Chandler High School Robotics

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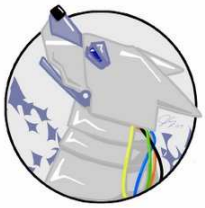

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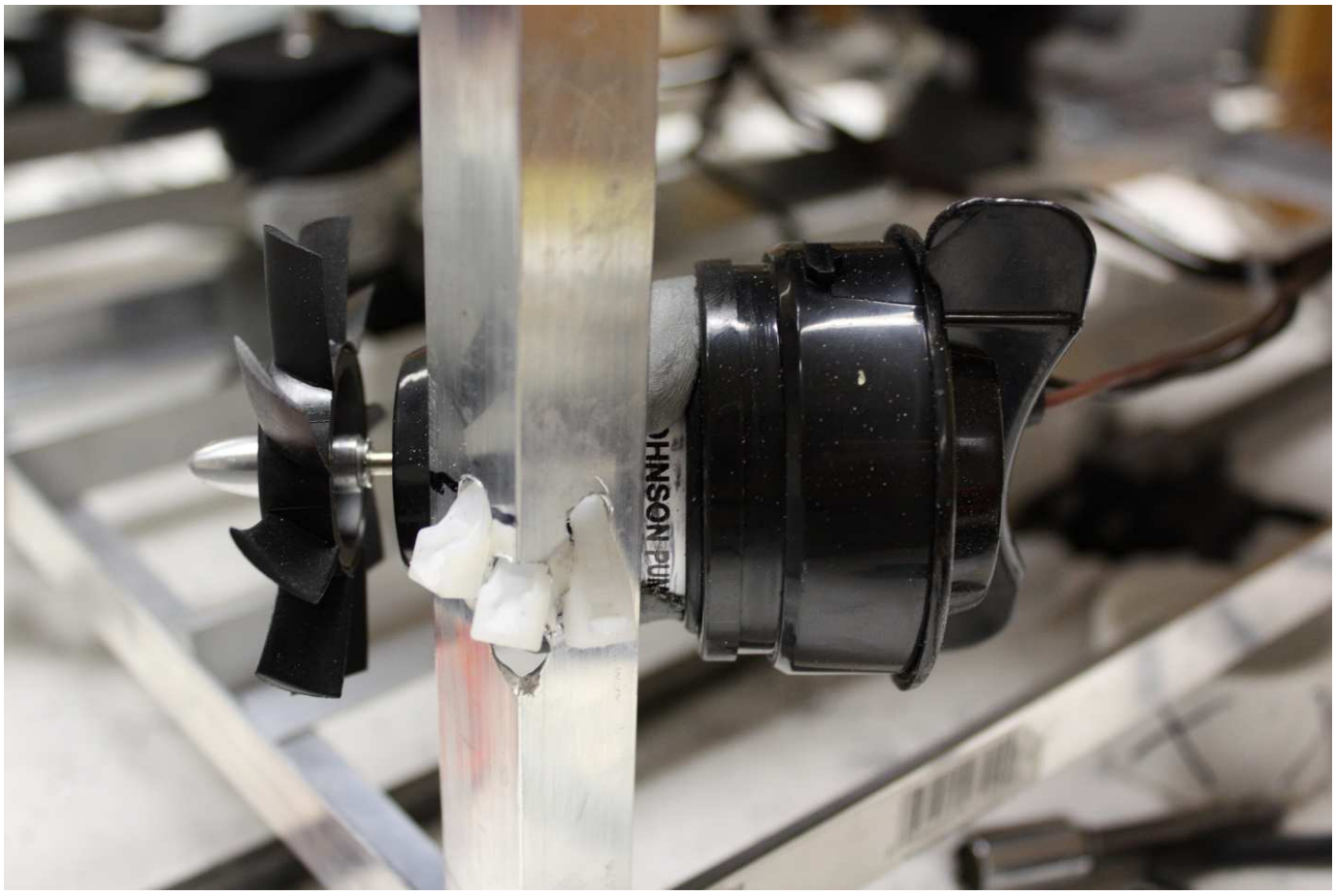
Abstract

