

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.

RoboDay

-project in RoboLab?

Our dynamic project environment has made RoboLab the largest and most impressive robotics lab in Denmark. We are ready to start a new season with projects and activities in almost all subject areas and levels. Turn up and find out how you can influence the future in RoboLab:

Tuesday 29 April at 1 pm in RoboLab

Programme:

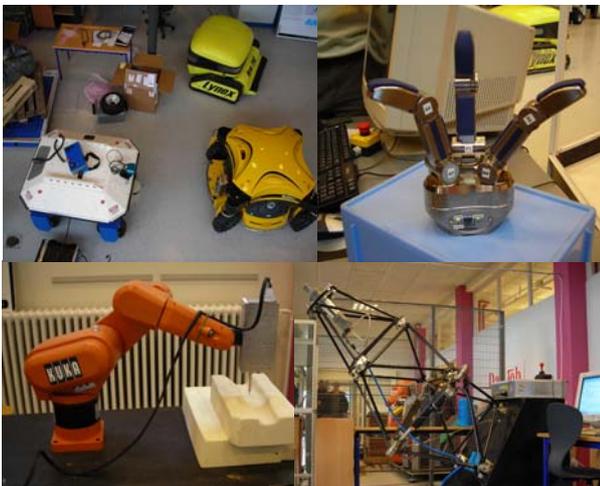
13.00-14.00: Inspiration, presentation of activities and equipment

14.00-14.20: Break with refreshments

14.20-15.20: Specific project ideas

This event is for:

- Students who are starting their project this autumn
- All others who are interested in robotics



Featured student project

This edition features an interesting spinoff project from the research done in RoboLab on the blood sampling PhD project, lead by Rajeeth Savarimuthu, which aims to automate the process of drawing blood from a patient.



Andreas Jensen is studying to be MSc in computer systems engineering and he is currently working on his bachelor thesis project in the offices above the lab. He is exploring the possibility of speeding up the computer vision algorithms used to process the infrared images of the patient's arm. The initial goal of the project was to see if it was possible to optimise the existing algorithms used to identify the veins in the image. 'The computer vision algorithms we are using are so computationally intensive that it currently takes minutes to process one frame from the video stream', says Andreas Jensen, 'The aim is to bring down process time so the image analysis can be done in realtime with 25-30 frames per second. This way it will be possible to see

instantly where the computer thinks the veins are’.

To achieve this goal Andreas is using a new and interesting approach; in the computer graphics industry the constant demand for better 3D graphics from new games, has driven the development of very powerful specialised processors used in modern graphics cards. ‘Until now the processors on 3D graphics cards have been too specialized to be of any real use, except for drawing 3D graphics’, Andreas explains. ‘This is beginning to change with the most recent generation of graphical processors from e.g. nVidia. The hardware is becoming general enough to be programmed almost as if it is a normal processor’. Nvidia is actively supporting this with the CUDA programming interface, which presents the graphical processor of the GeForce 8800 Andreas is using, as 12 parallel processors. ‘The challenge now is to adapt the algorithms so we get the best advantage from the 12 processors on the card’, Andreas explains.

Already now, half way through the project the numbers are promising; ‘initial tests show a 140x speedup by using the graphics card as a processor, and I still have some ideas I want to try’, Andreas concludes.

Robot Festival at Experimentarium

The first weekend in April RoboLab shipped the Wiimote controlled PA10 robot to Copenhagen to participate in the ‘Robot Festival’ science fair arranged by Experimentarium. Experimentarium is the natural science centre that aims to convey the different topics of natural science to primary, secondary and college students in Denmark through hands-on experience. Also present at the fair was ABB with two conventional 6-axis industrial robot arms.

More interesting was this year’s lineup of AGV’s (autonomous guided vehicles). The Technical University of Denmark (DTU) was present with this year’s track for the Danish national contest in robotic vehicles called the DTU RoboCup, along with some of the vehicles that were to participate in the contest held a few days later on 10 April.



Also present was Stanford University with their full size AGV called Stanley that won the 2005 DARPA Grand Challenge for robotic vehicles. Even though Stanley was confined to its podium during the stay in Copenhagen, it was possible to get a closer look at all the technology mounted both inside and outside the Volkswagen Touareg 4X4 that Stanley is build upon.



The Stanley CPU

On the roof of the car was an impressive array of five SICK laser range scanners (similar to the scanners we use in RoboLab on the Seecur mobile robot and our robot cell security system), a colour camera for medium range road perception, and two forward looking 24GHz radars for long range sensing up to 200 meters ahead. Also mounted on the roof was GPS antennas, which, in combination with inertial motion sensors and odometry, give Stanley accurate position information. Stanley employs a very novel system for one of the distance measuring systems (odometry); sensors mounted in the wheel wells look at the imprint the tyres leaves in the sand. This imprint is then used to measure the distance the Stanley has travelled.



