3/29/2022

Prof. Francesco Lamonaca, Ph.D

Editor-in-Chief

Acta IMEKO

Thank you for inviting us to submit a revised draft of our manuscript entitled, “Development of a noncontact operation system for radiographic consoles using an eye tracker for severe acute respiratory syndrome coronavirus 2 infection control” to Acta IMEKO. We also appreciate the time and effort you and each of the reviewers have dedicated to providing insightful feedback on ways to strengthen our paper. Thus, it is with great pleasure that we resubmit our article for further consideration. We have incorporated changes that reflect the detailed suggestions you have graciously provided. We also hope that our edits and the responses we provide below satisfactorily address all the issues and concerns you and the reviewers have noted.

This study is a feasibility study. The test machine must be validated in the laboratory prior to demonstration experiments. By publishing this research in the highly respected Acta IMEKO, we would like to use this as a basis for establishing cooperative relationships with companies. If we can establish a cooperative relationship with a company, we can use their consoles for clinical situation. Certainly, the value of the study would be small if it were not actually implemented into clinical practice, but it is the basic study that will lead to demonstration experiments. Therefore, we would appreciate it if you could publish this study for clinical application.

To facilitate your review of our revisions, the following is a point-by-point response to the questions and comments delivered in your letter. Added text is changed to red, and deleted text is changed to blue and strikethrough.

**To Reviewer B**

We appreciate your suggestion. We reconsidered and added a description of the User interface. Thank you in advance for your consideration.

**Reviewer’s comment**
The item of the paper is interesting Due to the fact that the proposed manipulation method that uses an eye tracker for infection control is not ready for clinical use, the Authors should give more information on the possible modifications foreseen for allowing the application in clinical practice-

**Authors response**
We added details in the Discussion chapter (L329Left). For clinical utilization, improvement of the User interface is most important. The larger the button size, the easier it is to use in any environment.

In Japan, infection control is quite severe and it is not allowed to enter isolation wards for research.　Thus, the experiment was conducted in the laboratory. If this paper is accepted, we are considering conducting experiments in a clinical situation in cooperation with a company.

**To Reviewer C**

We appreciate your suggestion. I corrected the points that were pointed out. Thank you in advance for your consideration.

**Reviewer’s comment**
1. The novelty of the paper is not clearly stressed and the state of the art discussion could be improved.

**Authors response**

We added sentenses in the Discussion chapter (L191Right). There have been no studies to utilize eye tracker for infection control of SARS-CoV-2. Therefore, the study by use of an eye tracker was state-of-the-art for the radiological technology field.

**Reviewer’s comment**
2. Please check the typos, for example: “measurements: width: 170 mm;”

**Authors response**

We removed the colon (L69Left). In addition, we modified it according to the Acta IMEKO format. we modified the description of the size of the device, as pointed out in No. 6. The following corrections have been made. “measurements: width, 169.5 mm;”

**Reviewer’s comment**
3. Why all the tests were performed on a simulated radiographic console instead of using a real console?

**Authors response**

For more clarity, we have defined this study as a feasibility study. Accordingly, the title has been changed to “Development of a noncontact operation system for radiographic consoles using an eye tracker for severe acute respiratory syndrome coronavirus 2 infection control: a feasibility study” and the Conclusion added (L294Right). By publishing this research in the highly respected Acta IMEKO, we would like to use this as a basis for establishing cooperative relationships with companies. If we can establish a cooperative relationship with a company, we can use their consoles for the clinical situations. Companies will not cooperate without a feasibility study using a simulated radiographic console such as this study.

**Reviewer’s comment**
4. The eye tracker requires prior calibration. Does the estimated “average operation time”, considered as the average time required to complete the operation, take into account this prior calibration time?

**Authors response**

We added sentences listed below in the Material and methods chapter.

* “The system provided with the Tobii PCEye Mini was ~” (L80Left)
* “The measurement results were ~” (L85Right)
* “The calibration error was ~” (L151Left)

Calibration time is not included in operation time. Calibration results can be kept on an individual basis, therefore, operation using our method for the examination can be performed without calibration in the hospital room.

