

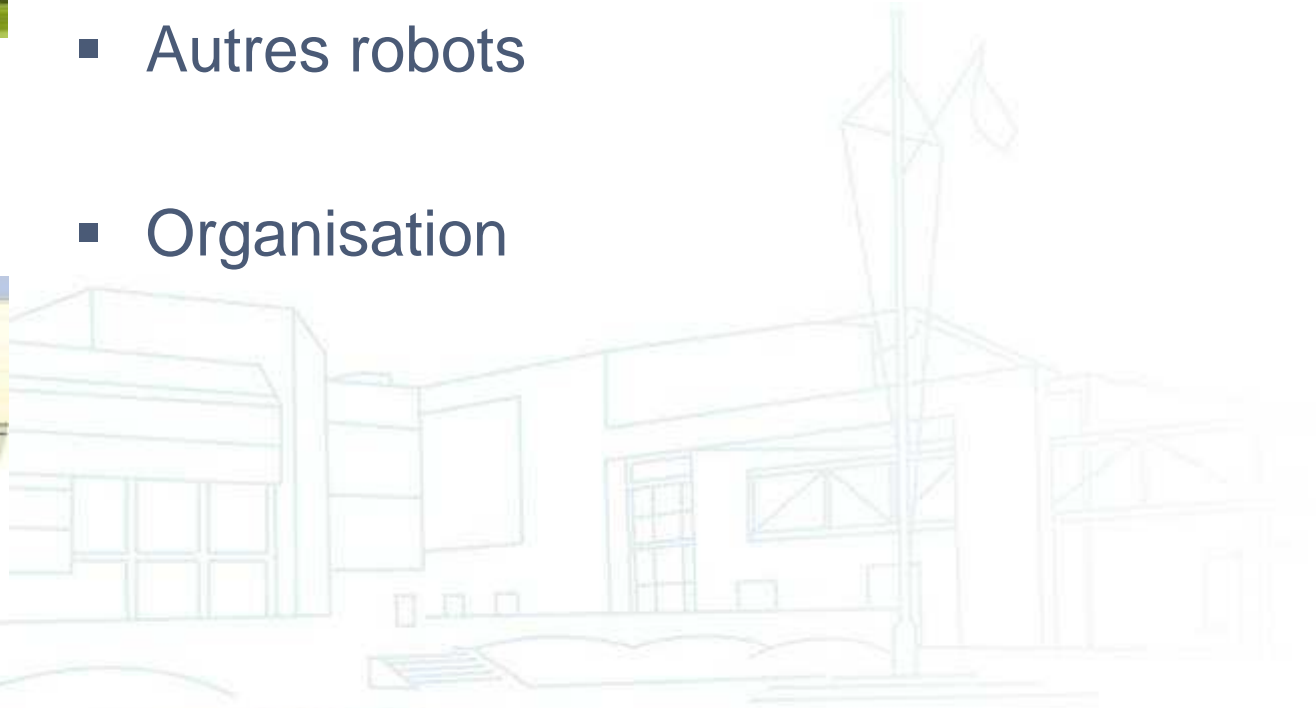


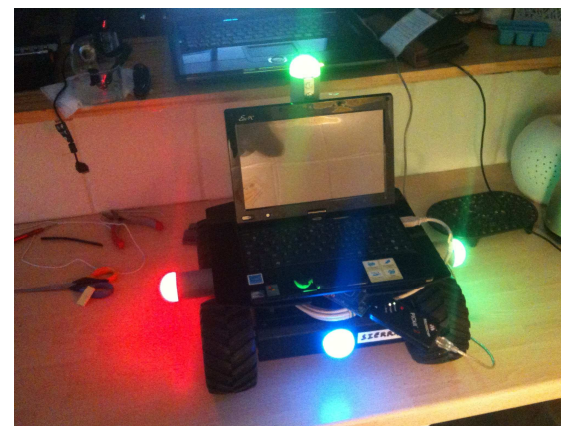
[La robotique à l'ENSTA Bretagne]

Fabrice LE BARS

Sommaire

- Présentation
- Principaux robots et concours
- Autres robots
- Organisation

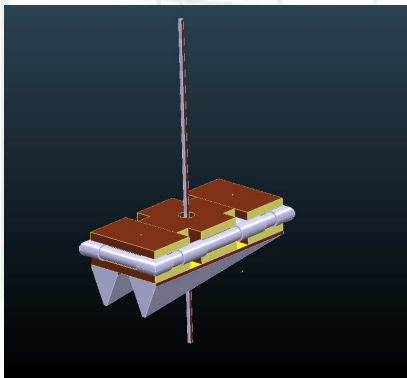
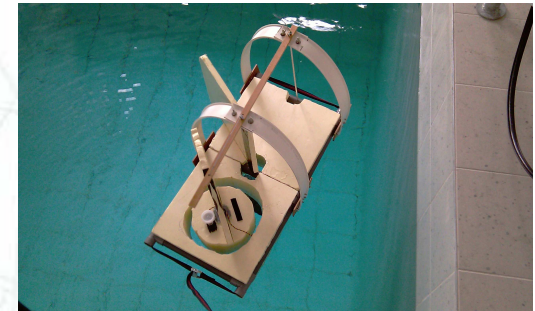
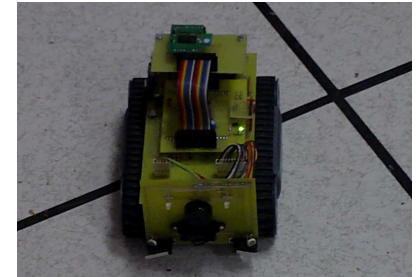




Présentation

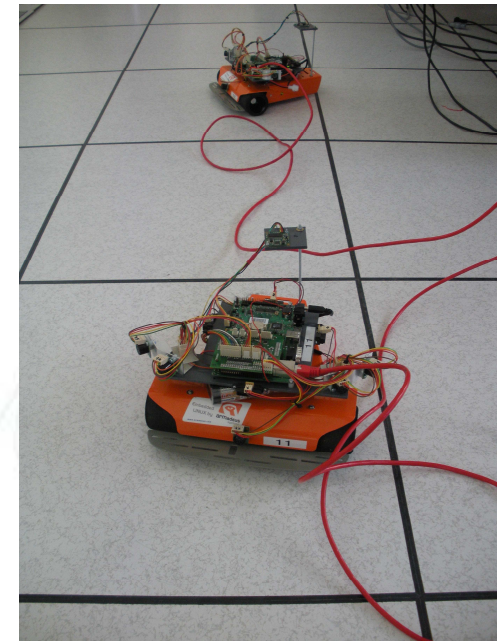
Présentation

- Activités extra-scolaires :
 - Construction de robots voiliers autonomes
 - Initiation au traitement d'images et contrôle de moteurs sur PC en C/C++
 - Quadrirotor
 - Mini-robots PIC des ENSI 1



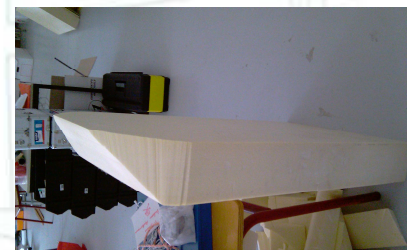
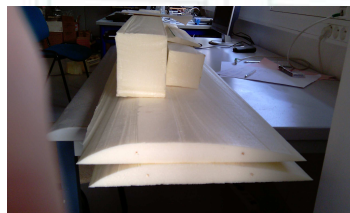
Présentation

- Cours en lien avec la robotique
 - Automatique
 - Méthodes ensemblistes pour la robotique
 - TP sur robots JOG (ENSI 1, FIPA 3)
 - ...



