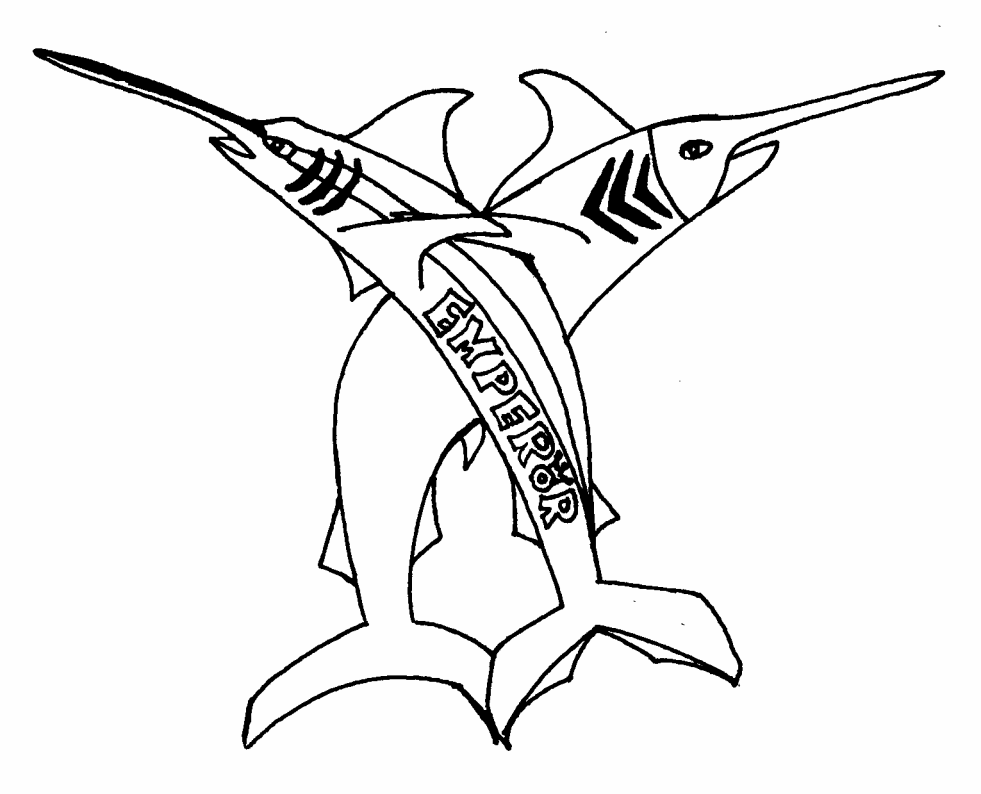
TECHNICAL REPORT

THE EMPEROR

TEAM: CLUB ESTAY



Members:

- Miguel A. Galindo
- Rodrigo Manzano
- Miguel M. Cacho
- Santiago Brinquis
- Luis Pita
- Pablo Mendoza

Mentor: Manuel Estrems

Instructors:

- Vicente Valenciano
- Carlos P. Santalla
- Juanjo Huertas

Abstract:

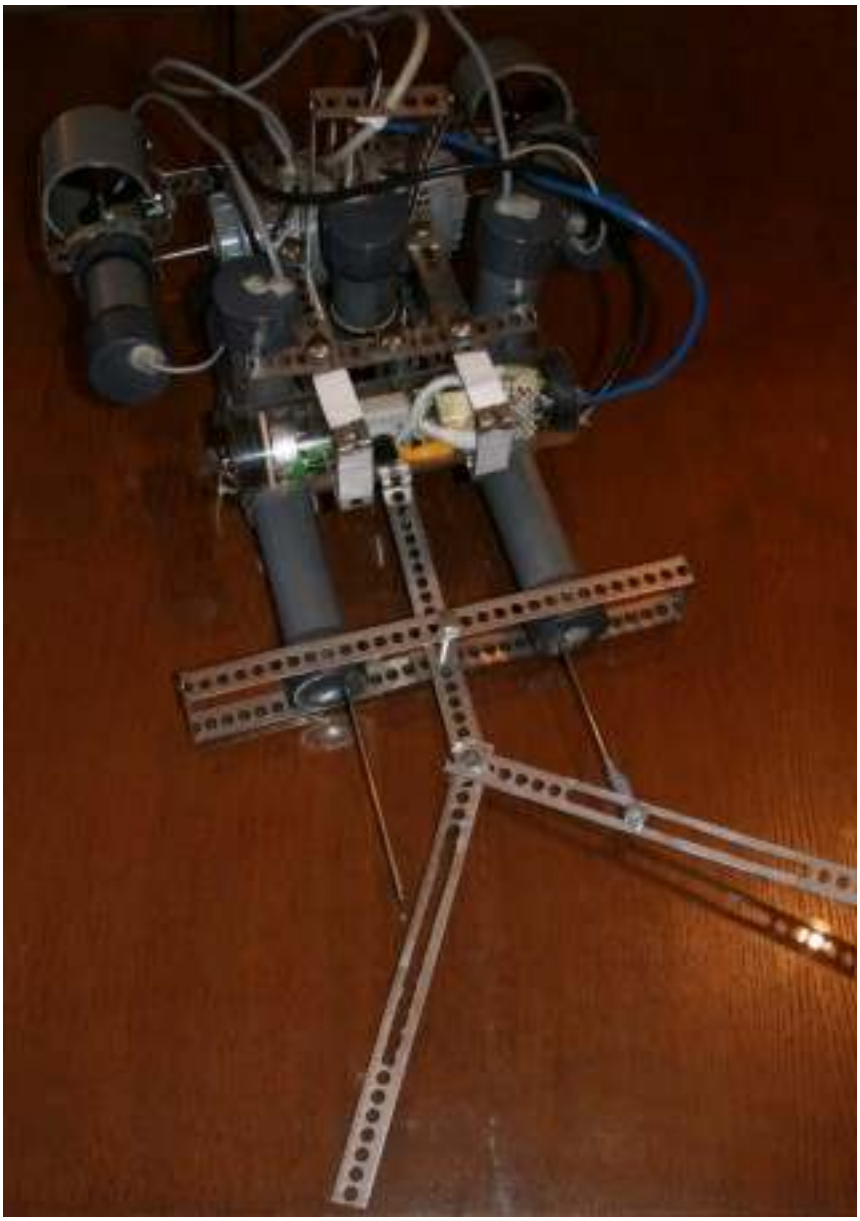
The ROV has been developed in the Club Estay by six students of 16 years coordinated by a professor of Manufacturing Engineering.

In September of 2006 we began to collect information about the last editions of ROV competition, and we had to receive practical instruction about electronics and physics during 4 months. When the rules and missions of the competition were published, we began to fix many meetings in front of the blackboard where the preliminary sketches where drawn and photographed. With these ideas we decide to attend the competition in February 1st and began to work in the construction of the ROV.

This is the first ROV we construct. The ROV is made mainly with scraps of old printers, CD readers, and floppy readers, from these devices we have extract DC motors, steppers, shafts, racks, etc. We could use a punched strip from the scrap washer production to make the modular structure and mechanisms.

This original ROV has the following properties. It has one propeller to control the depth, two other to propel the vehicle and control the direction. These two propellers are oriented up and down by a stepper helping the propeller in the task or immersion. The camera is linked with a stepper to see above and below the ROV. The pilot governs the ROV with a program in VBA in Excel that send instructions through the parallel port LPT1. An electronic box that regulates the speed of propellers has been also constructed.

Photo of the team and the ROV



EXPENSE SHEET				
MATERIAL	**DESCRIPTION**	**QUANTITY**	**PRICE**	**TOTAL**
Electrical material				
cables power supply 15m	power supply of external to ROV (15 m)	1	6.00 €	6 €
parallel load printer 10m	where the information passes to be transmitted from the computer to ROV and the electric current(10 m)	1	7.50 €	8 €
152 RCA gilts metal male	it connects wire to camera entrance	2	1.09 €	2 €
15E1031 CONNECT. Electric current 2,5X5,5	it makes electricity current from external to ROV´s camera	1	0.53 €	1 €
45RGE9BU LOAD RG-59/BU 75 OHM. MIL	COAXIAL WIRE (15 m)	1	9.16 €	9 €
electrical connectors	it is used for the attachment a lead with another	2	1.30 €	3 €
insulating tape. 10X15 BN	it is for insulating the leads and not to have short-circuits	1	1.60 €	2 €
TRT016 termoretractil yellow 1,6m poliolefina (acquire 0,8m)	Wire recoverement. (1 m)	1	0.89 €	1 €
EG1162 conector sub-female 25 pin solder 08110/25dh	is the female of printer port	1	1.53 €	2 €
Vision system				
78CAM002 (R) MINI CAMERA B/N+AUDIO+AAAAAALIMENTACION	it the gives the sight to ROV	1	26.64 €	27 €
Auxiliary materials				
teflon hight density	to seal joints	1	3.15 €	3 €
Richelet vaselina 30 G	to get the waterightness in the holes made for passing the wire from ROV to external	1	2.20 €	2 €
torics joins	they are use for the watertighness of the arms holes by where go out the hooks and in the propellers by where go out the spiral shaft	22	0.20 €	4 €
Electronic material				
ULN2003=L2003=TD62003AP integrated circuit	There are three, one controlates the step motor, another one the depht motor, and the third for the camera	3	0.25 €	1 €
L293D integrated circuit	for make H bridge	3	2.82 €	8 €
24V 2W zener diodo	for make H bridge become stable the step by	5	0.26 €	1 €

