they were melted.

We could not tell from the condition of the wires. The picture shows how the wire looked like.

The main reason for the burn wires is because we were using a torch. We should have been using a soldering tool but since Cody had brought a torch, we had been using that and had not given a

thought about using it. Using the open flam torch in a really cramped space was hazardous to both us and to the equipment. Well we began to work on the control panel with the right tool and we discovered that it was just a matter of soldering a wire back into place. After that we tested out the motor and it worked.



Control System Setup

While we were working on the robot and moving it to different places and just in general moving it, we had a lot of difficulty carrying it around because we would need to wrap the tether, then grab the battery, then the dvd player we were using, then the control panel box. It was too much of a hassle. So we decided that we would roll up the tether and place it on the robot and for the battery and the control panel, we would place both in a small plastic brief case. We would carry the dvd player in its case and transport by hand. We also attached Velcro to the bottom of the battery and control panel so that it wouldn't move as much, but in case we had to, we could take it out.

Choosing the Missions

When we began to look at the missions and what we had to do, we knew that we wouldn't be able to do a lot of what we wish we could do. So the missions that we would have to do would need to be easy to do, and that would not need us to buy complex expensive extra parts and do additions to the robot.

As the result of that, we decided upon several missions. We decided that any mission that had an objective of locating an object would be the first missions we would do. As they only need us to locate them, it would be relatively easy and would not need us to buy or add parts to the robot.

After that, we looked at the missions that involved pushing and object or retrieving an object, we saw that the origin beacon mission and the assistive lights mission would work best for us. Also on our minds were the vials and the PDA. We decided we would add a hook to the robot and on it add some magnets so that the metallic rings would have a better chance of staying on and not falling off. But to make sure that we would be able to do those missions, we worked on launching items in a pool and trying to pick them up. We couldn't do the Morse code mission because none of us knew Morse code and we didn't have a underwater microphone with which to hear.

We also couldn't do the measuring of the depth of the plane and also the measuring of the temperature of the location of the vials because we didn't have the materials and the space on our robot to place them.

So we came to the conclusion that we would do missions that didn't require a lot of power usage on the robot and that would not take too long to do. As you can see we looked at our options and saw that missions with little or no risk were the best options for our team.

Adapting to the Missions

The word adapt means several different meanings in the dictionary. Two of those definitions “is to make suitable or fit in a specific use or situation” and also to “to adjust (something or oneself) to different conditions”.

So to make our robot adaptable we decided that we would look for a larger propeller blade for the motor that would control our lift motor. We checked and used a small, medium, and large propeller blade and saw different results. The smaller blade didn't have a lot of strength when turning and the large one had too much water to displace and would not turn as much. The medium sized propeller blade worked the best and so we used that propeller blade.

In adapting our robot, we knew that we would have a problem with the buoyancy. We were present at last year's competition and we knew that after six feet and with pool noodles as ballasts, the noodles would collapse and would be less buoyant. We decided if the pool noodles would still be buoyant enough for us when we went past those six feet. We got to test our robot at the Chandler High pool and discovered that the robot worked well and that the noodles would not become less buoyant enough to leave us stranded at the bottom of the pool.

While we did have LED for the robot, we decided the in case we didn't have enough lighting, we would have several glow sticks that would give us more lighting. The problem with glow sticks is that we needed to know if the different color would mess up the black and white camera. We tested that and we saw that the glowsticks would need further testing and would have to be put in the right place so that it can cast light.

Another adaptation we did for the robot was adding the hook and the magnet. We decided that we would use a magnet so that when we had the PDA and the vials or any other mission piece with a metallic piece, it would have a better chance to stay on when we brought it up to the surface.

By making these changes and trying them out, we believe that we have adapted to the missions set before us and that all changes will aid us as we complete the challenges.

Expenditures

To make our robot better, we had to buy materials and other tools so we could work efficiently and make our robot efficient as well. Here is a chart of all that we bought and how much it cost.