For the Chandler High School Robotics Team (CHSRT), competing is nothing new. The team has been actively participating in the FIRST Robotics Challenge (FRC) for the past 5 years, they will compete in the National Underwater Robotics Challenge (NURC) for the second time, and CHSRT had previously competed in the Marine Advanced Technology Education (MATE) ROV Competition during the year of 2006. These competitions have led the team to gain much experience in the field of technology.

The teams current ROV for the NURC 2008 competition is named Nessy II. Certain perks of the Nessy II include extreme flexibility in directional travel, a large amount of visibility, and efficient yet cost effective tools for object retrieval. The devices on the robot that make this possible are its large quantity of 6 cameras, thruster that provide vertical, lateral, and horizontal spin movement. The ROV's electronics are incased onboard the ROV making it more maneuverable than if it were to have them in the surface because it allows for a smaller tether which only transfers data via a cat 5 cable.

The teams expects the Nessy II to be able to pick up the vials of serum along with the PDA using magnets, identify the self destruct button, turn on the airplane lights, and retrieve the airplane's black box. Through this Nessy II promises to be an exceptional robot.



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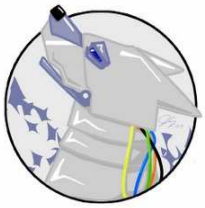

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Budget Report

Name of item	Purchased From	Description	Quantity	Cost per	Total cost	Donated?
Aluminum Beams	Home Depot	1/16" thick, 3/4" wide, 48" long	12	$4.18 per	$50.16	No
T10-PBC-CHWP9 White LED Lamp	Super Bright LEDs	N/A	3	$21.95	$65.85	No
PC823XS Color Wide Angle Micro Video Camera	Super Circuits	1/3" Parasonic CCD	1	$69.99	$69.99	No
PC100XS Video Security Camera	Super Circuits	Tiny 1.25" square	4	$14.99	$59.96	No
Casting Acrylic	Home Depot	Used to cast things	2 qt	$10.00	$20.00	No
Bilge Pump Motors	Bass Pro Shop	750 gal/hr	6	$17.99	$107.94	No
Bilge Pump Motor	Bass Pro Shop	500 gal/hr	1	$11.99	$11.99	No
Electronics box	Southwest plastics	Plastic, 18" x 13" x 7"	1	none	none	Yes
rivets	Home Depot	Aluminum, 1/8' x 3/8"	500	$2.00	$2.00	No
Banner	Fast signs	Vinyl, 3' x 7'	1	none	none	Yes
		Total:		$153.09	$387.89	1/5 : yes/no

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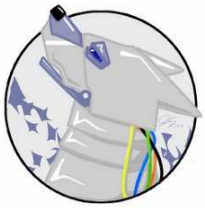

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Materials

- Aluminum Angles
- Bilge pump motors (750 gal/hr & 500gal/hr)
- Casting resin
- LED lamps
- PC823XS Color Wide Angle Micro Video Camera
- PC100XS Video Security Cameras
- Zip ties
- Epoxy
- Nuts & bolts
- Custom-made electronics box
- PVC
- PVC caps
- US First 2008 Robot Controller
- US First 2008 Operator Interface
- 2 Spikes
- 6 speed controllers
- 120v master switch
- Power distribution block
- Battery
- 4 CPU fans
- 2 computer case fans
- Rivets & rivet gun(s)
- J-B weld
- “Special” bolts
- Solder & soldering iron
- Coat hangar
- Dremmel
- Drill & various bits
- metal tape
- Paint thinner
- Numerous Sharpies
- Chop saw (7 1/8’ blade)
- Alligator clips
- Aluminum beams
- Popsicle sticks