SICK scanners on Stanley

The above and much more interesting technical information about Stanley can be found at:

<http://robots.stanford.edu/talks/stanley/>

If you are interested in robotic vehicles be sure to keep an eye out for this year's AGV summer course in RoboLab, which will be announced within a few weeks.

Presentation of SMAC linear actuators

The moving coil linear actuators from SMAC spans the gap between pneumatic actuators and classic electric actuators, as they have:

- The speed of pneumatics
- The precision of electric motors
- They can also emulate the 'softness' of pneumatics, as the 'softness' is computer controlled

The actuators have the following key characteristics:

- Range of motion: 10-100mm (depending on model)
- Force: 10-40N (depending on model)
- Acceleration: only limited by the force/mass relationship
- Speed: only limited by the acceleration and voltage supply
- Accuracy: Standard models of 5, 1, and 0.5 microns. Resolution down to 10nm as special orders

SMAC develops various products where more actuators are combined into multi axis actuators. For example a combined linear-rotary unit or 3 linear actuators combined to an X-Y-Z unit.

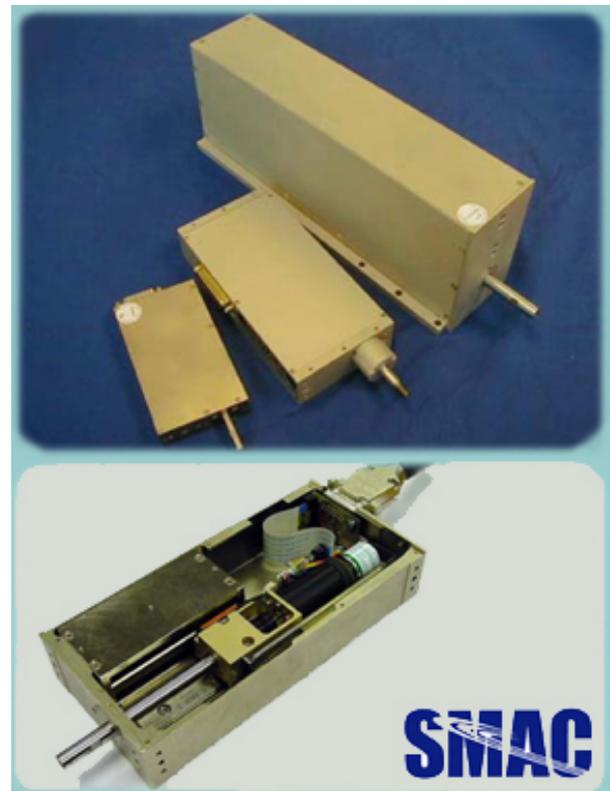
SMAC actuators are gaining favour in applications such as:

- Pick and Place
- Mechanical measurements
- Quality control
- Grasping

The SMAC agency in Denmark is owned by the company AVS.

AVS will visit the Faculty of Engineering on 28 April at 2 pm (room D1) in order to present the actuator technology and answer questions.

Everybody with an interest in the SMAC actuators are welcome to attend.





RoboLab at FieldRobotEvent 2008

12-14 June 2008 RoboLab will participate in the 2008 Field Robot Event held in Osnabrück, Germany. The annual event features an open-air field robot contest with different challenges such as navigation in maize fields and weed control.

RoboLab will send our autonomous AGV 'Seekur' and the two remote controlled 'Spider' and 'Lynex' robots to showcase our current research in field robotics.

For more information about the event have a look at www.fieldrobotevent.de. If you are interested in more information about the research in field robotics being done here at the faculty of engineering, feel free

Currently Present at the RoboLab

SDU Institutes: Institute of Industrial and Civil Engineering (IB), Institute of Chemical Engineering, Biotechnology and Environmental Technology (KBM), The Maersk Mc-Kinney Moller Institute (MMMI), Institute of Sensors, Signals and Electrotechnics (SENSE)

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

to contact Rasmus Jørgensen and Kjeld Jensen from the KBM institute, or have a look at www.casmobot.dk.

Coming events

- 23-25 April: Bus trip to **Hannover Fair 2008**.
- Monday 28 April at 2 pm in room D1: Presentation of **SMAC linear actuators**
- Tuesday 29 April at 1 pm: **RoboDay**
- Wednesday 7 May at 2 pm: **Plant Nursing Robotics**. Kjeld Jensen and Rasmus Jørgensen from the KBM institute will talk about ongoing projects in the area of field robotics vehicles.

Colophon

This newsletter is published by the RoboLab at The Faculty of Engineering.

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