Total we spent \$421.95

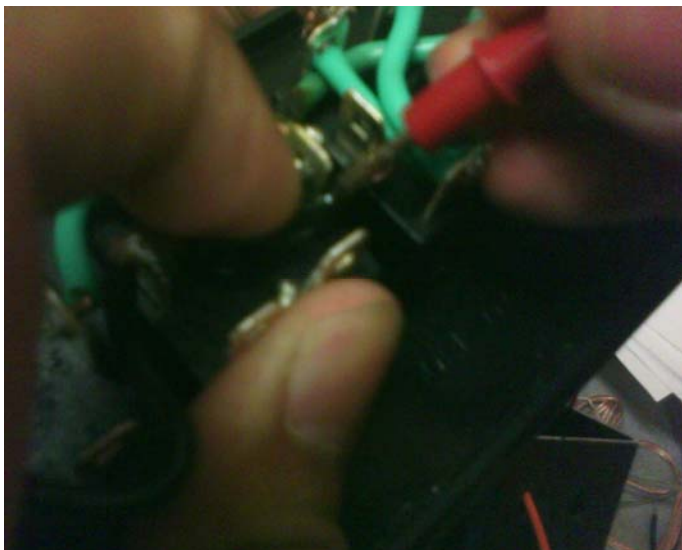
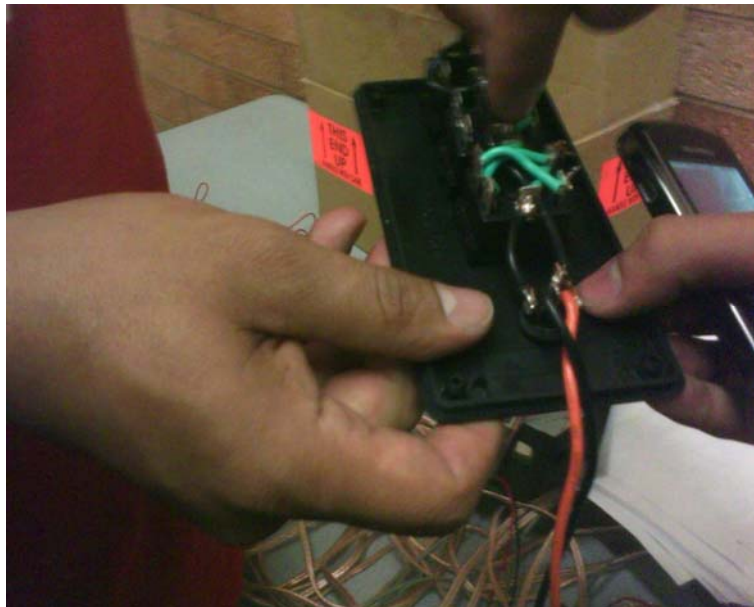
Item	Number of Items	Price per Item	Price
Robot in a Box kit	1	\$300	\$300
Magnets	1 set of two magnets	\$3.99	3.99
Telephone wire	50 feet	\$7.97	7.97
Speaker wire	150 feet	\$4.50 per feet	\$13.50
Large battery charger	1	\$49.99	\$49.99
Large battery and charger	1	\$33.44	33.44
propeller with shaft and top	1	\$7.00	\$7.00
propeller	1	\$1.98	\$1.98
Item	Number of Items	Price per Item	Price
metallic hook	1	\$0.98	\$0.98
fuse for 7 amp	Pack of one, contains 4	\$1.50	\$1.50
inline fuse	1	\$1.60	\$1.60

Skills Gained

Doing a thing over and over again and using that skill a lot gives you more experience in that skill. That is what basically what the team went through. We all had a general knowledge of everything. From the wiring, to the building, to knowing about negative buoyancy. We knew all about that, but we didn't use a lot of the skills. Well now we know a lot about

electronics and several other topics that we just knew general information about.

The team decided that working with other personalities and learning to tolerate each other was the skills that we gained. Other than that just working and learn-



ing different terms and wiring and learning about electricity was the main skills that we earned.

Acknowledgments

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for the help and support

For the Use of Facilities and Knowledge

Mr. and Mrs. Garciaacosta and their house, tools, and
pool

Mr. and Mrs. Williams for the use of their house and
tools

The Chandler High Robotics Team and their workshop,
tools, supplies, and their knowledge

Mr. Alexander, Chandler High computer teacher and his
room and knowledge

Roberto Mancera, our Mentor,

And especially Si Se Puede foundation and Mr. Esparza
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