

May 2008

## 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.

## Summer Edition

This is the last RoboLab Newsletter in this semester. Read about the Guitar Hero winner and the four robotics related summer courses of which one will be introduced at the Plant Nursing Robotics talk, see below. To register for a course, please go to the student self-service or send an email to Dorthe Anicka Wagenaar ([anicka@mmmi.sdu.dk](mailto:anicka@mmmi.sdu.dk)).

Spend August on an exciting summer course!

## Plant Nursing Robotics

*An introduction to our research activities within field robotics vehicles for plant nursing*

Monday 26 May, 14.00 at RoboLab

The environmental research group at the Institute of Chemical Engineering, Biotechnology and Environmental Technology (KBM) is conducting research in alternatives to traditional farming. In this talk we will present our research activities within the design and development of field robotic vehicles for plant nursing.



Working with field robotics vehicles requires a knowledge and understanding of many different scientific and engineering specialties: Mechanical and visual design, the physics of sensors and actuators, interface electronics, wireless communication, user interfaces, vision, navigation and autonomous software, to name some of them. The research group is therefore cooperating with the other institutes at the Faculty of Engineering.



We will present our current results from the Plant Nursing Robotics and Omnirota projects. We will also give an introduction to the new **summer course** with the title **Design and Development of Field Robotics Vehicles** running this August. Naturally, we will be happy to answer any questions you may have about the summer course and the possibility of writing a bachelor or master thesis related to plant nursing robotics.

Rasmus Jørgensen  
[rasj@kbm.sdu.dk](mailto:rasj@kbm.sdu.dk)

Kjeld Jensen  
[kjen@kbm.sdu.dk](mailto:kjen@kbm.sdu.dk)

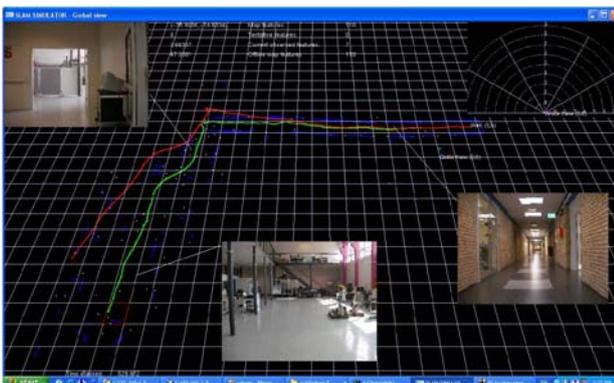


## Summer Course

### Mobile Robots - Localisation and Navigation (5 ECTS)

On 11-22 August the Maersk Institute offers a summer course in localisation and navigation for mobile robots. During the course students will become familiar with different algorithms for mobile robots and control frameworks such as MS Robotics Studio and Player/Stage. Through the project work you will get an opportunity to implement various algorithms and experiment with robots which will be ready to use. The course provides an excellent opportunity to gain insight into the world of mobile robots, which could provide interesting topics for bachelor and master projects.

The course is organised with approximately two hours of lecture in the morning and project work for the rest of the day. It is available for bachelor students on the 5th or 6th semester (as RBROB20) and for master students at any semester (as RMROB20). The course is targeted at computer systems engineering (Datateknologi) and IT engineer students. Others are welcome, but some experience with programming and knowledge of basic algorithms is required to follow the course.



The course description can be found on the RoboLab wiki ([roboLab.tek.sdu.dk](http://roboLab.tek.sdu.dk)). For more information, please contact Lars-Peter ([lpe@mmmi.sdu.dk](mailto:lpe@mmmi.sdu.dk)) or come by room D215B.

## Guitar Hero Prize

Jesper Sønnichsen got a chance to show off his fine motor skills during Forskningsens Døgn (Festival of Research) at the plaza in front of Odense city hall on the last weekend of April. He was able to beat not only RoboLabs guitar playing robot but also all the human competitors in a musical shootout in the computer game Guitar Hero. First prize was a brand new Xbox 360 Elite with the Guitar Hero III game sponsored by Microsoft in Denmark.

In the weeks up to the event RoboLab had been working hard to construct our very own robotic guitar hero. The robot is build as a torso with two of our new lightweight EasyBot arms from Universal Robots (our local robot company with headquarters right next to the lab). One of the arms was designed to hold on to the guitar with a strong magnet, and the other arm was fitted with a 5-fingered hand that can press the buttons on the guitar joystick for the game.



The hand, designed by Thomas Priisholm who has recently graduated as mechatronics engineer from SDU in Sønderborg, is actuated by five small pneumatic cylinders and was designed specifically for the guitar. To make the hand look as human as possible and still be able to press all five buttons on neck of the guitar joystick, Thomas took a little inspiration from guitar

legend Jimmi Hendrix who also used his thumb to press the strings when he played the guitar.



