Augmented Reality Exhibits of Constructive Art: 8th Annual 3DUI Contest

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\textbf{ABSTRACT}

The 8th annual IEEE 3DUI Contest focuses on the development of a 3D User Interface (3DUI) for an Augmented Reality (AR) exhibit of constructive art. The 3DUI Contest is part of the 2017 IEEE Symposium on 3D User Interfaces held in Los Angeles, California. The contest was open to anyone interested in 3DUIs, from researchers to students, enthusiasts, and professionals. The purpose of the contest is to stimulate innovative and creative solutions to challenging 3DUI problems.

\textbf{Keywords:} 3DUI contest, augmented reality, constructive art.

\textbf{Index Terms:} I.3.6 [Computer Graphics]: Methodology and Techniques—Interaction Techniques

\section{INTRODUCTION}

The problem presented was to develop a 3DUI for an AR exhibit of constructive art. Each 3DUI should support the task of building virtual pieces of artwork from provided virtual materials in a real physical space. Provided ARTags are used to track the physical space. Also, each 3DUI must meet the following requirements.

\section{REQUIREMENTS}

The first requirement is that the 3DUI must be developed for a tablet or smartphone, and must require physical 3D interactions. The tablet or smartphone must be held in one or two hands. Additional hardware to hold the device is not allowed, including peripherals such as Google Cardboard and the Samsung Gear VR.

The second requirement is that the 3DUI does not use external devices or sensors, outside of the tablet or smartphone. It can involve the touchscreen and the sensors integrated into the tablet or smartphone, such as multi-touch gestures, buttons, gyroscopes, accelerometers, magnetometers, GPS, cameras, and microphones. Additional ARTags are allowed for object detection and for extending the capabilities of the 3DUI beyond the sensors.

The third requirement is that the provided ARTags will serve as pedestals for constructing virtual pieces of artwork. Once placed on a pedestal, the base of a virtual piece of artwork should not be manipulated. The virtual camera should not be manipulated independently of these ARTags. The display’s view of the virtual world should match the camera’s view of the physical space.

The fourth requirement is that the 3DUI must provide 3D interaction techniques for selection, integrated 3-DOF (degrees of freedom) positioning, and integrated 3-DOF rotations (see Figure 1), across all tasks. In addition, the 3DUI must provide an interaction technique for 3-DOF scaling with the Fried Sculpture artwork (see Figure 2) and an interaction technique for parameter manipulation with the Particle System artwork (see Figure 3).

Finally, the contestants must demonstrate that their 3DUI provides the ability to reconstruct the virtual pieces of artwork from the provided virtual materials. Additionally, the 3DUI should be innovative, afford high usability, be simple to learn and use, and be able to effectively finish the reconstruction tasks.

\section{SELECTIONS}

Teams of up to ten people were allowed to register for the contest in December 2016. A total of eight teams registered during this period. In January 2017, seven of the eight registered teams submitted their solutions, each comprised of a two-page abstract and a video demonstrating the design and functionality of the 3DUI. The 3DUI Contest chairs reviewed and judged each submission on how well it fulfilled the requirements above. After a brief revision process, seven submissions were accepted for publication and invited to be presented live at the 3DUI Contest.

\section{JUDGING}

The 3DUI Contest will be judged through two means. First, selected 3DUI experts will judge the presented 3DUI solutions during the live contest, based on the requirements above. Second, attendees of IEEE 3DUI 2017 will have the opportunity to cast votes for their favorite solutions during the live contest portion. The winners of the 8th annual IEEE 3DUI Contest will be announced before the close of IEEE 3DUI 2017.

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