	step circuits			
CR251K RESISTANCE 1k 1/4W 422265937	for the step by step circuits	8	0.07 €	1 €
EG2954 ZOCALO CI 16 sideburns	for circuits	12	0.23 €	3 €
NE555=MC1455P1 Integrated Circuit	for making the variable restistor work	1	0.23 €	0 €
493331437 variable resistance plastic of shaft 100K logaritmic	it serves for the join of a lead with other adjust the speed of the propellers	3	2.09 €	6 €
Mechanics materials				
helix 60mm m4	helix	3	3.90 €	12 €
T.C/PL M3X30 Z TUERY	they are screws which keep the ROV's metal structure joined together			0 €
ARAND.M4-M6-M8 CA	washer	1	1	1 €
T.C/EXAGONA M6X30	for estructure	1	1.10 €	1 €
T.C/EXAGONA M8X50	for estructure	1	1.10 €	1 €
stoppers of 40mm	They are PVC use for block the tubes	18	1 €	18 €
PVC TUBES 40mm	to make the propellers and the arms (2 m)	1	2.42 €	2 €
PVC TUBES 75mm	to make the propellers and the arms (1 m)	1	1.20 €	1 €
220/0201 BLACK COMMAND BUTTON ç20mm 16mm hight	they to put in the variable resistance	3	2.15 €	6 €
CLE003 REGLETA 2 poles (clema) C.I.	screwed box for wires to be joined in	4	0.36 €	1 €
CLE003 REGLETA 3 poles (clema) C.I.	screwed box for wires to be joined in	12	0.46 €	6 €
			TOTAL	**139 €**

Travels

tickets	Flying to St. Johns	4	660	2 640 €
Insurance		4	60	240 €
			TOTAL	**2 880 €**

Recycled materials

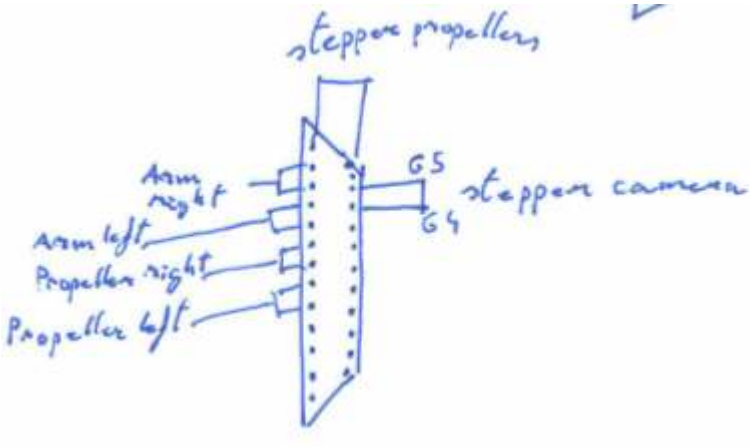
Printers	To obtain Motors, shafts, wires, circuits
Old DVD	Racks
Metal strips	From the fabrication of washers, it is used to make the structure and mechanism

Donations

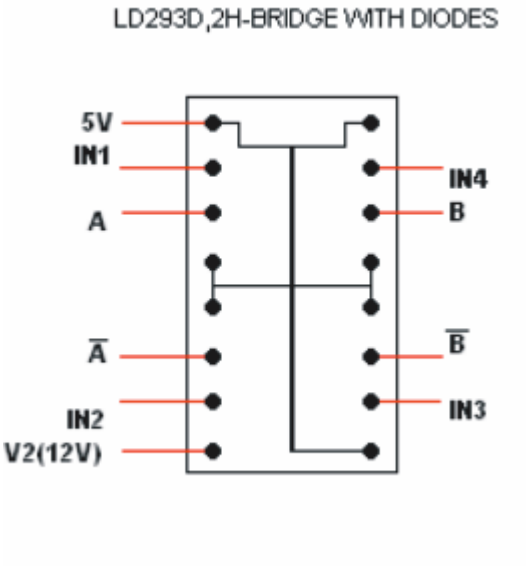
Himoinsa	1000 € of dotation to help travel stipends
UPCT	Has donated old printers, DVDs, metal strip, etc.

