

Introduction

RoboLab is the centre of activities related to robotics and automation at the Faculty of Engineering. The lab is the home of a number of major research and development projects including researchers, students on bachelor and master programmes and industrial partners.

The lab is located in 'Hal J' at Niels Bohrs Allé 1.
The newsletter will report on activities at RoboLab.

Welcome

Welcome to the first RoboLab Newsletter in the autumn semester. In this issue you will find reports on events that took place during the summer period.



Formula Student

The annual 'Formula Student' contest, was held at the Silverstone Race Circuit in England on 10-13 July. Our faculty participated as the 'SDU-Vikings Racing Team' among about 90 other teams representing different universities from throughout the world. Almost 2000 students were gathered at the circuit.

Last year we participated, for the first time, in class 2; a class for teams who have progressed beyond initial design concepts and who have built not a complete car but as a minimum a complete chassis. At this event the design concepts were presented and the chassis were scrutinised in detail by strict judges. Our car didn't pass because of a welded crash bar – it has to be manufactured in one piece!.

This year we participated in class 1; a class for ready to drive race cars. Points were

awarded for design, presentation, budget, acceleration, skid pad, sprint, endurance and fuel economy.

To design and build a race car in a team, is a tremendous challenge for a student and it takes a great deal of commitment – and technical and cooperative skills. The project involves many different skills: design, mechanics, electronics, computer science, project management, etc.

The project runs for a relatively long period, meaning that different project groups come and go – each working on parts of the overall project. The students come from different semesters and different fields of study; final projects, bachelor projects, master theses and international semesters. 26 students participated in the previous semester – about half of them studying electronics/computer science.



You may wonder why so many electronics/computer science students participate. The reason is that we have

decided to make an electronic implementation of as much of the car's functionality as possible; engine control, dashboard, gearshift, launch control, data logger – all tied together in a real-time network.



The process of getting the car ready for the tournament in July was beyond hectic - not least because there was a report to write and an exam to pass in June! After the exam period the students carried on with the project in a praiseworthy manner and worked round the clock. They only just managed to 'test' the car (i.e. to let it run for a short round at our car park) the night before shipping it to Silverstone (not much of a test!!!).

At Silverstone we carried on with error corrections, modifications, tuning and repair – four days and nights with not much sleep! Before participating in the tournament the car had to be security approved through visual inspection, brake test, tilt test and noise test. The security approval was handled by skilled officials - the security had to be in top before the car enter the racetrack! The car didn't manage to pass on first try so we had to work hard for a couple of days before it passed.

Before leaving Denmark we would have been more than happy if the car could just pass the security approval; and now the car was actually approved for the racetrack! Wow! Though by that time we had missed two of the contest disciplines: acceleration and skid pad. This meant that it wasn't possible to win a top placement – well, we

just had to carry on to see how far we could go in the last two disciplines.

The sprint discipline was carried out on a narrow curved track. We passed but overturned several traffic cones – the car simply couldn't make a sharp enough turn! Just another problem to be solved before next day's race!

Hard work on the car and it was ready for the last challenge: the endurance/economy race. In this discipline the car must run 22 km (25 rounds). Another problem arised; suddenly the gear lever didn't work properly and the car had to drive in 2nd gear all the time! (not that economic). On the round 24 just 20 meters before the finishing line, the car ran out of petrol! Zero points – in spite of officials arriving and pushing it over the finishing line.

We could have finished as number 36 if we had completed the endurance race – instead we ended as number 55 of the 72 approved cars. Actually quite okay in the light of the struggles we faced and the fact that the top team opponents work on a budget of about 1,000,000 Euro !!! We have a budget of about 200,000 DKK.



Finally, thanks to all the participants for your great involvement in and commitment to the project. This contest is a great challenge for students at the faculty and we hope to welcome new students, who will find the project exciting and who will want to commit to it. If you're interested you can go to the RoboLab (Hall J) to have a look at the car and to talk to some of the people working on the project. You can find more

information on www.sdu-vikings.dk or 'google' 'SDU-Vikings' and 'Formula Student'.

