

Submit Grant Proposal | VR@Illinois

Submitted by:

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1. Name

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2. Email

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3. Your Status

Faculty

4. Your Department

Carle Illinois College of Medicine

5. Provide a brief summary of the VR/AR project that would be funded by this grant proposal

This project will generate a virtual reality app that will help students learn the three-dimensional relationship between brain anatomical structures and correlate that understanding with Magnetic Resonance (MR) images of the exact same brain slices. Understanding the three-dimensional relationship between neuroanatomical structures is often a difficult concept for students. This is further exacerbated by the fact that 1) acquiring human brain specimens is sometimes difficult; 2) three-dimensional structures are not easy to visually reconstruct from individual post-mortem brain slices or MR images due to surrounding brain regions occluding visualization of the structure; and 3) plastic models have limited realistic appearances. This proposed app will address these difficulties by allowing students to explore in virtual reality the three-dimensional aspects of a post-mortem brain while simultaneously viewing the more clinically relevant corresponding MR images. To accomplish this we will generate two primary models. The first model will be a reconstruction of the post-mortem human brain. The second model, immediately adjacent to the first will be a reconstruction of the MR images taken from the post-mortem human brain slices. These models will be linked so that removal or moving a brain slice from either model will remove or move it on both. Furthermore, selection of a brain region in either model will highlight it in both, while providing a text box for educational content on that brain region. In addition, students will have the ability to select a reconstruct button that will generate a translucent model of that structure through both models. This will allow the student to fully appreciate and understand the three-dimensional orientation of the selected structure while still being able to fully appreciate the rest of the anatomical structures. Furthermore, this will allow for students to obtain the educational benefits of learning from actual human post-mortem brain samples along with clinically relevant MR images without the incurred costs or ethical dilemmas of purchasing actual human brains or obtaining patient de-identified MR images.

6. How much funding are you requesting?

\$4,395.29

7. Provide a brief preliminary budget of how the funds would be used

This project is requesting 40 hours of graduate hourly support (@ \$22.36/hour + 0.1% Fringe = \$895.29), \$500 for 3D printing a custom brain slice holder for the magnetic imager, and \$3,000 for imaging the brain (an average of 12 slices per brain @ 30min per slice and \$500 per hour based on Beckman magnet use charges) for a total of \$4,395.29. Any amount in excess of the award will be covered by local discretionary funds, and the PI will oversee all aspects of the project, including student supervision, dissemination to other educators, and incorporation into the Clinical Neuroscience course.

8. Describe the anticipated outcomes of your project.

Completion of this project will result in a VR and tablet app that will provide neuro-anatomical educational tools for the Clinical Neuroscience course in the Carle Illinois College of Medicine, the Neuroscience Program for graduate education and undergraduate neuroscience courses such as Psych 210, 310 and 414. Inclusion of a wide breadth of anatomical educational content will allow this app to be easily used for learners at various educational levels.

9. What is the proposed timeline for your VR project?

This project will take one year to complete. It will begin in December of 2019 when the human brains for the Clinical Neuroscience Course are obtained. We believe this is ideal as it would minimize the number of requests for human tissue. Based on prior experience developing educational apps, a one-year completion time-line will allow for incorporation into the Clinical Neuroscience course in January of 2021.

10. Additional information

Completion of this project requires the expertise of multiple individuals on and off campus who already see the importance of this project and have agreed to donate their time and effort. Brad Sutton, the director of the Magnetic Resonance Functional Imaging Lab at Beckman Institute will assist with the MR scanning and processing of the post mortem brain slices along with generating the translucent three-dimensional models. Harris Nisar, the Medical Simulation Engineer at the Health Care Engineering Systems Center, will assist with writing the code for the application. Shahriar Salamat who is a professor in the Department of Pathology and Laboratory Medicine at the University of Wisconsin School of Medicine and Public Health will be providing the human brain samples. Note, Dr. Salamat has previously provided the brain samples for the Clinical Neuroscience course. Roberto Galvez, who has a PhD in Neuroscience and is currently a Teaching Associate Professor in the Carle Illinois College of Medicine will provide the neuroanatomical educational content for the app. Dylan Mann is a second year medical student at Carle Illinois College of Medicine who will also help with all aspects of the project.