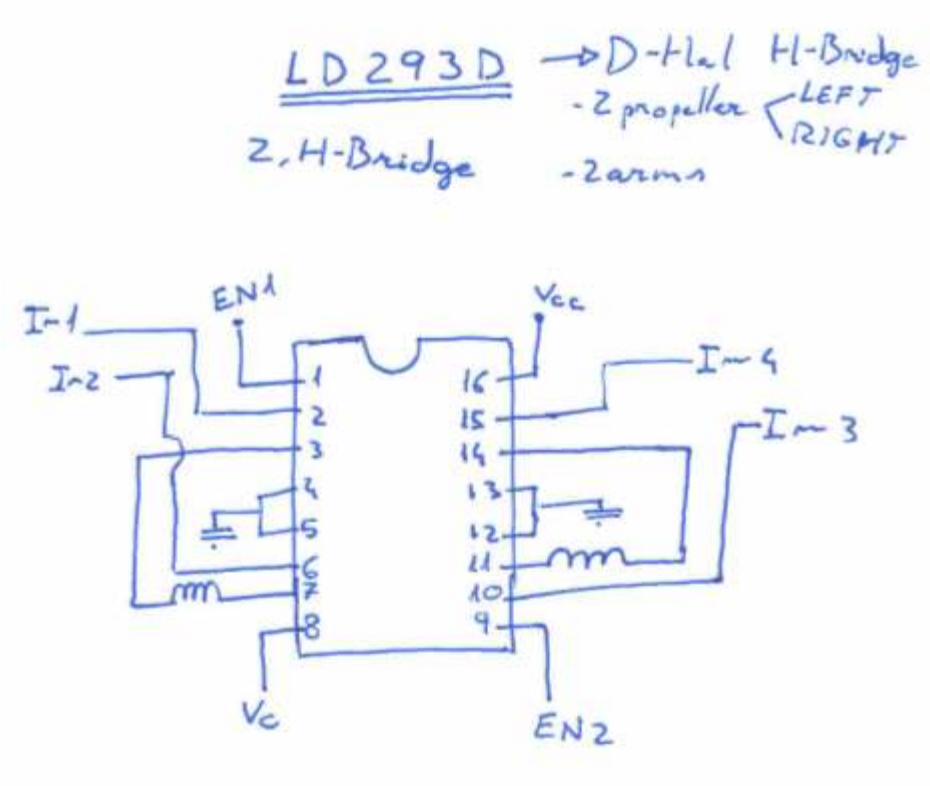
Electrical Schematic

Printer port connection system

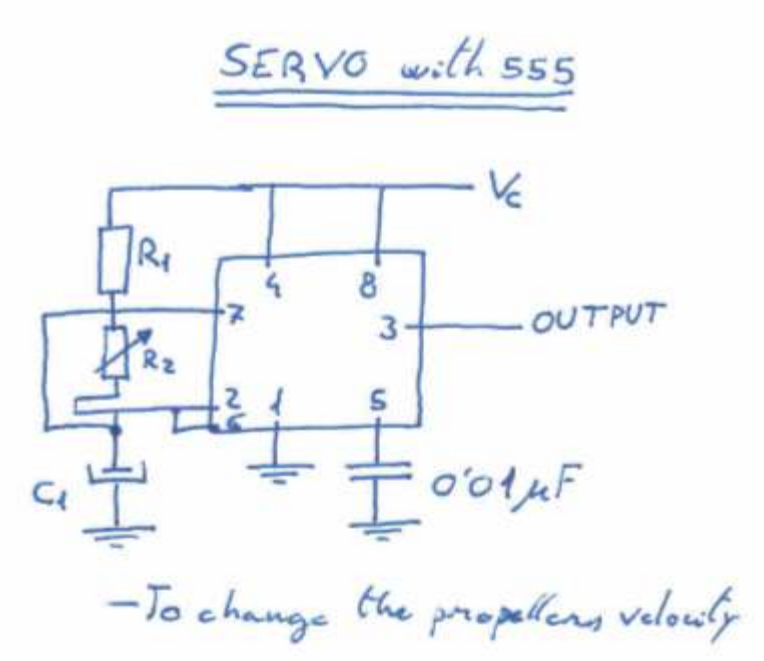


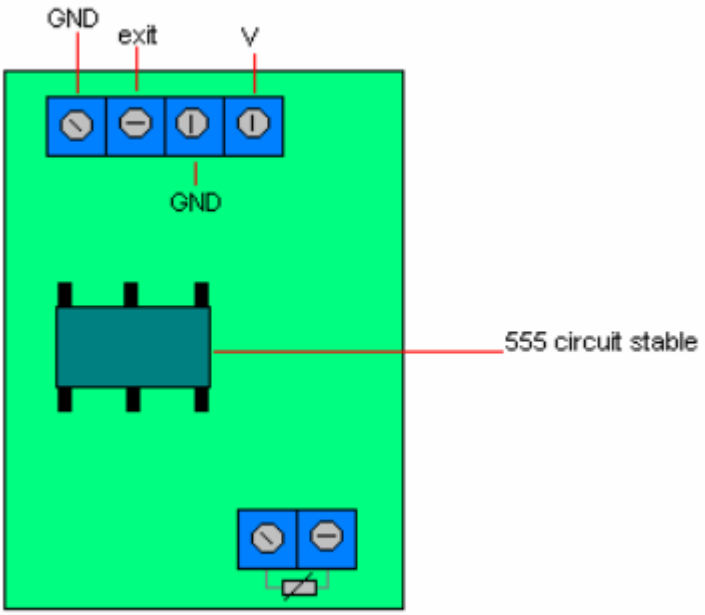
Dual H-Bridges for DC Motors



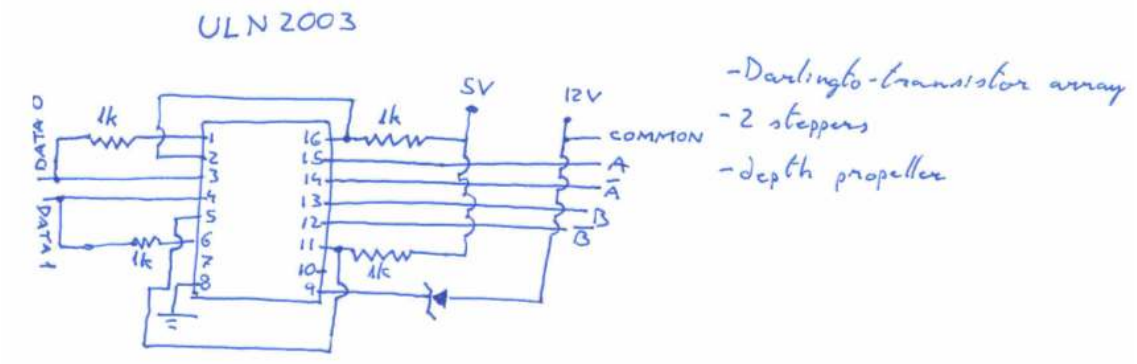


Control speed of propellers

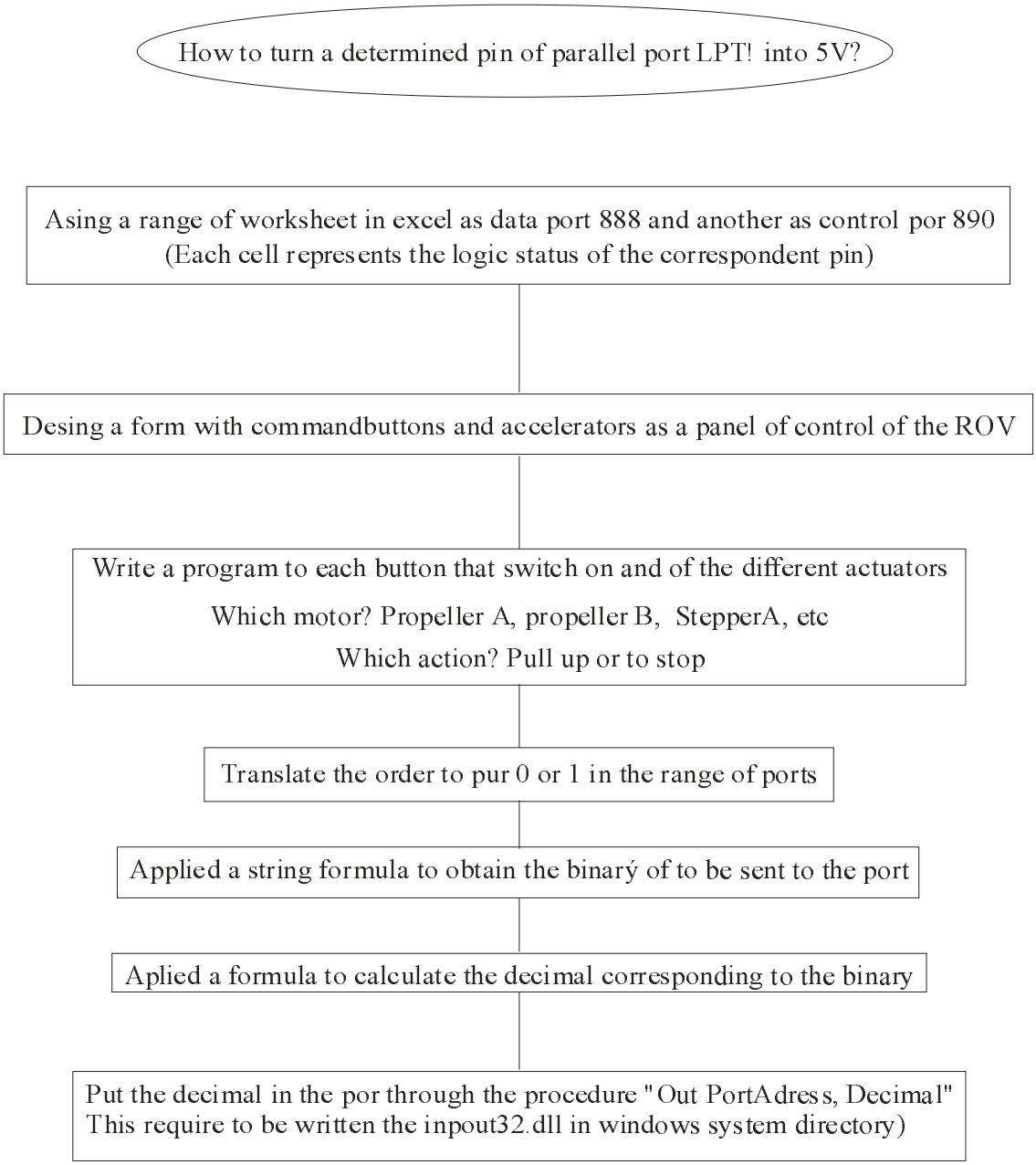




Steppers control (horizontal propellers and camera vision) and depth propeller



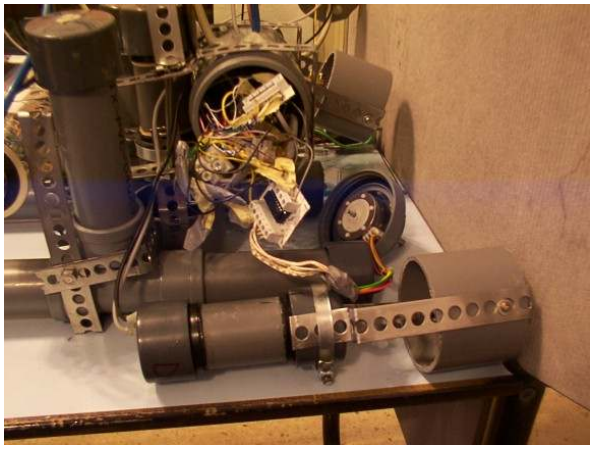
Block diagram of software in the ROV



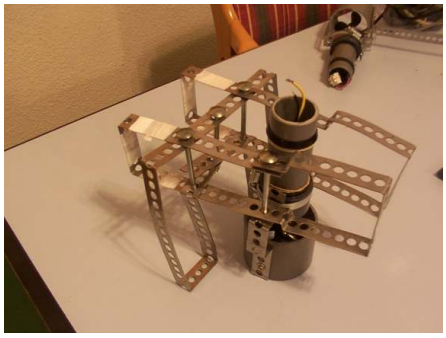
Design rationale

The rov has 5 different systems:

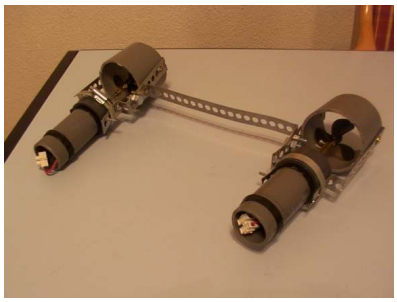
1. THE BODY. Is the brain of Emperor and in where all the h-bridge circuits are for moving the step by step motor, also, there is a stepper motor wich turns the propellers and all the leads.



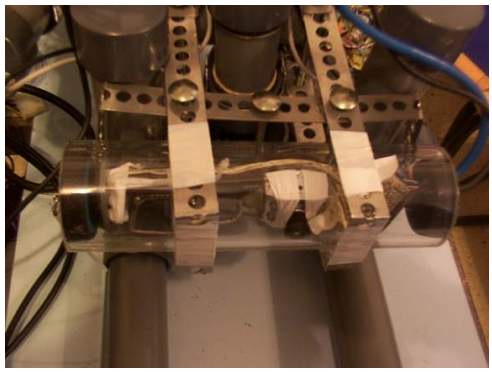
2. STRUCTURE. Also is the main structure of Emperor, in it connects through a metallic structure, the arms, the camera and the propellers of movements and of depth. Beside it joins Emperor with the surface by three leads of electric current, data and sight.



3. THE PROPELLERS. Are which do possible the movement in the ROV. There are 2 that are for the direction (right and left) and other for the depth. The propellers are of 12V y they are to get of printers (HP and EPSON).



4. THE VISION SYSTEM. It is a black and white camera that is inside of a transparent tube. The camera is joined to a step motor for can to see in all directions (up and down).