Summer Course in Localisation and Navigation for Mobile Robots

Equipped with laptops and four mobile robots (one Pioneer AT, one Seekur and two CoroWare CoroBots), nine students assembled for the August 2008 introductory course on Localisation and Navigation. This is the first time that The Maersk Mc-Kinney Moller Institute has offered this course. Compared to previous summer courses in the construction of mobile robots (AF50), the focus was on high level algorithms and applications.

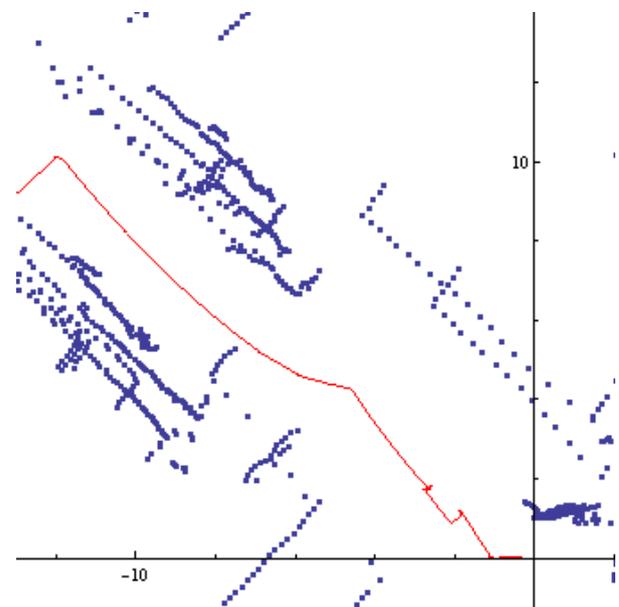


Pioneer AT and Seekur robot in the RoboLab

The course schedule consisted of two weeks of lectures and lab work followed by a week of journal writing and remaining work on the robot platforms. Using a range sensor and feedback from the wheel encoders, the students would implement an algorithm to keep track of the position of the robot when driving in a known environment. The Pioneer AT and CoroWare Corobot robots would drive around in an office, whereas the Seekur robot would roam the parking lane.

To implement the tracking algorithm the students had to be familiar with a programming and simulation framework

(ARIA for the Seekur robot, and Player/Stage or Microsoft RobotStudio for the Pioneer AT and CoroWare Corobot robots), as well as with kinematics of differential drive robots, extraction of features from range sensor data, matching of features to environment landmarks, and a filtering algorithm for maintaining the current estimate of the robot position (a Kalman filter or a particle filter). Other selected topics of the course were path planning algorithms and the optimal order for searching a number of rooms.



Range sensor scan from the parking lane.

Aloha – RoBlood project presented in Hawaii

It's not always easy to be a PhD student in the field of medical robotics. In fact, being a PhD student in the RoBlood project involves a lot of travelling in order to share the vision and goals of the project with other researchers. All the travelling can become almost unbearable to cope with and a huge burden on an already troubling study.

The latest research results in the project were presented in a paper and submitted to

the IASTED conference in Signal and Image Processing. Unfortunately for me, the paper was accepted and selected to be presented at the SIP08 conference in Hawaii.

So without hesitation, I put aside my personal wants and needs for a week and volunteered to go to the other side of the globe and present the paper. This I did only to spare my fellow researchers the trouble and discomfort of a very long trip. I am sure that my colleagues will do the same for me, if similar circumstances should arise. As you can see in the below picture, I am trying very hard to enjoy the trip despite all the many distracting elements as beautiful surroundings and warm weather.



The reader must understand, that this trip to Hawaii was entirely work related and therefore without any room for personal pleasure. Therefore, returning to the cold and rainy Danish weather was a relief for me. It meant that I could concentrate on the research without constantly thinking of the sunny pool area at the hotel in Hawaii.

Thank you SDU, for giving us the best research conditions in the world 😊

Thiusius Rajeeth Savarimuthu

Colophon

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External partners: MPN, RoboCluster, Scape, Danish Technological Institute, Universal Robots, Odense Technical College (OTS).