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Procedures

1. Cut aluminum angles with chop saw
2. Put aluminum angles together with nuts and bolts to form a short 20X20X8 rectangular prism
3. Attach motors on to case with black PVC putty and zip ties
4. Motors are positioned so we only do horizontal movement
5. Test and enclose cameras in casting resin
6. The Watertight case is made up of a lid container and gaskets
7. The case is sealed with nuts and bolts to maximize the watertight casing
8. Build an aluminum rack in the watertight case to hold all of the electronics
9. Attach Magnets on to the skies so we can pick up the vials of serum and the PDA
10. Attach coat rack on the front of the frame so we can easily obtain the Black Box
11. Add circuit breakers and operator interface into the watertight case
12. Attach cameras to the frame
13. Plug the motor wires into joystick controlling devices

Tests are done on the ROV for buoyancy and maneuverability

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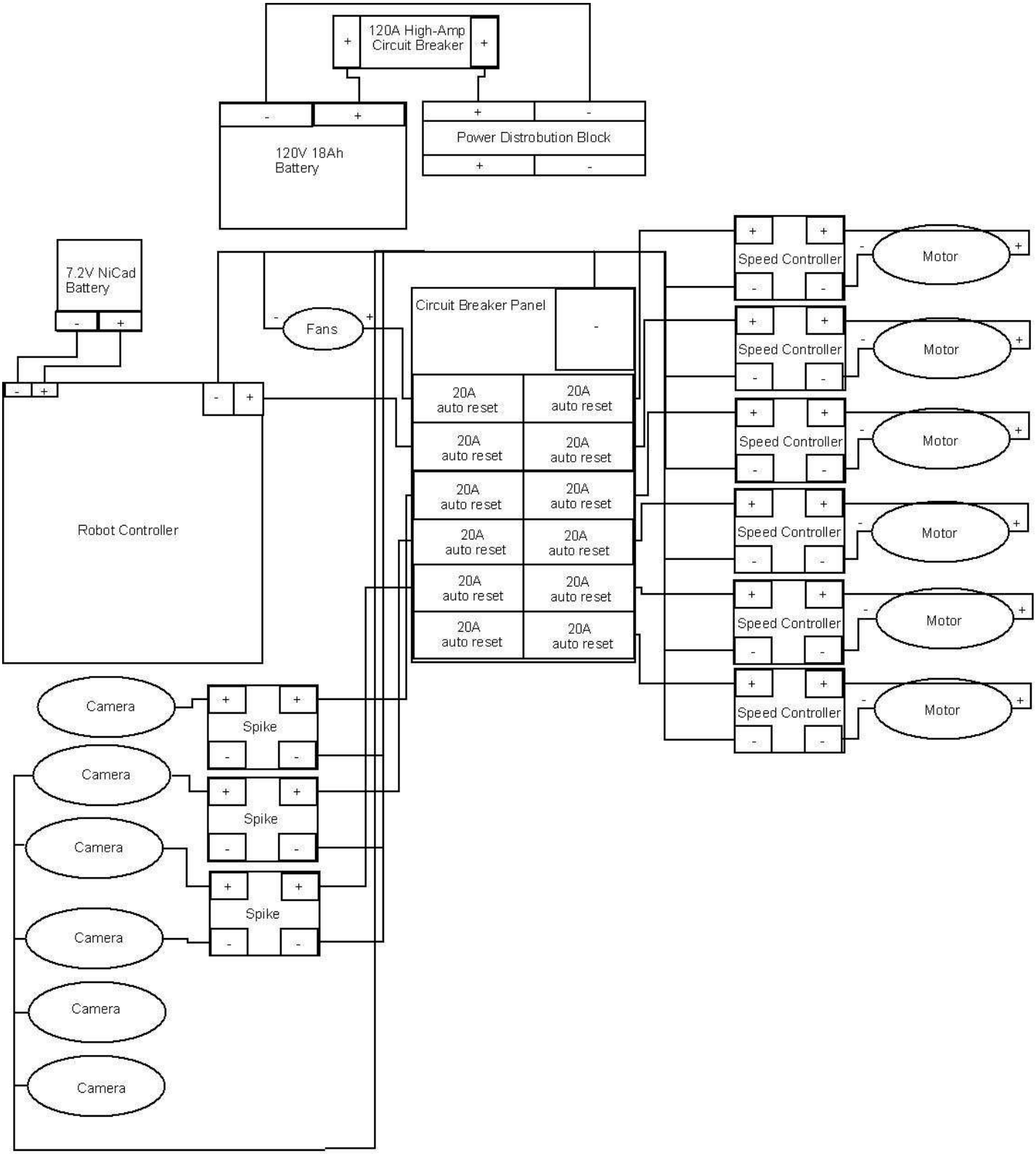
Electrical Diagram