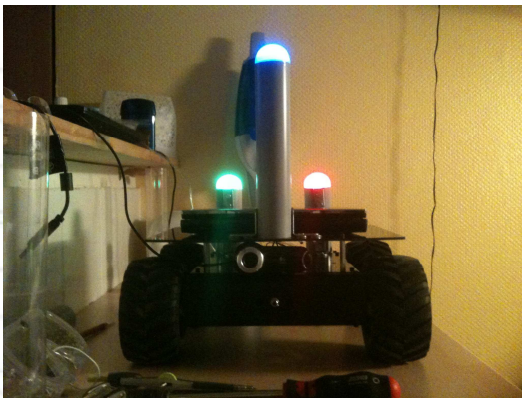
Présentation

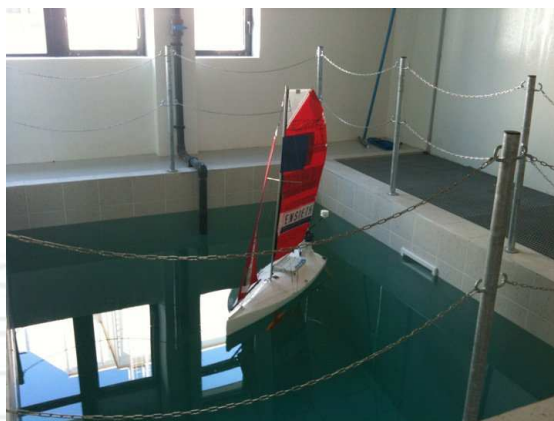
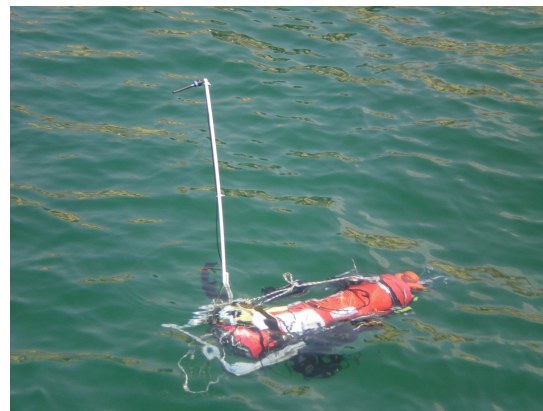
- Projets industriels ENSI 2 / Applications système ENSI 3
 - Robots voiliers/radeaux autonomes
 - Sous-marins SAUC-E
 - Jeu des buggys
 - Hovercraft
 - Cerf-volant/planeur



Présentation

- Stages d'été
 - 2 stages d'été ENSI 2 => participation au concours de robots terrestres CAROTTE (début Juillet 2010 à Angers)
 - 1 stage d'été ENSI 2 + 2 volontaires ENSI 1 => participation au concours de robots sous-marins autonomes SAUC-E (début Juillet 2010 en Italie)

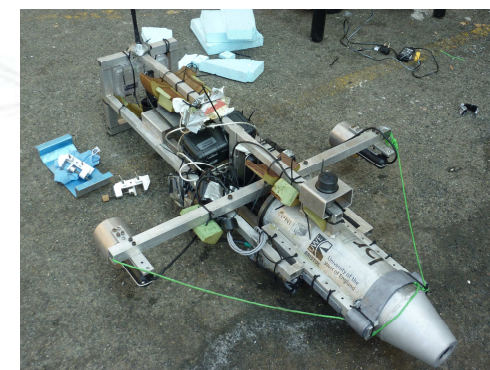
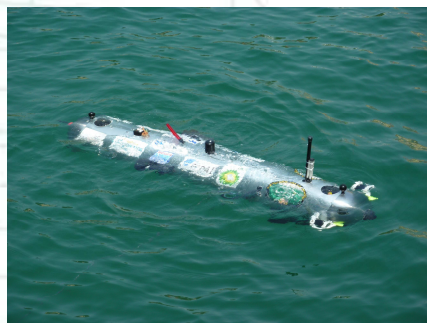
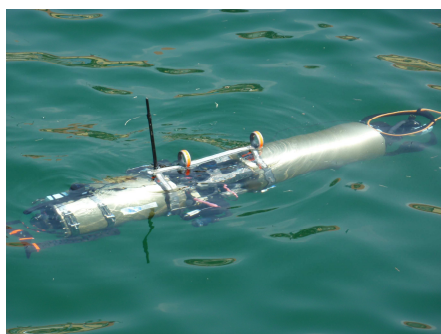




Principaux robots et concours

Principaux robots et concours

- SAUC-E (Student Autonomous Underwater Challenge - Europe)
 - Concours de robots sous-marins autonomes dans une piscine ou un port
 - Missions : passer à travers des cadres, détecter et localiser différents objets par sonar ou camera,...

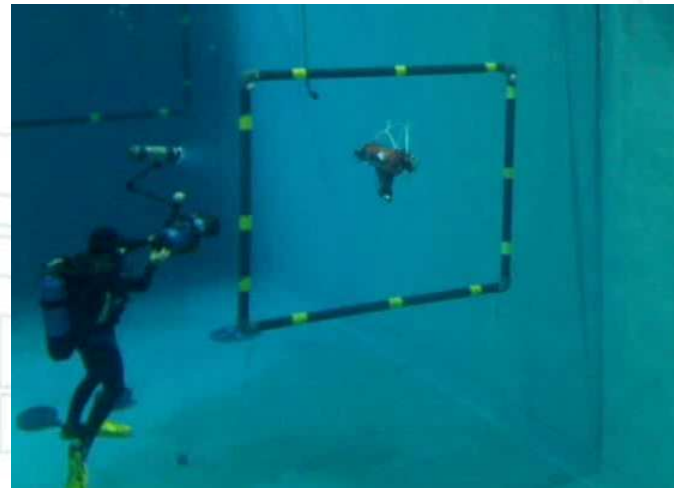
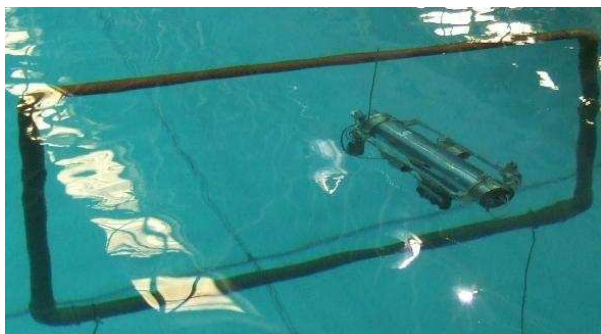


