

TDDE19 Advanced Project Course - AI and Machine Learning
Introduction
Cyrille Berger

Course overview

Lecture content

- Course overview
- Projects

Project

- Group ~6 persons
- Common theme, different tasks
- 160h
- Weekly meeting
- Customers

Outcome

- Project dependent
 - Code
 - Evaluation
 - Small report

Timeline

- W35: Project selection
- W36: Project discussion
- W37~38: Research
- W39~48: Implementation
- W49~50: Presentation

Project selection

- **Email me before Wednesday noon**
with:
 - Your LiU login
 - A ranked list of preferred projects
 - If you want to work as a group of several people together, send me a single email with all your LiU logins

Projects

Projects

- Multi Robots / Humans System
- Advanced dialog system for robotic system
- Objects recognition for robotic systems
- Obstacles avoidance for UAVs
- RoboCup @home with the Softbank Pepper platform
- Stream reasoning
- Teaching a robot to play football

Multi Robots / Humans System

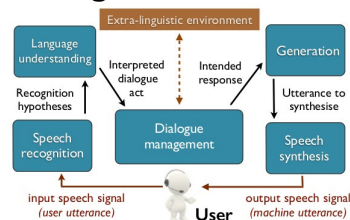
- Customer: Cyrille Berger



- Developing functionalities for a system of robots in a rescue operation
 - Path planning for a ground robot helped by a small UAV.
 - Gesture and speech recognition so that a human can give commands to a robotic system.
 - Using a virtual reality system (steamvr, occulus...) to display information about a robotic system and allows humans to remote control them.

Advanced dialog system for robotic system

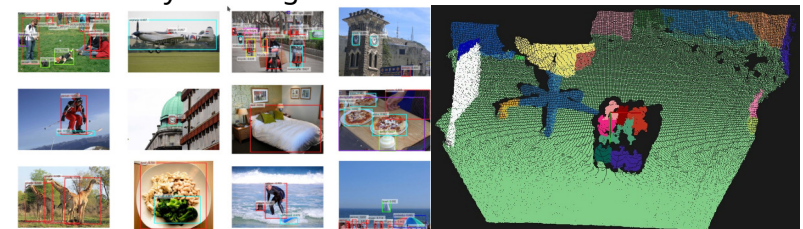
- Customer: Cyrille Berger



- The goal of this project is to implement a dialog system for a robotic system, that can be used for simple query (*where is robot X?*) or setup complex mission.

Objects recognition for robotic systems

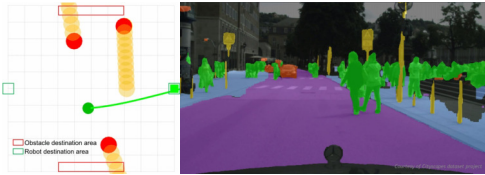
- Customer: Cyrille Berger



- Make it easy for robots (using ROS) to use different object recognition algorithms, possibly implement some of them
- Setup a training framework for a human operator to easily teach new objects to the robot
- **Require** access to a nvidia card

Objects recognition for robotic systems

- Customer: Olov Andersson



- In this project we suggest the students works with quadcopters equipped with a camera (or possibly a kinect-like device) to detect objects and generate trajectory to avoid obstacles.
 - Detection of obstacles in sensor data, mainly images
 - Improve Model-Predictive-Control+Machine-Learning work that has been done in our research group, for instance with system identification
- **Require** access to a nvidia card for the obstacle recognition part

RoboCup @home with the Softbank Pepper platform

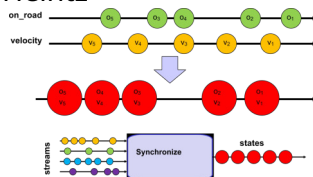
- Customer: Mattias
- The RoboCup@Home league aims to develop service and assistive robot technology with high relevance for future personal domestic applications.



- Assemble a full AI-robotics software stack in ROS using of the shelf components/packages. This includes Motion planning, Task planning, SLAM, Markov Localization, Exploration, Speech recognition, Speech syntesis, Human detector, QR-code detector (and possiblly additional object detectors).
- Demonstrate the scenario in the
- Demonstrate the scenario at some area in the B-/E-building using the Pepper
- Extend the scenario to make the tasks and interactions more

Stream reasoning

- Customer: Fredrik Heintz



- Probabilistic Logic Stream Reasoning over Continuous Data
- Multi-Hypothesis Stream Reasoning, extend the current stream reasoning engine to evaluate temporal logical formulas over streams of sets of states (compared to streams of states as today)

Teaching a robot to play football

- Customer: Fredrik Heintz



- Automatic Machine Learning Data Generation, use the Linköping Humanoids Nao robots to automatically collect machine learning data to for example automatically tune the ball detector or the pose calibration for different conditions.
- An Automated Robot Test Bed, use the Linköping Humanoids Nao robots to provide a fully automated learning test bed
- Bayesian Optimization / Programming by Optimization for the RoboCup Standard Platform League

Remember

- Deadline for project preferences is Wednesday, August, 28th at **noon**.