Engaging Social Interaction on Multiplayer Augmented Reality Application through 3-DOF Manipulation

1Muhammad Reza Aditya, 1Muhamad Nuh, 1Novian Gilang Bujana, 1Nova Eka Diana, 1Nurmaya, 1Ummi Azizah Rachmawati
rezaditya28@gmail.com, muhamadnuh54@gmail.com, noviangilang@gmail.com, nova.diana@yarsi.ac.id, nurmaya@yarsi.ac.id, ummi.azizah@yarsi.ac.id
1Informatic Department, Faculty of Information Technology, Universitas YARSI, Indonesia

Abstract

Social interaction is a significant point to further user experience toward an Augmented Reality (AR) application. This study strives to build an AR application that presents multi-user or collaborative experiences on the AR virtual objects in real-time. Authors developed the application using ARCore and AR-Foundation SDK with the intention to run the application either on Android or IOS platform. The application employed Google cloud anchors to anchor the same AR scene that multiplayer can observe in their device. When a user in the collaborative AR mode updated an object, then Cloud anchors will assure to update the AR view for all users automatically. We implemented three degreeof-freedom (3-DOF) of scaling, rotation, and zoom in/out, to manipulate the virtual objects in the collaborative AR scene. This research concentrated on investigating the response time of the application for simultaneously updating the AR scene and also the leverage of the collaborative interaction in increasing social interaction among AR users.

Keywords : Augmented Reality, multiplayer, 3-DOF manipulation, Cloud Anchors, ARCore.

Acknowledgements: The authors wish to thanks the KIST School Partnership Project 2019 for funding this research.

Background

One of the learning processes in the world of education is body anatomy, with media books and teaching aids as learning aids. there are a lot of text and audio resources for the subject of medical research at the moment, but appreciate platforms that involve medical learning. In medical education, the introduction of human heart structure or what is known as anatomy becomes very important, one of which is the anatomy of the heart. the heart is a hollow organ and has four spaces located between the lungs. The necessary understanding is done for students and teachers in the process of heart anatomy learning, the use of Augmented Reality technology can be done, with the process of applying this technology it is expected to be more interactive with the support of visualization for images that produce realistic learning in the learning process.

Augmented Reality is defined as technology that combines the real world with cyberspace, interactively interactive in accordance with real time, and makes three-dimensional animation. Augmented Reality is very challenging in attracting, inspiring, and motivating students, to facilitate and control from a variety of different perspectives, which were not previously considered in the world of education. based on these problems, the learning method is made using AR (Augmented Reality) as a communication medium that helps in the learning process by visualizing 3D anatomy in accordance with the theory and information provided, equipped with Multiplayer concepts with 3D heart anatomical objects and AR that can be used in several different devices, increasing student and teacher interaction in them.

Aim

Scanning in real areas (Markerless) is used in object placement.

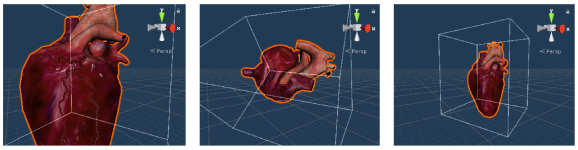
Object manipulation with 3-DOF

Implement single / multiplayer interactions in improving the learning process using Google Cloud Anchor.

Result & Discussion

The role of CardioAR creates an augmented learning environment by providing substantial assets concerning learning activities and paradigm. The outcomes of the CardioAR are expected to meet the learning assessment and objectives, and also usability and user experience feel toward the application.

3DOF scale rotation manipulation (Degrees Of Freedom) is applied to objects that have been placed in the marker field, the manipulation applied is scale(i), rotation(ii), and zoom in/out(iii)*.



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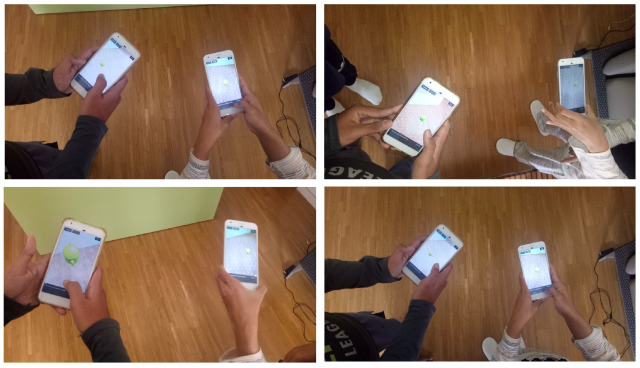

Hosting anchors
When you host an anchor, ARCore sends relevant visual mapping data from a user's environment to Google servers. Once this data is uploaded, it is processed into a sparse point map, similar to an ARCore point cloud.

Resolving anchors
Resolving a Cloud Anchor lets multiple devices in a given physical space use previously hosted anchors to establish a common frame of reference.

times, Host : 00:03.74 Resolving : 00:01.26

API Quotas

Quota type	Maximum	Duration	Applies to
Number of anchors	Unlimited	N/A	Project
Anchor **host** requests	30	minute	IP address and project
Anchor **resolve** requests	300	minute	IP address and project

Technical Tools

ARCore unity