I. IDENTIFICATION DATA

Thesis name:	**Efficient self-exploration and learning of forward and inverse models on a humanoid robot with artificial skin**
Author's name:	**Maksym Shcherban**
Type of thesis :	bachelor ▾
Faculty/Institute:	Faculty of Electrical Engineering (FEE) ▾
Department:	Department of Cybernetics
Thesis reviewer:	Matthias Rolf
Reviewer's department:	School of Engineering, Computing, and Mathematics. Oxford Brookes University, UK.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment
challenging ▾

Evaluation of thesis difficulty of assignment.
The thesis subsumes challenging aspects both technically and scientifically. Proficient use of ROS and Gazebo, as well as a complex learning library was required to achieve the objectives. The research question requires substantial empirical work and interpretation thereof.
The difficulty is capped by the lack of a physical robot implementation of method and experiments.

Satisfaction of assignment
fulfilled ▾

Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.
Tasks 1-3 are achieved excellently.
Task 4 has developed towards exploring the impact of different exploration algorithms instead of model algorithms, which is equally relevant. A comparison of model algorithms is mentioned but no results actually shown.
Task 5 is discussed along some very interesting arguments, but no empirical results shown (which still clearly qualifies this task as achieved).

Method of conception
outstanding ▾

Assess that student has chosen correct approach or solution methods.
Methods are well chosen from start to end. While the technical foundations were largely prescribed, a good sense of methodological choice in the experiments down to very detailed critical analysis of the results is clearly demonstrated. Illustrations and tables are all well conceived and useful. The problem formulation as well as the experiments are logically and comprehensibly broken down into sub problems that are addressed consistently and satisfactory.

Technical level
A - excellent ▾

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.
Expert knowledge of the domain is clearly demonstrated conceptually, technically, and notionally. The learning framework is conceived very logically and based on up-to-date literature. All major aspects of data management and representation, learning, and exploration are well discussed and analyzed. The analysis of the experimental data clearly shows a very good critical stance and good understanding of this challenging research domain.

Formal and language level, scope of thesis   , A - excellent ▾

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.
Fully satisfactory.

Selection of sources, citation correctness   A - excellent ▾

Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.
Extensive amount of state-of-the-art research literature with good handling of sources content-wise as well as formally.
Technical resources are equally well represented and cited.

Additional commentary and evaluation
Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.
This thesis demonstrates an excellent technical and scientific achievement at the level of an undergraduate course. It is, in fact, interesting and relevant in a wider scientific sense that could warrant dissemination at a scientific venue. At that post-graduate level, I have several follow up questions and comments that might guide further discussion and investigation.

- The use of KNN makes some immediate sense for the discretized data domains modeled in this thesis, but results should have been actually shown. Discrete data ranges, while natural from the necessarily discrete sensor layout and a necessary first step, are not good to exploit the full strength goal babbling based algorithms. These algorithms thrive from being able to make extrapolations that allow very quick discovery, but which is only possible from continuous data. Continuous contact is in fact very briefly mentioned in the thesis. Also soft touch could be relevant for this line of investigation, as it spreads out measurement and makes adjacent sensors also metrically closer in the observation space.
- Random motor babbling seems in fact oddly efficient in Fig. 4.2 considering exploration happens in a 12 dimensional space in which touches should only occur sparsely by means on random motion. Have the ranges of motion been specifically tweaked to facilitate as many touches as possible in the area covered with sensors? Showing and analyzing the rate of contact could be useful.
- Out of reach goals in Fig. 4.3 are rather artificial, given that the true size of the space is an immediately known body property. The experiment nevertheless correctly points out an important general difference between the investigated algorithms.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION
Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

I evaluate handed thesis with classification grade | A - excellent ▾ |

Date: 31/05/2019   Signature: