Researchers make clinical trials a virtual reality

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A researcher inspects eye data. Credit: University of Tennessee

Clinical trials can be time-consuming, expensive and intrusive, but they are also necessary. Researchers at the University of Tennessee Space Institute in Tullahoma have developed an invention that makes clinical trials more efficient by moving them into the virtual world.

Called "digital Eye Bank," the computer software eye modeling program includes data from people's eyes for researchers to use when testing their inventions. Developed by Ying-Ling Chen, research assistant professor of physics and Jim Lewis, professor emeritus in physics, Eye Bank can take data from eyes of patients' and build it into models from the commercial optics program to be used for researchers' virtual clinical trials.

"The idea of Eye Bank is to use existing clinical data and build in realistic and personalized eye models stored in a ready-to-use tool kit like a group of volunteers," said Chen. "Then we can call on any specific eye to test a newly designed optical instrument on the computer and see what kind of performance the design gets. This testing can be done repeatedly without hurting real human subjects."

Currently 35 eyes with various demographics and conditions from Wang Vision Center in Nashville are included in Eye Bank. This variety, combined with the researchers' control of conditions, may allow results of testers' finished product to be more refined before advancing to the real clinical trial phase, which is administered by a third-party.

"Being able to mathematically and computationally describe the visual response of normal and abnormal eyes and sub-groups of the population allows for optimal results of designing the technology," said Chen.

In most clinical trials used today, the types and conditions of eyes that are studied are not as varied as desired because it is difficult and expensive to find the diversity and range of subjects. The result is an uncertainty in the performance of new instruments to detect and diagnose a range of unusual eye conditions. In the virtual world, users can manipulate the eye, such as opening it partially or rotating the pupil. They can also give it certain conditions, such as growing a cataract or developing a tear duct issue. This allows users to see how well their instrument measures in response to such conditions.

This characteristic can be especially useful in assisting surgical planning by predicting outcomes of visual performance.

"For instance, we can predict how one person's eye can react to LASIK surgery and simulate the day and night vision after the procedure," said Chen. "Today, it is also not well known on how the long-term outcome

of new interventions would be. But in the virtual world, we could induce cataract and dry eye and other aging conditions to predict the possible complicated outcomes and problems."

Eye Bank could also be helpful in medical education, as most students are not trained on diseased eyes.

Although currently used for optical research, the researchers see broad applications for their technology.

The research is currently undergoing testing funded by the National Institutes of Health.

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