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Struggle of the Year

Many things can be seen as challenging in the fields of engineering and technology. Extensive projects such as the building of a robot will always have at least one memorable moment of struggle. These are moments at which things may seem to hopelessly be breaking apart.

The CHSRT had such a moment during the construction of one of the Nessy II's underwater cameras. The event occurred following the curing process of a cameras waterproofing shield of casting resin. At the time excess resin was being removed was at the bottom of one of the cameras a larger than expected chunk of resin fell off pulling along with it was a piece of wire. The wire had ripped itself from the camera and the team was in for a serious headache. The problem was that the camera had been incased enclosed in casting resin and it would be a very difficult task to plug the wire back in.

The team considered trashing the camera. Repairing it although seemingly difficult and close to impossible was the rout they choose. They had noticed that the wire had left a hole in the resin leading to the pin it was to connect to, so they decided to create a pool of solder in the hole and connect the wire to it. Although a very good idea in theory it only caused problems as it resulted in the loss of insulation in a neighboring wire, which led to a continues amount of circuit tripping in our attempts to attach the broken wire to its place. The team de-soldered the area where solder was a applied in the pool and used JB weld glue to insulate the de-soldered wire. The team then expanded the hole in the resin and attempted to directly connect the camera pin to the wire using a small amount of solder at the tip of the wire. This was a very difficult task and took a lot of time to complete because of the low visibility in the area the wire was to be connected, but in the long run the plan worked that the team was able to save on of its underwater cameras.

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Conclusion

Learning from ordeals in the past the team this year decided to employ a new way of developing under water cameras. Cameras from the previous competition had overly leaked so this year the team incased them in casting resin in order to insure that the cameras would not leak. This solution was discovered when the team aided some elementary school and junior high teams in their creation of an ROV in a box.

Along with cameras the ROV in a box kits influenced the teams use of bilge pump motors on their own ROV. The ROV utilizes 4 horizontal thruster and 2 vertical thrusters created from 750gph bilge pump motors, cpu fans and computer case fans. The horizontal motors were mounted in such a way that the ROV may move forward, back, spin in either direction, and move in both lateral directions.

The most effective way it seemed to the team to pick up objects that are to be transferred to the surface was to place magnets on skies at the bottom of the ROV. The magnets purchased by the team were tested to ensure they could handle carrying the weight objects .

This year like in the previous year the team decided to take the challenge of having their electronics onboard in order to not have the ROV pull around a thick tether. Along with the electrical components it is a 12V battery. All of these components are incased in a waterproof container created out of PVC. The flat lid an container are placed upside down on the ROV so that the container would only allow water to come in from the bottom if the case were to leak, and because it creates a giant air bubble water does not fill into the case..

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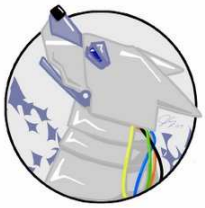

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- http://sisepuede.cc/
- http://southwestplasticsfab.com/
- http://www.fastsigns.com/

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Sponsors

Si Se Puede Foundation, Inc.

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