



June 6, 2012

STUDIENARBEIT / DIPLOMA - /BACHELOR - /MASTER THESIS  
for  
N.N.  
Mat.-Nr. XXXXXXXX, field of study XX-XX

### **Knowledge modeling for robot indoor mapping**

#### Problem description:

Bayesian logic networks (BLN) and Markov logic networks (MLN) are two powerful tools of statistical relational learning (SRL) which is a subdiscipline of artificial intelligence and machine learning. In general, SRL deals with models of domains that exhibit both uncertainty and relational structure. Methods developed in SRL are well suited for (but not limited to) knowledge representation. They use first-order logic to describe relational properties of a domain in a general manner and adopt probabilistic graphical models (such as Bayesian networks or Markov networks) to model the uncertainty.

In this Bachelor/Master thesis one should define and model common sense knowledge for indoor robot mapping [1] using either BLN or MLN, so as to enhance its performance. The underlying idea of this thesis is to demonstrate how the use of high-level knowledge (rule-based) could possibly ease low-level data processing. The BLN/MLN that is used for knowledge modeling must be trained using labeled data, and the final approach should be experimentally evaluated.

#### Tasks:

- Literature overview on knowledge representation using BLN and MLN
- Knowledge definition and modeling for robot indoor mapping
- Training of the BLN/MLN using labeled data
- Experimental evaluation
- Documentation

#### Bibliography:

- [1] Z. Liu, D. Chen and G. v. Wichert, Online Semantic Exploration of Indoor Maps. *2012 IEEE International Conference on Robotics and Automation*. St. Paul, USA.
- [2] D. Jain, S. Waldherr and M. Beetz, Bayesian Logic Networks. *Technical Report IAS-2009-03*.
- [3] M. Richardson and P. Domingos, Markov Logic Networks.

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