**Reviewer’s comment**
5. Please, improve Figure 2 and Figure 5, which are not clearly visible.

**Authors response**

We replaced Figure. 2 that was adjusted to improve clarity. Monitor size is added in the figure. Accordingly, we added Material and methods chapter (L78Left). Figure. 5 was divided and modified to clarify. In particular, Visibility was improved to clarify the operating procedures.

**Reviewer’s comment**
6. Numbers and units must be written as shown in BIPM SI brochure and VIM-International Vocabulary of Metrology document. For example; “26 ´ 1, 3 ´ 1, 4 …cm” must be written as 26  cm ´ 1 cm, or alternatively 26 ´ 1 cm2 . There are other similar mistakes that must be corrected in manuscript. Moreover, please check also the number of decimal digits used.

**Authors response**

These error has been corrected in accordance with the reviewer’s comment. Here is the list of these below.

* “width, 169.5 mm; height, 17.8 mm; thickness, 12.4 mm; and weight, 59 g.” (L69Left)
* “(resolution: 1920 pixels × 1080 pixels)” (L80Right)
* “26 cm × 1 cm, 3 cm × 1 cm, 4 cm × 2 cm, 10 cm × 2 cm, 2 cm × 2 cm, 2 cm × 2 cm, and 4 cm × 4 cm” (L176Left)
* “from −1.0 to 1.0, with −1.0 and 1.0.” (L205Left)
* “1.22 ± 0.94 cm and 1.19 ± 0.79 cm” (L158Right)

**Reviewer’s comment**
7. Please, more details are needed for the experiment 2, in particular describe the experimental setup including the environmental conditions. Does the room light condition affect the device performance or the measurements? In a hospital ward, how can you guarantee “the distance between the computer screen and the observer constant”?

**Authors response**

We added sentences in the Discussion chapter (L329Left, L281Right). There is no effect on the brightness of the room. Cases exist in which eye tracker used in hospital rooms. Additional references added [29],[30]. Here is the list of these below.

[29] Bates, R., Donegan, M., Istance, H.O. et al. Introducing COGAIN: communication by gaze interaction. Univ Access Inf Soc, 6(2007), 159–166.

DOI: https://doi.org/10.1007/s10209-007-0077-9

[30] Debeljak, M., Ocepek, J., Zupan, A. Eye Controlled Human Computer Interaction for Severely Motor Disabled Children. Computers Helping People with Special Needs. ICCHP 2012. Lecture Notes in Computer Science, 7383(2012) pp. 153-156.

In addition, experiments were conducted in a laboratory where natural light existed. In other words, the experiment is conducted in an environment similar to a hospital room. The usable distance is equal to the distance that the console would normally be used. Therefore, the operator can use the console at the same distance normally used for the console.

**Reviewer’s comment**
8. When a misoperation occurs, how can the operator correct the error?

**Authors response**

We added the description in the Discussion chapter (L329Left). Misoperation can be adjusted by moving the gaze point by the magnitude of the calibration error.

**Reviewer’s comment**
9. “The coordinates of the mouse cursor while the operator was gazing at each point were measured five times. Each student performed the operation experiment five times” it is not clearly understandable what the authors mean for accuracy and calibration error. Moreover, it is not clear the calibration procedure, this part should be revised.

**Authors response**

We added sentences listed below in the Material and methods chapter.

* “The system provided with the Tobii PCEye Mini was ~” (L80Left)
* “The measurement results were ~” (L85Right)
* “The calibration error was ~” (L151Left)
* “The procedure mentioned above was ~” (L185Left)

The word "accuracy" was deleted because the expression is not appropriate. ”Each student performed the operation experiment five times” was deleted.

**Additional comment**

Prof. Yongbum Lee, Ph.D. changed his name to Yohan Kondo.

We deleted the unnecessary sentences. The deleted sentence was the caption “However, these do not necessarily indicate that a calibration error is significantly larger than another.” in Fig.9.

The authors would like to thank the reviewer for the interesting remarks and comments on the manuscript.