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ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

SUPERVISOR'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	Retargeting Infant Movements to Baby Humanoid Robots
Author's name:	Ondrej Fiala
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis supervisor:	Doc. Mgr. Matej Hoffmann, Ph.D.; Valentin Marcel, Ph.D.
Supervisor's department:	Department of Cybernetics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **challenging**

Evaluation of thesis difficulty of assignment.

The thesis was challenging in the sense that it required abstract knowledge on geometrical transformations for the mastering of kinematic representations and their transfer to humanoid poses but also because it required the ability to transfer joint angles into two very different simulation platforms Mujoco and Gazebo and for different humanoid shapes (dummy, iCub, MIMo, and fetus). Additionally, the thesis required some understanding of the physics engines to simulate contacts and touch activation and the graphical renderers for the robot eyes. Moreover, the student had to get acquainted with infant biomechanics – proportions and constraints of small babies.

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.

The assessment is totally fulfilled with an addition of an extra humanoid shape (the fetus simulator) which has its own tactile sensors. The theoretical points were well understood and properly treated and the proposed practical solutions meet very well the assignments.

Activity and independence when creating final thesis **A - excellent.**

Assess that student had positive approach, time limits were met, conception was regularly consulted and was well prepared for consultations. Assess student's ability to work independently.

The student was autonomous and managed to consult the supervisors when required. Additionally, he provided very good visualization content to be used for the team's presentations of current research at conferences. Moreover, two of the target platforms required communication with external research centers (Frankfurt Institute of Advanced Studies; University of Tokyo), which the student perfectly managed.

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.

Tthe work is in line with state of the art formalization of 3D pose representations for humanoids. Filtering and analysis of motion where also justified using expert literature. Additional knowledge obtained from the retargeting on iCub, MIMo, and fetus simulator has been gathered, compared and synthesized in the thesis.

Formal and language level, scope of thesis **A - excellent.**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.
The notations in the thesis are clear and pertinent, and reflect the knowledge on the state of the art. The thesis is well arranged and the student has made a very important pedagogical effort to describe his work. The combination of formal mathematical notation, schematics, block diagrams and photos/videos is appropriate and of highest standard.

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.
The sources selected by the student are pertinent state of the art methods and are well cited and the presented work is well placed in the literature.

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.
All the goals of the thesis have been achieved with the addition of an extra humanoid platform: the fetus simulator. The thesis provides a detailed and sound groundwork for any additional projects on the subject. The text is very didacticl and well documented. The student dealt very well with the difficulty of handling multiple simulation platforms.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation.

Overall, the thesis is of excellent quality both on the technical level, with solid results obtained, and nice visualizations for the different simulation platforms while being well documented.
The thesis provides a "first-person baby simulator" where movements of actual babies can be mapped onto different robot platforms, with the possibility of collecting visual and tactile inputs. This technology will be key in furthering our understanding of infant development.

We evaluate the handed thesis with classification grade **A - excellent.**

Date: **8.6.2023** Signature: