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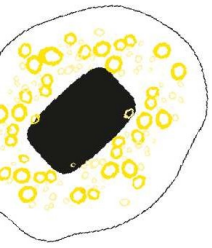

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FROM
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DATE
20/11/2024

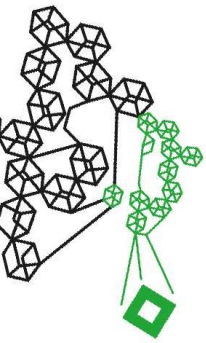
REFRENCE
20241120-JvE-01

ANNEXES
None.

SUBJECT
Report thesis Pierre-Antoine CABARET

Dear Justine Gromaire,

Please find below my preliminary examination of the doctoral thesis of Pierre-Antoine CABARET entitled: "*Design of multi-actuator haptic devices and rendering methods for navigation and virtual interactions*". I have reviewed the electronic version sent to me by the candidate on October 21, 2025. Please do not hesitate to contact me if you have any questions.



The thesis is a pleasure to read. The thesis is well-written, the flow of the thesis is straightforward, and the key concepts and findings come across clear. The topic of the thesis is timely and relevant. The research field is relatively young and I expect that its importance will grow in the next decade. Supporting people through advanced haptic devices can have important effects on efficiency, safety, and user experience, but we currently have limited knowledge of the design space for this feedback, the pros and cons, and of the boundary conditions of applying the technology in real world environments. Pierre-Antoine's work definitely adds to our body of knowledge and may ultimately lead to improving the performance, safety and well-being of users.

The candidate clearly showed to be able to develop the hardware and software needed for the experiments. The experiments are carried out carefully and with respect for the participants. The methods chosen for data collection and analyses are not always obvious and extensively described, but show that the candidate is well aware of the complexity of the research field in which for instance performance, safety, and user experience are all relevant dimensions but not necessarily highly correlated. Getting grip on the effects of the interface design on all those aspects is of eminent importance to reach valid and reliable conclusions. This is certainly true for including

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representative users and I am happy to see that the last chapter included users of power wheelchair. The results of this chapter underline the importance of the risks of generalizing results obtained in a laboratory setting with young and fit participants to other settings and populations.

The candidate shows sufficient knowledge of the relevant literature and covers the majority of recent experimental results and findings in the introductory chapters, although some older but still relevant literature seems to missing in certain places. Overall. This results in an easy to follow structure and introduction to the experimental chapters.

The chosen topic is scientifically justified and of relevance from an applied perspective. The scope of the dissertation, the key concepts, and the research objectives are all clearly presented. Grounding the research questions and hypotheses, and linking them to the literature review in the introduction is less strong. The writing style is fluent and the language is clear. It is clear that the candidate made an important independent contribution to the publications. The dissertation and the publications -although mainly in conference proceedings- proof the candidate's original scientific contributions and the scientific value of the work. The work described in the thesis has withstand the peer review process. The candidate is the first author and thus responsible for the main research input. He has presented the work at international conferences that are respected in the field.

Sincerely yours

Prof. dr. J.B.F. van Erp

Full Professor of Tangible User Interaction, University of Twente.
Principal Scientist, TNO.