Principaux robots et concours



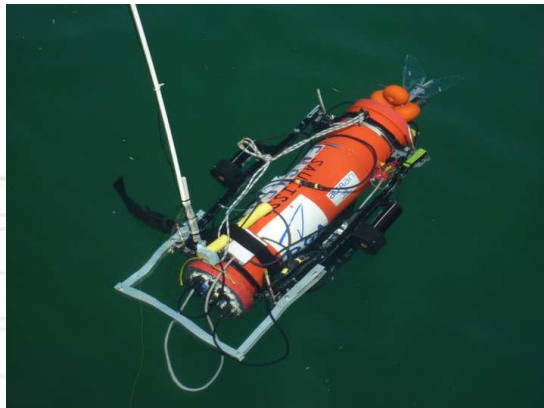
Principaux robots et concours

- SAUC-E (Student Autonomous Underwater Challenge - Europe)
 - 4 participations au concours : en 2007 (3^{ème} sur 6), 2008 (2^{ème} sur 6), 2009 (2^{ème} sur 8) et 2010 (3^{ème} sur 9)



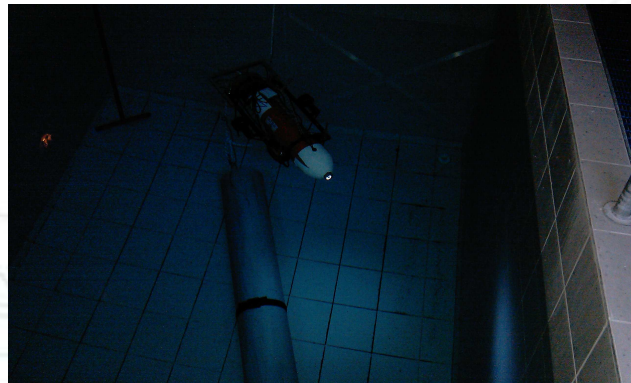
Principaux robots et concours

- SAUC-E (Student Autonomous Underwater Challenge - Europe)
 - 2 robots sous-marins : SAUC'ISSE (construit en 2007) et SARDINE (construit en 2010)



Principaux robots et concours

- SAUC-E (Student Autonomous Underwater Challenge - Europe)
 - SAUC'ISSE



Principaux robots et concours

Switch :
It is a home-made watertight switch.

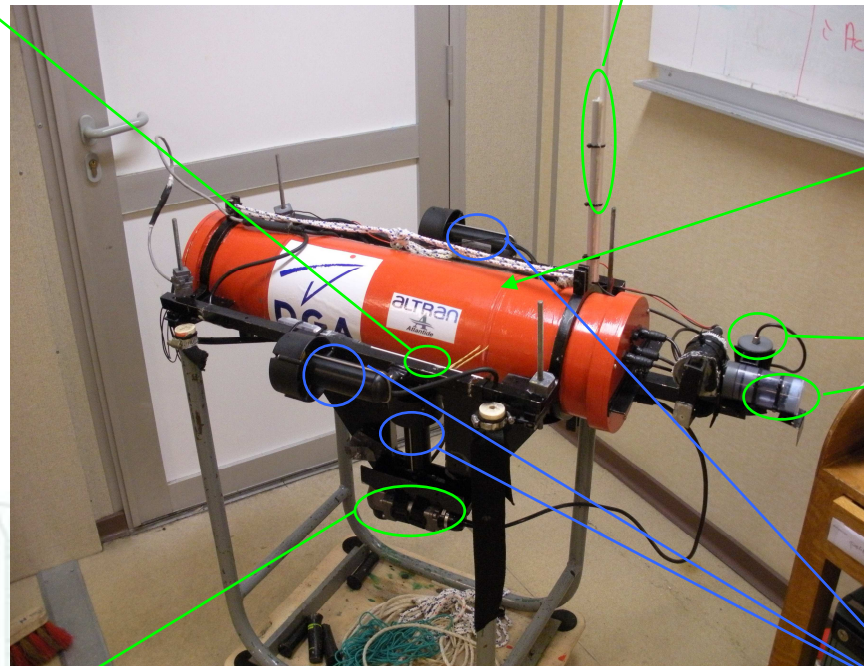
WIFI antenna :
It allows the communication with an external computer (up to a depth of 1 m).

Aluminium tube :
The submarine is based on an aluminium tube of 80 cm with a diameter of 20 cm. It contains the embedded electronics and the batteries. It is closed by 2 aluminium covers with IP68 connectors to connect the external peripherals with the internal devices.

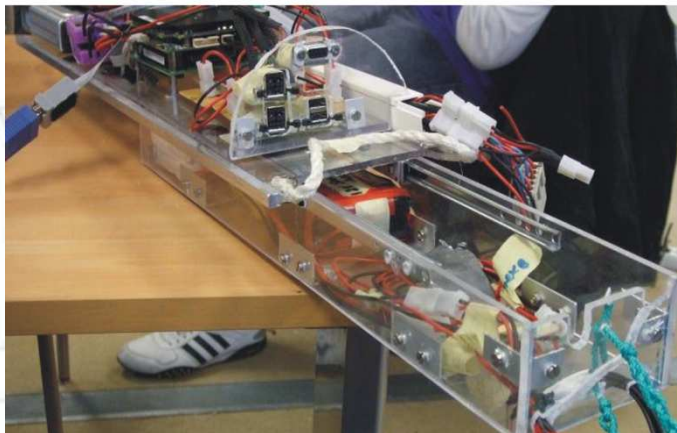
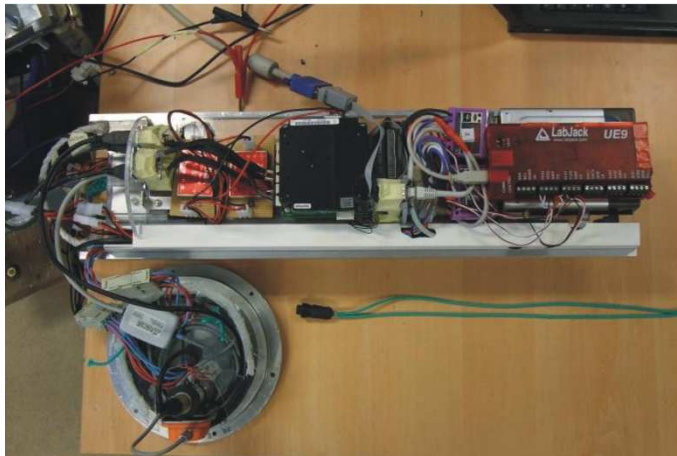
Cameras :
We use 2 watertight cameras to locate different objects in the water.