5. THE MANIPULATORS. Are the two arms with form of T, to be designed to meet the requirements of the missions Are all of PVC inside of each one, there is a continuous motor that take to join a gear wheel, when the motor move the gear wheel, it move the zipper and this make to move the iron bar ahead and back.

Challenges and troubleshooting techniques

The construction of the arm was the most difficult challenge we faced. We took a rack from an old DVD device, a shaft from a printer and we joined it. Then we needed to introduce it into a tube, and geared it with a pinion moved by a motor. We put the gear into a shaft, and it into a "T" form tube. As we can't fix the rack in the shaft, we had to put a modified stopper with an orifice of the exact measure of the section of the rack. We solve the problem of the vibrations and the body of the ROV and took more robustness. Then we could fix it and the challenge was accomplished.

The second challenge we faced was that we couldn't move perpendiculary the arms each other. We made a mechanism based on a metal strip with regular holes and slots. Thus, we can thread the cables, close boxes and position the locators. These operations are necessary to accomplish the missions.

Another challenge was to get watertigthness in the propellers, the body and the wires. In the propellers, to get it we put conic joints between the plugs and the tubes; and in the shafts we put proxilina glue to fix it to the arms. In the body we put toric shaft seals in order to join the plugs to it. Then, finally we put grease in the conic joints.

Lessons Learned

During the design and building process, we have learned lots of things because little did we know about engineering we began. Our mentor, M. Estrems had to teach us programming, design, etc.

During the design and construction of Emperor, the team has reaped the rewards of a vast array of lessons learned and new acquired skills. First and foremost was the knowledge gained that the journey is more important than the destination. Each of us has grown in many ways that not only assisted in this project but will carry on into our individual endeavours.

We've learned about manufacturing, mechanics, machining, and electronics involved in building an ROV. It was necessary to learn machining skills, such as using the drill for to make precision holes in the PVC plugs and welding electronics components. We learned how to read schematics and colour code wires to identify positive and negative wires. We also acquired knowledge on buoyancy, watertighness.

In addition to technical skills, we learned how each individual's contributions were vital to the success of the team. We gained knowledge of our own strengths and weaknesses and applied what we learned about ourselves to the success of the team. A strength revealed a weakness, and each weakness provided us with what we needed to improve ourselves. The

technical skills we learned are secondary to the interpersonal skills we have gained. What we have gained will help us communicate with future co-workers and friends. As we have been taught, patience is a virtue.

After all we have learned, the most important lesson was the value of the friendship. Since becoming part of this team, we have become closer than anyone could have imagined. We've learned more about each other and have gained greater mutual respect. We have been through the worst and the best, and the six of us have lasted through it all.

Future improvements

Although our team is very confident in our ROV and the team itself, we know that there is always a place for improvement. We hope that in the future, the team will have less difficulty in working together. Team cohesion is fundamental when working on any type of project. Technically, the time of setting up is considerable each time we want to immerse the ROV. And the different components are not very accessible. The circuits of stepper are very hot and se consider it is dangerous when the time of immersion is greater than 30 min.

Description of historical and cultural aspects of human life at the poles

ESKIMOS

Eskimos or Esquimaux is a term referring to aboriginal people who inhabit the circumpolar region, excluding Scandinavia and most of Russia, but including the easternmost portions of Siberia. There are two main groups of Eskimos: the Inuit of northern Alaska, Canada and Greenland, and the Yupik, comprising speakers of four distinct Yupik languages and originating in western Alaska, in southcentral Alaska along the Gulf of Alaska coast, and in the Russian Far East.
The Inuit and Yupik peoples are related to the Aleuts from the Aleutian Islands in Alaska. The Eskimo languages, together with the Aleut language, comprise the Eskimo-Aleut language group.
Inuit languages comprise a dialect continuum, or dialect chain, that stretches from Unalaska and Norton Sound in Alaska, across northern Alaska and Canada, and east all the way to Greenland. Speakers of two adjacent Inuit dialects would usually be able to understand one another, but speakers from dialects distant from each other on the dialect continuum would have difficulty understanding one another. The four Yupik languages, including Aluutiq (Sugpiaq), Central Alaskan Yup'ik, Naukan (Naukanski), and Siberian Yupik are distinct languages with limited mutual intelligibility. While grammatical structures of Yupik and Inuit languages are similar, they have pronounced differences

phonologically, and differences of vocabulary between Inuit and any of one of the Yupik languages is greater than between any two Yupik languages.
The Sireniki language is sometimes regarded as a third branch of the Eskimo language family, but other sources regard it as a group belonging to the Yupik branch.

Inuit

The Inuit inhabit the Arctic and Bering Sea coasts of Siberia and Alaska and Arctic coasts of the Northwest Territories, Nunavut, Quebec, Labrador, and Greenland. Until fairly recent times, there has been a remarkable homogeneity in the culture throughout this area, which traditionally relied on fish, sea mammals, and land animals for food, heat, light, clothing, tools, and shelter.

