

Answers to the comments for Professor Rita Kiss

Helping visually impaired people and improving their quality of life is an important task for visualization professionals. One of the most important challenges is navigating visually impaired people outdoors and indoors. The steps of navigation are to recognize the current location, interpret the destination, calculate the shortest route, and navigate safely based on feedback. The present PhD dissertation focuses on indoor navigation: it compares different technologies and solutions, presents the indoor navigation method developed by the Candidate, which recognizes and avoids obstacles with the help of markers, recognizes the markers remotely. Finally, the dissertation analyzes the detection accuracy of several modifications. I was also one of the reviewer of the workplace discussion of the present dissertation. The Candidate corrected the dissertation taking into account the comments of both reviewers.

- First, I would like to thank you for your review and useful feedback. They have provided me with valuable insight to improve the thesis in terms of its content and analysis. Therefore, I have done my best to address all the issues raised.

In the thesis booklet, I suggest the numbering the figures and refer to figures with number in the text.

- Thank you for your helpful comment. I modified it and added numbers to the table and figures.

After the Summary, the theses are provided briefly as new scientific results. The dissertation formulated 4 research questions and 4 goals; however, 3 new scientific results can be read. The answers to the research questions and goals are always given by the theses, so they must be connected (number and content). The question Q1 and the purpose of O1 are formulated in Chapter 1, however it is no answer as a thesis. The all three theses can be accepted as a new scientific result.

- Thank you for your helpful comment. Question Q1 and the purpose of O1 were to help understand, organize, systematize the existing knowledge about DL and MAT, find the strengths and weaknesses of the latest MAT systems for PVI, and develop an indoor navigation system for PVI. Moreover, It was used to make a taxonomy that provides an overview of the different MAT solutions that helps PVI. I published a literature review to show this taxonomy. So, this O1 helped to develop the indoor navigation system, which is a part of the first thesis. Therefore, I did not put it as a separate thesis. I combined it with the first one.

Question for the Candidate:

- 1) Please summarize the limitation of the present research!
 - To improve accuracy, orientation sensors should be integrated to quickly warn PVI if they turn in the wrong direction.
 - Detecting markers under occlusions can be improved using deep learning models.

- We need to integrate the support to detect and avoid obstacles to the proposed system.
 - The system can detect objects, but can't calculate the distance, so depth camera or ultrasonic sensor can be used.
 - Recognition time should be minimized. I am working on training different classification algorithms such as VGG16, VGG19, EfficientNetB0, Resnet50, inception V3, MobileNet V2 and comparing them. Then I will modify the best one to improve accuracy. Also, I will install the final model on Raspberry pi, Intel NCS to minimize the execution time.
- This system was developed to be used on android mobile phones and it should be developed also for IOS.

2) What procurements and developments are needed for the method to spread in everyday life?

- **By administrator:**
 - A virtual map should be constructed for each floor by sighted people. They should move inside the building to find interest points such as laboratories and lecture rooms.
 - Markers should be printed and placed in the specified location of interest.
 - An admin application is used to scan each marker and store details about it in a Firebase Database. This information includes marker id, the floor number, and the name of the place. This process is repeated for each floor in the building.
- **By PVI:**
 - A smartphone is needed to install the application on it.
 - A hardware like raspberry pi is attached to a white cane in case of using it to detect objects.

The research summarized in Dissertation of Mostafa Abdallah Abbas Atwa Elgendi is forward-looking. The Candidate proves his suitability for independent scientific work with his dissertation. After a successful public defense, I recommend the PhD title.

Finally, I want to thank you for your work, valuable comments, and efforts.

Sincerely,

Veszprem, 8 November 2021

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