Thrusters :
2 horizontal thrusters handle the speed and the direction of the robot.
1 vertical thruster controls the depth.
The submarine is stable thanks to a heavy keel which is also used to hold the sonar and the vertical thruster.

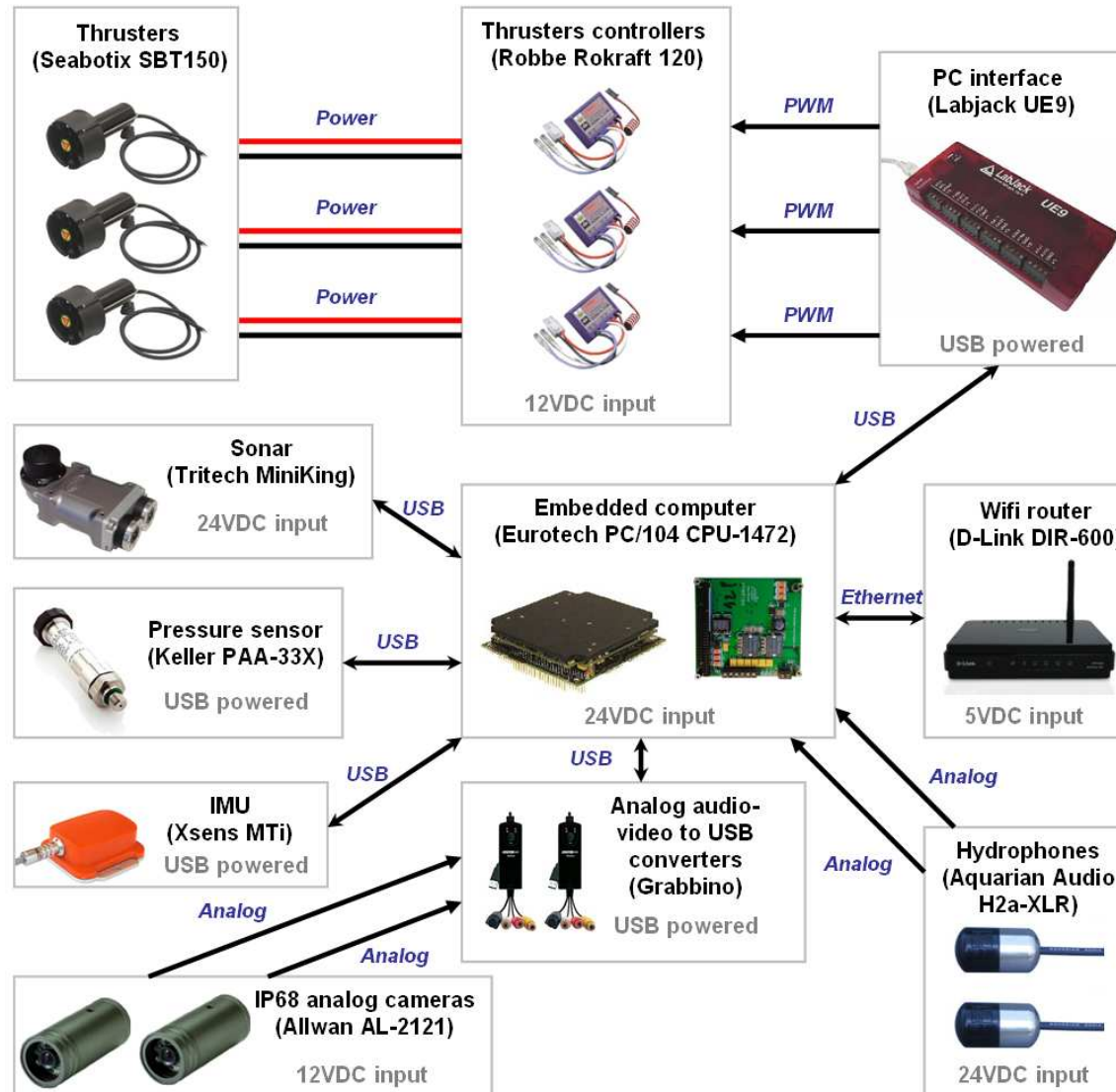
Sonar :
The sonar is used to localize the submarine by trying to detect the borders of the water area. The sonar makes a continuous scan of 360°.



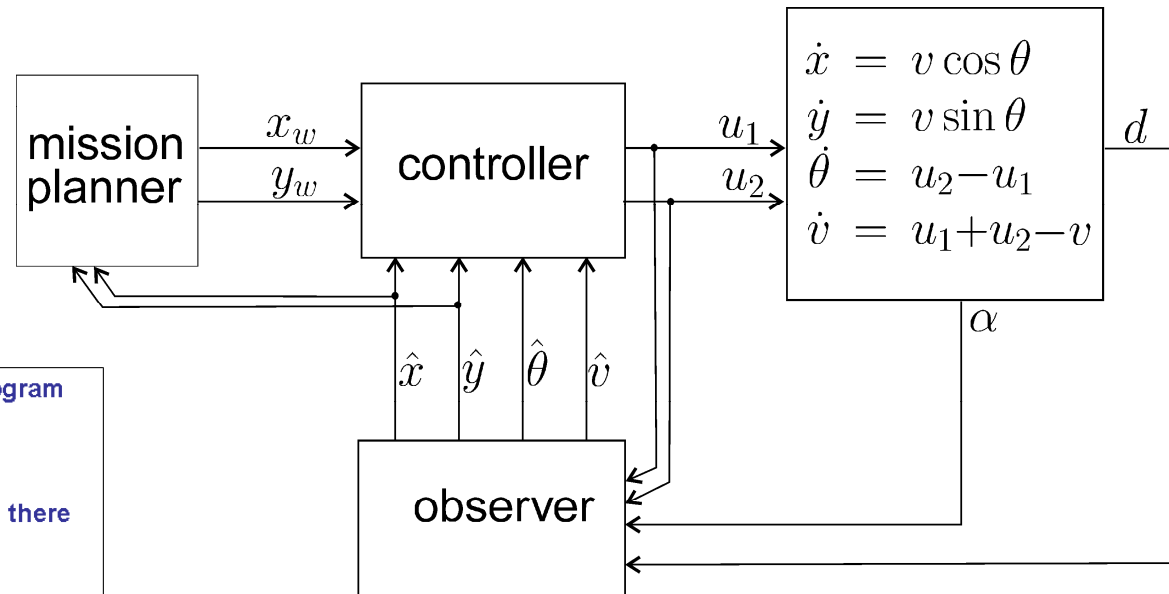
Principaux robots et concours



Principaux robots et concours



Principaux robots et concours

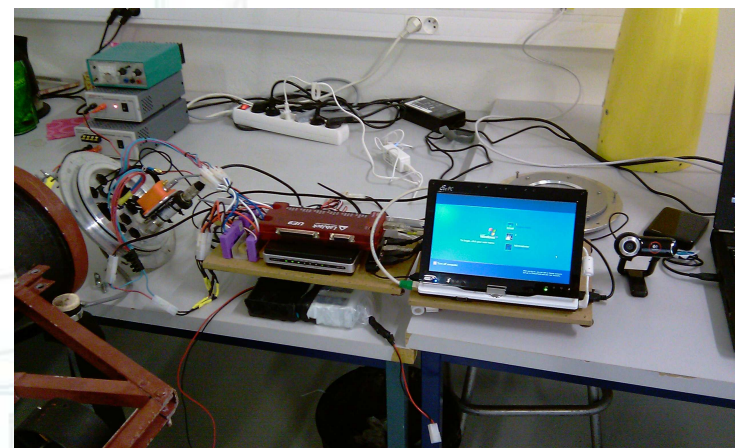
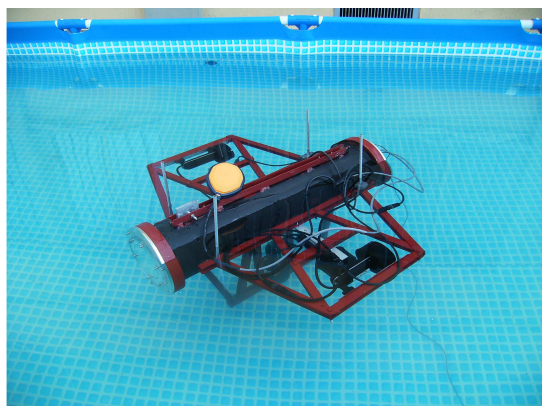


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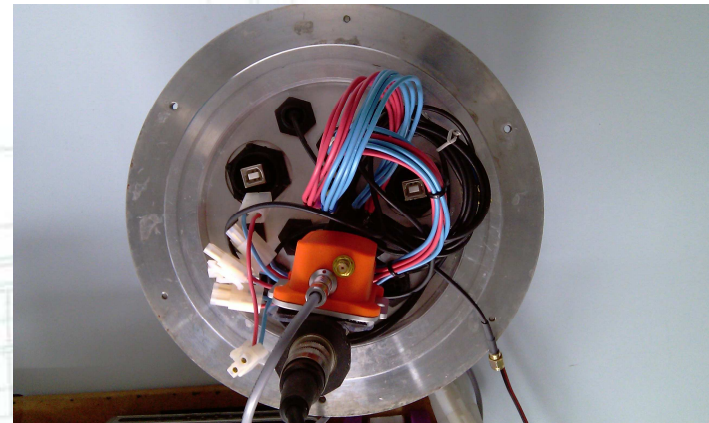
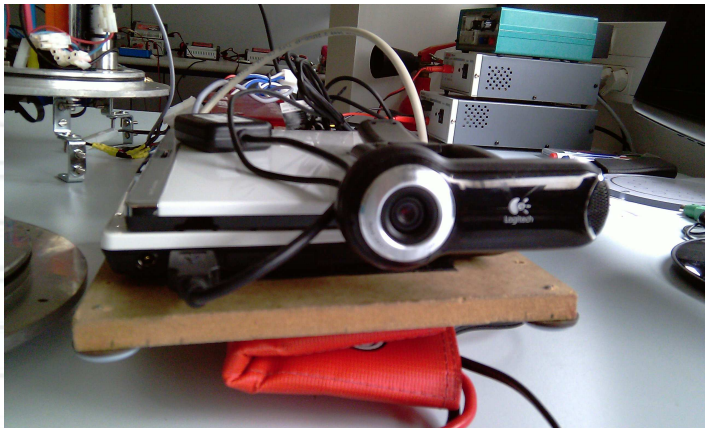
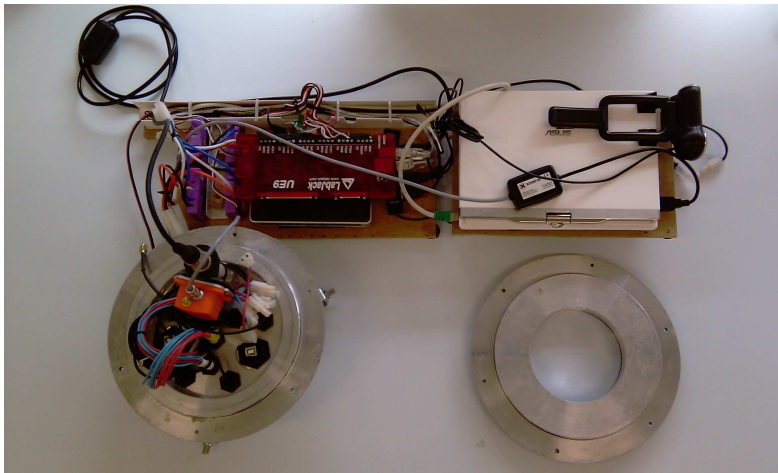
% this is a commentary. It is ignored by the program
% Example 1: go to depth -3m
%% step1: start depth regulation
depthreg -3
%% step2: wait 15s for the robot to actually get there
wait 15
% Example 2: some random movements at -3m
heading 1
wait 5
thrust 1
wait 10
stop
heading 1.57
wait 10
% Example 3: high level action
configureWallFollowing 12.5 1.2 -1.57 0 0.3 0.2 0.5
startWallFollowing
wait 20
stopWallFollowing
generalstop
depthreg 0
    
```

Principaux robots et concours

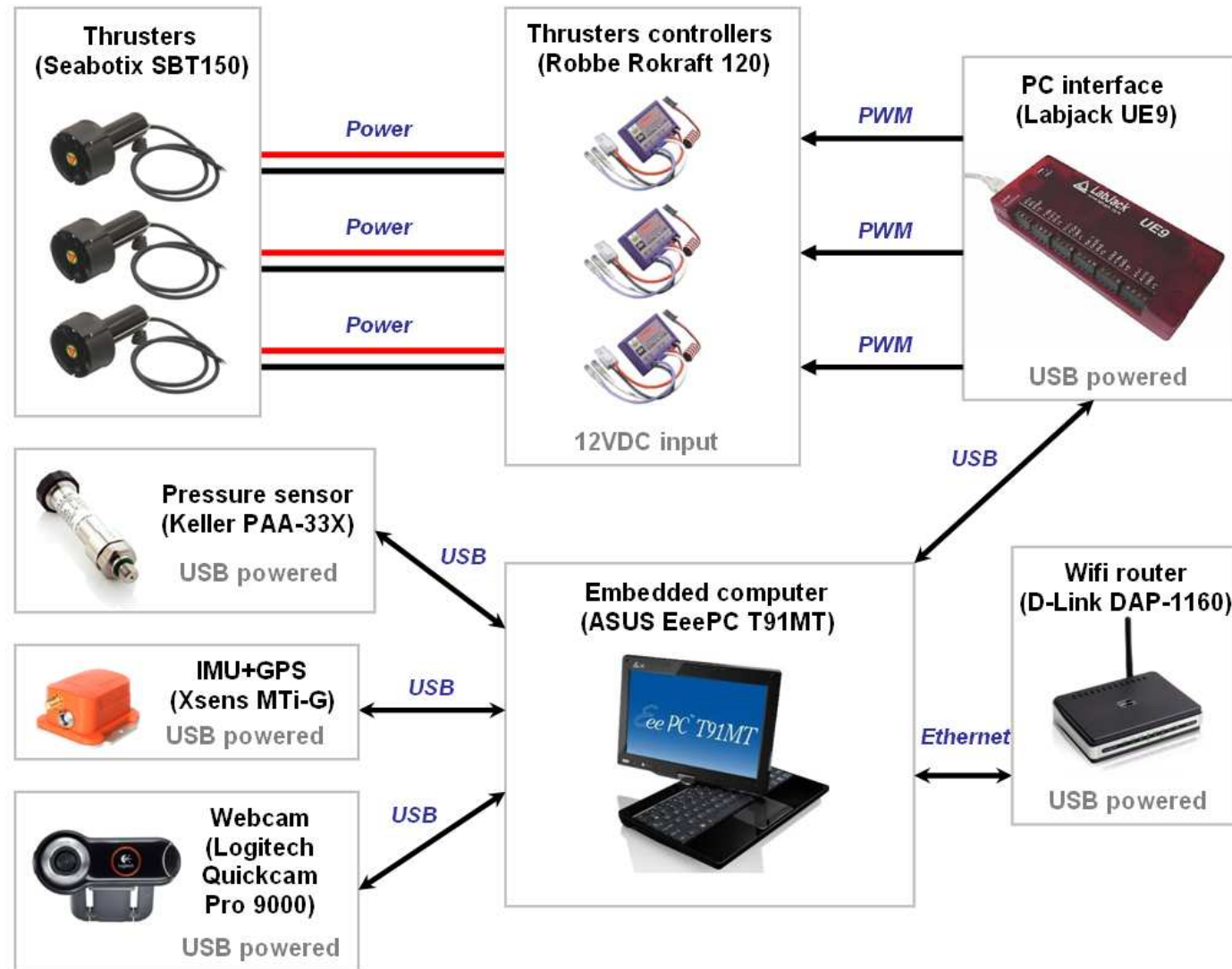
- SAUC-E (Student Autonomous Underwater Challenge - Europe)
 - SARDINE



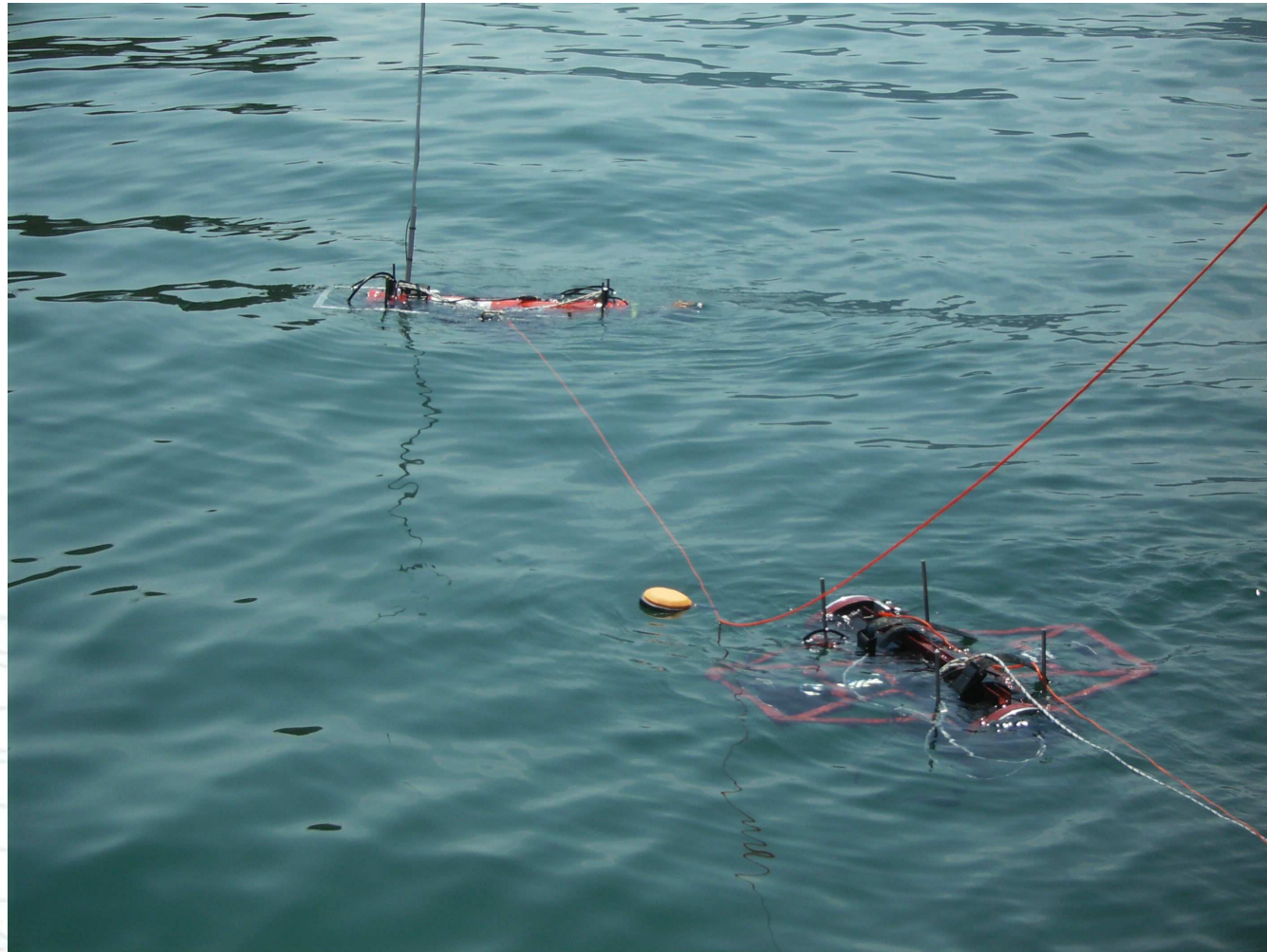
Principaux robots et concours



Principaux robots et concours

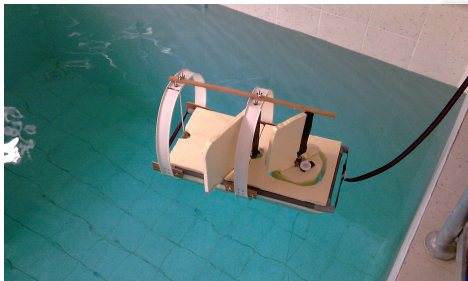


Principaux robots et concours



Principaux robots et concours

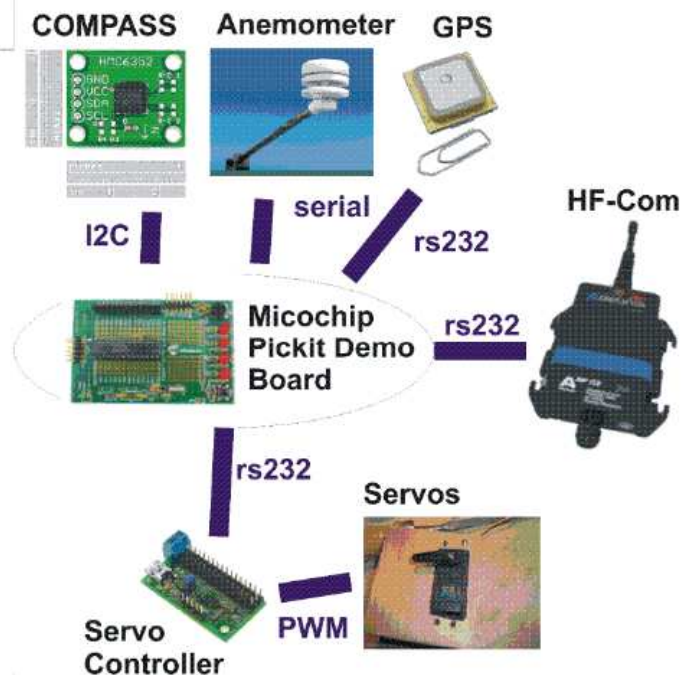
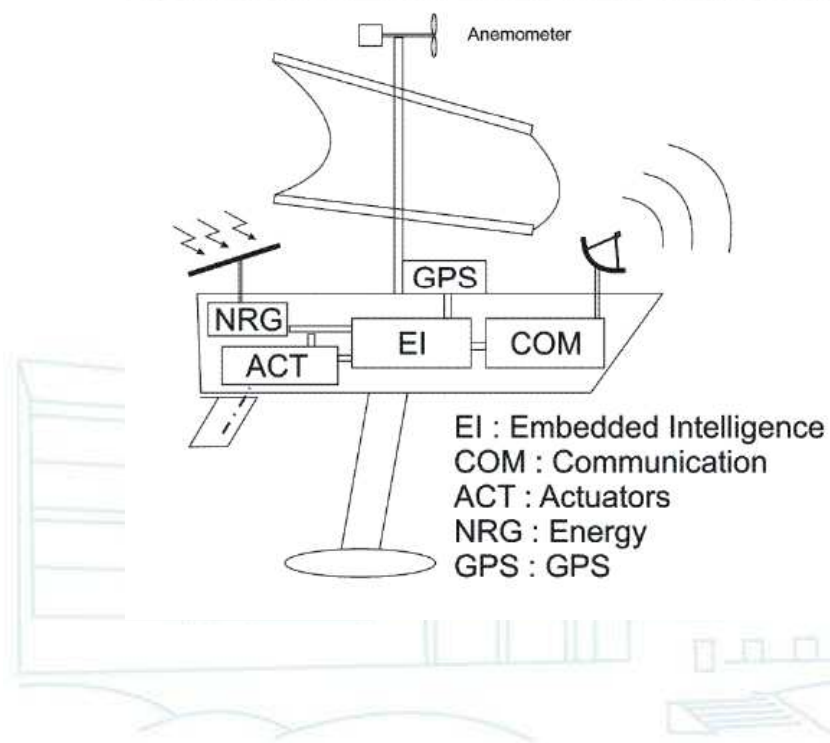
- Robots voiliers autonomes
 - Ocean Conqueror (mini et maxi)
 - Optimist
 - Traversée de la rade
 - Challenge Microtransat



Principaux robots et concours

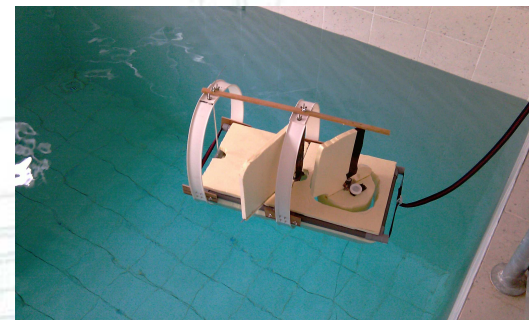
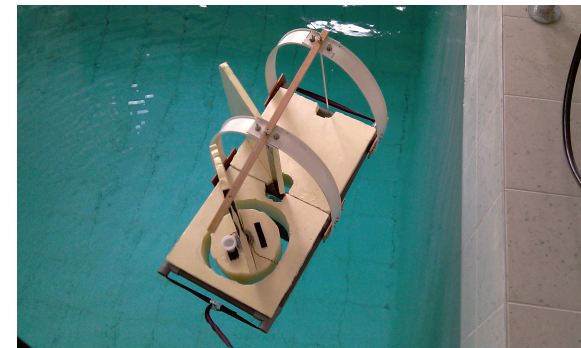
- Robots voiliers autonomes
 - Principe de leur électronique

Simplified diagram of the transatlantic robot's electronics



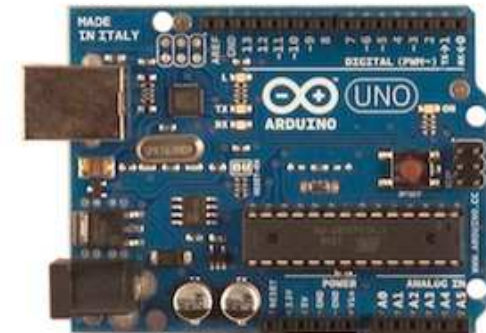
Principaux robots et concours

- Robots voiliers autonomes
 - Ocean Conqueror (mini et maxi)



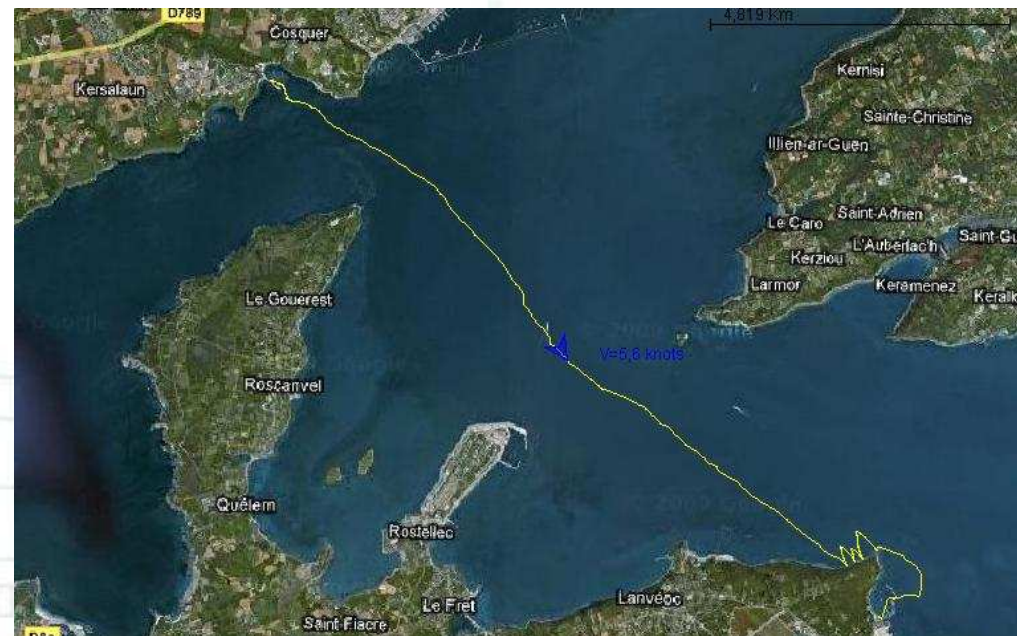
Principaux robots et concours

- Robots voiliers autonomes
 - Optimist



Principaux robots et concours

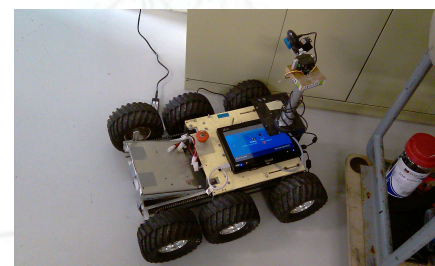
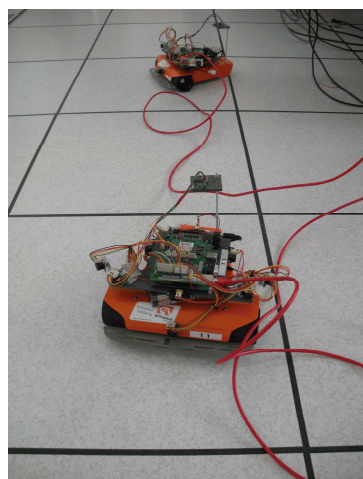
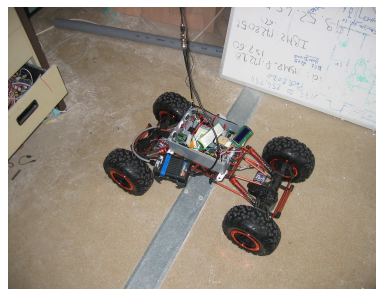
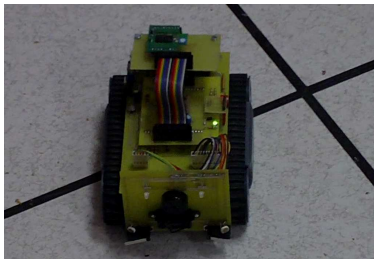
- Robots voiliers autonomes
 - Traversée de la rade



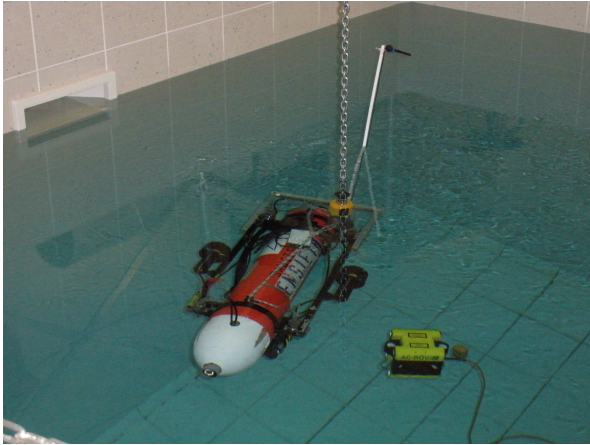
Principaux robots et concours

- Robots voiliers autonomes
 - Challenge Microtransat :
 - Course de traversée transatlantique pour voiliers autonomes
 - Chaque bateau doit donner sa position toutes les 24h





Autres robots



Organisation

Organisation

■ Moyens

- Budgets

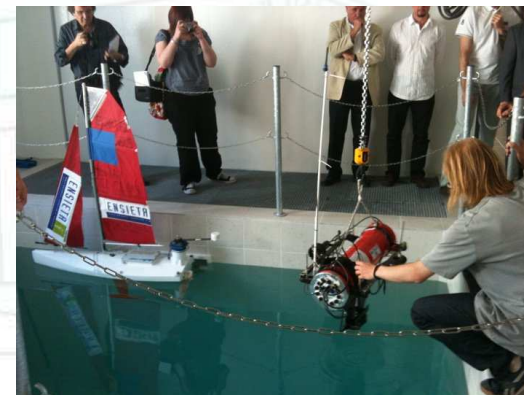
 - 35000€ par la MRIS

 - Budgets pour l'enseignement (TP, projets,...)

 - Prix gagnés aux concours et sponsors (club robotique)

- Bâtiments réservés à la robotique

 - Bâtiment M : salle M 003 zone robotique, possibilité d'utiliser la piscine en M 014 pour des tests



Organisation

- Encadrement :

- Professeurs

- Luc JAULIN (D 214, luc.jaulin@ensta-bretagne.fr)

- Olivier REYNET (D 207, olivier.reynet@ensta-bretagne.fr)

- Benoît ZERR (D 209, benoit.zerr@ensta-bretagne.fr)

- Benoît CLEMENT (D 210, benoit.clement@ensta-bretagne.fr)

- Yvon GALLOU (M 011, yvon.gallou@ensta-bretagne.fr)

- Gilles LE MAILLOT (M 111, gilles.le_maillot@ensta-bretagne.fr)

- 2 doctorants anciens élèves de l'école

- Fabrice LE BARS (D 208, fabrice.le_bars@ensta-bretagne.fr)

- Jan SLIWKA (D 208, jan.sliwka@ensta-bretagne.fr)



Questions?



■ Liens utiles pour plus d'informations

- <http://media.ensta-bretagne.fr/robotics/>
- <http://www.ensta-bretagne.fr/Jaulin/club.html>
- <http://www.youtube.com/user/ensietarobotics>
- <http://www.facebook.com/pages/SAUCISSE/142805275731790?ref=sgm>

■ Contacts

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- fabrice.le_bars@ensta-bretagne.fr