Canada's Inuit
Canadian Inuit live primarily in Nunavut (a territory of Canada), Nunavik (the northern part of Quebec) and in Nunatsiavut (the Inuit settlement region in Labrador).

Inupiat
The Inupiat or Inupiaq people are the Inuit people of Alaska's Northwest Arctic and North Slope boroughs and the Bering Straits region, including the Seward Peninsula. Barrow, the northernmost city in the United States, is in the Inupiaq region. Their language is known as Inupiaq.

Inuvialuit
The Inuvialuit live in the western Canadian Arctic region. They are descendants of the Thule people, of which other descendants inhabit Russia and parts of Scandinavia. Their homeland - the Inuvialuit Settlement Region - covers the Arctic Ocean coastline area from the Alaskan border east to Amundsen Gulf and includes the western Canadian Arctic Islands. The land was demarked in 1984 by the Inuvialuit Final Agreement.

Kalaallit
The Kalaallit live in Greenland, which is called Kalaallit Nunaat in Kalaallisut.

Yupik

The Yupik are indigenous or aboriginal peoples who live along the coast of western Alaska, especially on the Yukon-Kuskokwim delta and along the Kuskokwim River (Central Alaskan Yup'ik), in southern Alaska (the Alutiiq) and in the Russian Far East and St. Lawrence Island in western Alaska (the Siberian Yupik).

Alutiiq
The Alutiiq also called Pacific Yupik or Sugpiaq, are a southern, coastal branch of Yupik. They are not to be confused with the Aleuts, who live further to the southwest, including along the Aleutian Islands. They traditionally lived a coastal lifestyle, subsisting primarily on ocean resources such as salmon, halibut, and whale, as well as rich land resources such as berries and land mammals. Alutiiq people today live in coastal fishing communities,

where they work in all aspects of the modern economy, while also maintaining the cultural value of subsistence. The Alutiiq language is relatively close to that spoken by the Yupik in the Bethel, Alaska area, but is considered a distinct language with two major dialects: the Koniag dialect, spoken on the Alaska Peninsula and on Kodiak Island, and the Chugach dialect, is spoken on the southern Kenai Peninsula and in Prince William Sound. Residents of Nanwalek, located on southern part of the Kenai Peninsula near Seldovia, speak what they call Sugpiaq and are able to understand those who speak Yupik in Bethel. With a population of approximately 3,000, and the number of speakers in the mere hundreds, Alutiiq communities are currently in the process of revitalizing their language.

Central Alaskan Yup'ik
Yup'ik, with an apostrophe, denotes the speakers of the Central Alaskan Yup'ik language, who live in western Alaska and southwestern Alaska from southern Norton Sound to the north side of Bristol Bay, on the Yukon-Kuskokwim Delta, and on Nelson Island The use of the apostrophe in the name Yup'ik denotes a longer pronunciation of the p sound than found in Siberian Yupik. Of all the Alaska Native languages, Central Alaskan Yup'ik has the most speakers, with about 10,000 of a total Yup'ik population of 21,000 still speaking the language. There are five dialects of Central Alaskan Yup'ik, including General Central Yup'ik and the Egegik, Norton Sound, Hooper Bay-Chevak, Nunivak, dialects. In the latter two dialects, both the language and the people are called Cup'ik.

Siberian Yupik (Yuit)
Siberian Yupik reside along the Bering Sea coast of the Chukchi Peninsula in Siberia in the Russian Far East and in the villages of Gambell and Savoonga on St. Lawrence Island in Alaska. The Central Siberian Yupik spoken on the Chukchi Peninsula and on St. Lawrence Island is nearly identical. About 1,050 of a total Alaska population of 1,100 Siberian Yupik people in Alaska still speak the language, and it is still the first language of the home for most St. Lawrence Island children. In Siberia, about 300 of a total of 900 Siberian Yupik people still learn the language, though it is no longer learned as a first language by children.

Naukan
About still speak the Naukanski. The Naukan originate on the the Chukot Peninsula in Chukotka Autonomous Okrug in Siberia.

Reflections of the Experience

Miguel M. Cacho -"It has been an amazing experience, and my first glaze in engineering outside school. Though I am not really keen on submarines and marine world, what I have to say is that this project has been really important to me, and I've enjoyed myself a lot. After taking part on the engineering of this rov, I am surer to make the aeronautics university course after ending High School studies. "

Luis Pita-" To be brilliant I have learned a lot and I have passed it very well but to once they have had me to call the attention, I will like me next year to return to repeat it."

Santiago Brinquis-"The best thing is than we have known to confront the difficulties and everything that we have proposed we have done it."