Template for thesis project proposals

Project Title	To build a hybrid map by augmenting the intrinsic kinematic model of a mobile robot to a spatial map, and semi-supervised learning of meanings towards self/situation awareness.
Author(s)	*Student(s) name(s)*
Keywords	robotics, mapping, semantic maps, unsupervised semantic mapping, data mining, kinematic model, situation-awareness.
Project description	;Background : Each region of a spatial robot map potentially has a meaning (semantics). For instance the map of house could be segmented into kitchen, corridor, bedroom, etc. The fact that these meanings are generated from what humans understand of their surrounding, is crucial for a successful communication (e.g. in HRI). On the other hand a robot becomes more situation-aware by knowing the semantic of its surrounding. The aim of this project is to integrate the kinematic/dynamic model of the robot into the spatial map of the environment. And employ an unsupervised method to identify the semantics of the environment while the self of the robot is also reflected in the spatial map. ;Objectives : The expectation is to bridge a robots self-awareness (e.g. traversability of a path based on its intrinsic models and the terrain), to the situation-awareness that is supposedly capable of estimating future state of the situation. ;Research Questions : How to integrate the intrinsic kinematic/dynamic models of a mobile robot seamlessly into the spatial map of the environment? How to identify ego-centric meanings that emerge from the integration of spatial maps and robots kinematic/dynamic model? ;Setup : Simulation, and experimental results the lab environment.
References	Pronobis, Andrzej, and Rajesh PN Rao. "Learning Deep Generative Spatial Models for Mobile Robots." arXiv preprint arXiv:1610.02627 (2016). Khalil, Wisama, and Etienne Dombre. Modeling, identification and control of robots. Butterworth-Heinemann, 2004. Shahbandi, Saeed Gholami, Bjorn Astrand, and Roland Philippsen. "Semi-supervised semantic labeling of adaptive cell decomposition maps in well-structured environments." Mobile Robots (ECMR), 2015 European Conference on. IEEE, 2015.
Prerequisites	Programming (preferably C++ or Python), Machine Learning, Data Mining. Bonus: Mobile Robots (kinematic/dynamic modeling), ROS.
Time frame	Spring 2017
Supervisor(s)	Saeed Gholami Shahbandi, Bjorn Astrand,
Programme	Mobile and Autonomous Systems
Examiner	*Name of project Examiner*
Signatures	*Student(s):* *Supervisor(s):* *Examiner:*