To make the robot actually play the game, a PC with a cheap TV-tuner card was connected to the video output of the Xbox. The open source computer vision software OpenCV was then used to analyze the video signal and calculate when to press the buttons on the guitar with the 5-fingered hand.



Jesper Sønnichsen, the lucky winner, was handed the prize last Wednesday. 'I think I'll have to wait until I have finished my exams before I unpack the Xbox' Jesper explains with a smile. His is just a few weeks away from his HF (higher preparatory exam), and plans to take a year off for work and travel after he graduates. 'I'm sure I will have plenty of opportunity to take it for a spin then'. Congratulations to Jesper from RoboLab!

## Summer Course Multi-Agent Systems (5 ECTS)

The significance of multi-agent systems research and technology is increasing due to the growing need to coordinate distributed operations, their increasing use to simulate complex systems in a decentralised way, and the developing communication infrastructure.

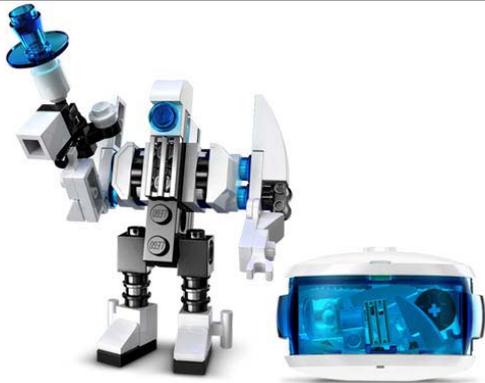
The aim of the course is to give participants a grounding in multi-agent systems - one of the most active areas of computer science and artificial intelligence - and put them in a position to participate in either multi-agent projects and/or to prepare them for MAS use in industry.

After a general introduction to multi-agent systems, the basic notions of the domain, insisting on methodological issues of how such systems may be conceived and realised, are presented. It is shown how MAS methodology is different from more traditional methodologies, and the best problems and the particular domains in which MAS seems to be the most promising paradigm to adopt are identified. MAS are approached by splitting them into Agents, Environments, Interactions, Organisations and Dynamics. Having established the different parts that constitute MAS, the programming tools (from languages for building MAS to integrative environments) are dealt with, before presenting multi-agent oriented programming.

In the final part of the presentation, examples of real-world applications are presented in various domains (vision, GIS, NLP, robotics, simulation of complex natural systems, software engineering, telecommunications, town and country development, Internet applications).

As part of the course, several exercises are analysed and programmed using a standard multi-agent-oriented programming tool. No prior background in multi-agent systems and technology is expected, even though a basic background in Artificial Intelligence and/or Software Engineering will certainly help.

Lecturer: Yves Demazeau.



## Summer Course

### Robots and Dynamic Agents Interfaces (5 ECTS)

The goal of the course is to introduce students to the basic aspects of robots and other dynamic, life-like agents with a final focus on how to interface human activities to such agents.

Basic robots (such as LEGO MINDSTORMS, TILES, I-BLOCKS, etc.) are used as tools for the study of dynamic agents. Students will be introduced to the robots and the different ways of programming such robots.

After a short summary of traditional agents, human cognition and interfaces, the crucial aspects and techniques of new emergent technologies, such as artificial life and self-adaptive robots, will be presented. Robotics, input-output relations, adaptation, neural networks and other artificial life techniques will be examined. A practical section will follow and students be requested to run a small project in order to familiarise themselves with these techniques. Afterwards, lessons will face problems related to human machine interaction and related interface designs. Psychological and aesthetic aspects will be included. The last part of the lessons will focus on all the dynamic aspects of the human-machine relationship.

### Currently Present at the RoboLab

SDU Institutes: Department 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).

A project, during which students will design and realise a dynamic system with a particular human oriented interaction, concludes the course.

No specific prerequisites are required, but programming experience, mechanics understanding and know-how in electronics are suggested.

Lecturers: Luigi Pagliarini and Henrik Hautop Lund.

## Coming Events

- Monday 26 May at 2 pm:  
**Plant Nursing Robotics.**  
Kjeld Jensen and Rasmus Jørgensen from the KBM institute will present ongoing projects in the area of field robotics vehicles.
- 11-22 August: **Summer Course: Mobile Robots – Localisation and Navigation (5 ECTS)**
- August: **Summer Course: Design and Development of Field Robotics Vehicles (7.5 ECTS)**
- August: **Summer Course: Robots and dynamic Agents interfaces (5 ECTS)**
- August: **Summer Course: Multi-Agent Systems (5 ECTS)**

Actual dates for the three last summer courses will be announced later.

## Colophon

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

## Editorial Team

Palle Hermansen (pahe@mmmi.sdu.dk)

Anders S. Sørensen (anss@mmmi.sdu.dk)

Anders Bøgild (andb@mmmi.sdu.dk)

Dorthe Sølvason (dorthe@mmmi.sdu.dk)

Janne Valdgård Petersen (jvp@tek.sdu.dk)