POSUDEK DIPLOMOVÉ PRÁCE - VEDOUCÍ

REVIEW - THESIS SUPERVISOR

Matematicko-fyzikální fakulta Univerzity Karlovy
Charles University in Prague, Faculty of Mathematics and Physics

Thesis title in Czech: Simulace symptomů duševních onemocnění ve virtuální realitě

Thesis title in English: Simulation of symptoms of Mental Health Disorders in Virtual Reality

Student: Shivam Sharma

Study program: Computer Science - Visual Computing and Game Development [IVVPA]

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Significance: The work focuses on a very relevant issue of using VR technology in education of medical students, specifically focusing on a field of psychiatry and simulating phenomenology of symptoms of typical mental disorders.

Aims of the thesis: The aim of this thesis was to develop a software tool for simulation of various symptoms of selected mental health disorders (e.g. depression, bipolar disorder and schizophrenia, etc.) using virtual reality (VR). This tool could be later applied as an education tool to provide insight and increase understanding of symptoms in students studying psychiatry or clinical psychology.

The student met the required assignment of the thesis and created a tool containing all the required elements. The software was closely monitored by experts (psychiatrist and clinical psychologist) to ensure the quality and relevance of the simulation in means of the represented symptomatology. The work also includes a pilot experiment testing the software by small group of students and experts that evaluated its usability and feasibility.

Formally, the thesis is written in English and meets the required form. The thesis contains more than 60 pages of text, not including reference list. The work is not plagiarized according to the system check. The only formal issue is that the abstract is missing in the thesis document. The separate abstract file provided is too short and, to my opinion, does not fully capture the content of the thesis. The student divides the thesis into six main chapters including Theoretical background, Project Setup, Analysis of the topic, Implementation, Pilot Experiment section describing the used methodology and the Results section with short discussion of the thesis outcomes, that is followed by Further scope section outlining potential future steps.

The content of the individual chapters is adequate and clearly describes the individual steps taken by the student during the preparation and subsequent implementation of the software solution. In the theoretical background the author had sufficiently described the complexity of mental health symptomatology on the example of selected mental disorders and utilization of VR technology in education of medical students. The next chapter presents the analyzed requirements and dependencies associated with individual targeted symptoms, and potential solutions that could be used to simulate them. In the Implementation section, the author describes the software project implemented through the Unity software, its technical design and architecture, and defines individual symptom classes. The following chapters describe the experimental work performed with the app in the target population of experts and students, and obtained results. The additional files (attachments listed separately) contain a csv file with the result data of the study and read-me file to install and run the project and the APK file on the Oculus Quest 2 device. Grammatically, the work contains only a minimal number of errors. The literary sources used are adequately chosen and properly cited in the thesis and listed in the reference list, including freely available software resources.

The resulting SW application is well described in the thesis and meets the requirements set by the thesis supervisor for an educational VR game simulating symptoms of selected mental disorders. The created VR project, despite some shortcomings related mainly to the inner voice sounds applied (AI generated synthetic voices), sufficiently represent the functionality of the applied symptom mechanics. The developed VR app forms a functional tool allowing illustrative simulation of symptoms phenomenology accompanying selected mental disorders. The app enables also to select any preferred combination of symptoms and adjustment of the intensity or other settings of individual symptoms by an expert, who will use the application with students. The application also contains a short introductory instruction with an illustrative demonstration of the used game controllers and adjustable settings. The only shortcoming of the game so far is that it contains only computer-generated voices, which do not take into account the gender of the respondent and can be confusing or perceived as artificial and this will need to be corrected in the future by the extension of the database of vocal expressions. Nevertheless, the prototype already provides all key elements and contents, and the application was evaluated very positively by both students and experts. To my opinion, the game has a great potential for practical use and will be used in more comprehensive testing with the target group of medical students during next year. The game has also a potential for further development and addition of more examples of diseases.

The performed pilot study pointed to good user-friendliness of the app and clarity of the presented content. It would have been interesting to experimentally assess also the level of experienced presence in virtually simulated scenes, or to accurately evaluate the corresponding cybersickness symptoms, but the nature of testing the application in a limited time frame (e.g. during a teaching unit or free time of an expert) did not allow a more comprehensive testing of the application with more extensive participant feedback. Further testing of the application in collaboration with the author is therefore planned.

During the development process, the student consulted his pilot designs and applied methods with the supervisor. He repeatedly verified the suitability of used solutions with respect to the aims of the thesis and the target population that will use it in the future as a tool for education in psychiatry and other associated fields. The student carefully verified his decisions by testing it with the help of several mental health experts. He took part in a pilot testing with a group of foreign medical students and carefully corrected all the bugs identified during the testing process. He repeatedly modified the application and added new functions according to the requirements and recommendations of experts that tested the prototype versions of the app.

OVERALL, the author:

- has presented a theoretical part of the thesis, which is systematic and shows a sufficient orientation in the subject matter;
- was able to clearly formulate the objectives of the thesis and analyze the targeted area;
- was able to create a VR tool meeting the required criteria;
- demonstrated the evaluation of the developed software both by experts and targeted students;
- was able to work well with the interpretation of the results and possible further direction of the research.

I also appreciate the linguistic and formal treatment of the submitted work, which is clear and understandable also for professionals in other fields. I evaluate positively that the student carefully and very thoroughly consulted his decisions about the design of the software in individual steps and patiently edited the game as requested.

I RECOMMEND THE SUBMITTED THESIS FOR DEFENCE, and I consider the work excellent.

PRÁCI DOPORUČUJI K OBHAJOBĚ a hodnotím výborně.

Klecany, 26. August 2023

Mgr. et Mgr. Iveta Hocko Fajnerová, Ph.D.