ARSC Model And Projection Based Augmented Reality

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I. Area of Research in Computer Science

Data visualisation, non-photorealistic renderings, and perception in virtual environments are all topics of study in this field. It is informed by and contributes to research in the fields of algorithms, human perception, art, animation, computer vision, and image processing.

Information visualisation, visualisation of 2-D and 3-D flow data, multivariate visualisation, non-photorealistic rendering, volume visualisation, point dependent modelling and rendering, physically and perceptually-based image synthesis, colour appearance design and reproduction, and the investigation of perceptual issues in virtual environments are some of the department's specific research thrusts.

II. Augmented reality as an area of research

AR brings the physical and virtual worlds together in real time, supplementing the real world with computer-generated virtual objects [1,3,10,11,13].

AR is defined as a technology that combines real and virtual objects in a real world, aligns real and virtual objects with each other, and allows for real-time interaction, according to one of the most widely accepted definitions [2,4,7,12,14]. Milgram's mixed reality spectrum is a classification of how physical and virtual components can be combined [12]. From a fully real to a completely virtual world, there is a spectrum [5,12].

The user experience of AR exists on the reality- virtuality continuum described by Milgram in 1994 that describes the overlap of the physical world and a digital world. 3 Unlike immersive virtual reality (VR) that creates a total virtual experience, augmented, or mixed reality (AR/MR) encompasses the middle of the reality-virtuality continuum and allows for continued interaction with the real world [7].

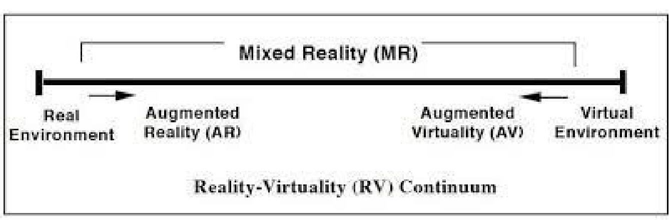

Figure 1: Milgram's mixed reality continuum

Based on this continuum, mixed reality may be defined as a situation in which real and virtual objects are combined. AR lies closer to the real environment end of the continuum as can be seen in Figure above [1,5].

AR can be considered a more realistic version of mixed reality because it incorporates virtual objects into the user's real-world environment, allowing interaction with virtual material [1,5,7]. In the case of mobile AR, the technology involves the addition of digital elements to the real world through a smartphone camera. Examples of mobile AR applications include Pokémon GO, which is a location-based mobile AR game that enables users to catch various digital Pokémon creatures around their area and AR GPS DRIVE/WALK NAVIGATION which provides an AR-powered navigation system.

Virtual reality is distinct from augmented reality in that it shuts out the physical world and immerses the user in a digital world through a virtual reality headset such as the Oculus Rift or Samsung Gear VR [16].

Many people already own smartphones and therefore have access to augmented reality [1,6]. Because of advancements in mobile technology and the increased usage of smartphones, using AR for learning has become more feasible [4,8,9,13]. Due to fast processors, graphics hardware, and various onboard sensors, smartphones and tablets are perfect for facilitating AR experiences [13].

III. Research topic ARCS Model

The focus, importance, trust, and satisfaction (ARCS) model of motivational design was used to examine how AR technology affects student motivation to learn [4,8,11]. Based on the ARCS model, the design of the AR technology must attract student *attention*, it must be *relevant* to the students, the students must be *confident* with the technology, and the students must feel *satisfied* after using the technology [18].

Figure 2: Keller's ARCS model of motivational design

(a) Attention

It refers to the learners' interest. It is critical to get and hold the learners' interests and attention.

(b) Relevance

The learning process should show the usefulness of the content so that learners can bridge the gap between content and the real world.

(c) Confidence

This component focuses on developing success expectation among learners, and success expectation allow learners to control their learning processes. There is a correlation between confidence level and success expectation. That's why providing estimation of probability of the success to learners is important.

(d) Satisfaction

There is direct relation between motivation and satisfaction. Learners should be satisfied of what they achieved during the learning process.

IV. AR Mobile Technology

In previous research, the augmented reality educational tools were created especially for the courses [4,8,11,18]. The educational AR tool in this study was the Anatomy 4D mobile application developed by DAQRI, rather than a custom-built AR mobile application for the course[18]. Prior to the report, a course convenor in the UCT Faculty of Health Sciences confirmed that this mobile application was relevant to second-year MBChB students.

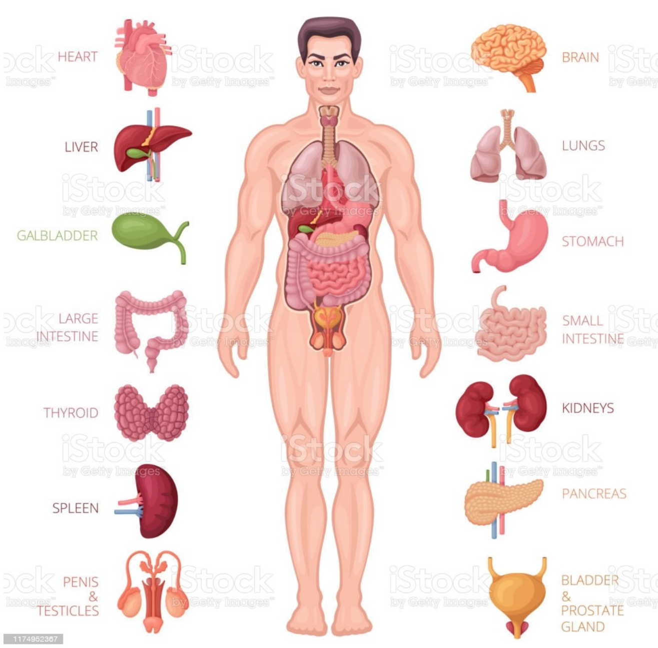

Figure 3: Human Anatomy

The Anatomy 4D mobile application was chosen based on its accessibility. All participants used both the anatomy notes as well as the AR mobile education application.

Anatomy 4D is a free application that uses AR to enable interaction with pictures of the human body. The application uses a target image and the camera on a mobile device to display an AR model of the human body

Figure 4: 4D Human Anatomy

A. Projection Based AR

Artificial light is projected onto real-world objects in projection-based virtual reality. Projection on objects may be used to deceive people about an object's location, orientation, and depth. In this case, an entity is considered, and its structure is thoroughly examined [19].

Human interaction is enabled by projection-based augmented reality applications, which send light onto a real-world surface and then detect human interaction (i.e. touch) with that light. Differentiating between an intended (or known) projection and the altered projection (caused by the user's interaction) is how the user's interaction is detected. Another fascinating application of projection-based virtual reality is the projection of a three-dimensional (3D) interactive hologram into mid-air using laser plasma technology [19].

Based on projections AR is a video projection technique that can expand and reinforce visual data by projecting images on the surface of 3D objects or space; it falls under the umbrella of Spatial Augmented Reality in a broad sense [20].

Using projection-based AR, it is easy to implement graphical representation that ordinary lighting techniques cannot express. Unlike general lighting technique, the technique can project high-definition image or video, and change the object shape visually with the flow of time [20]. Therefore, it can show visual images dynamically. This combination of imagery and real-object allows the audiences to recognize visually extended space.

There have been previous attempts using depth camera, like Kinect from Microsoft, to extract dynamic object silhouette with flexible shape [21,22]. With the aid of depth data in space, this equipment can easily extract the masking image. The centre lines of the projector lamp and the IR camera lens must be parallel and as close together as possible to achieve a high-quality result [20].

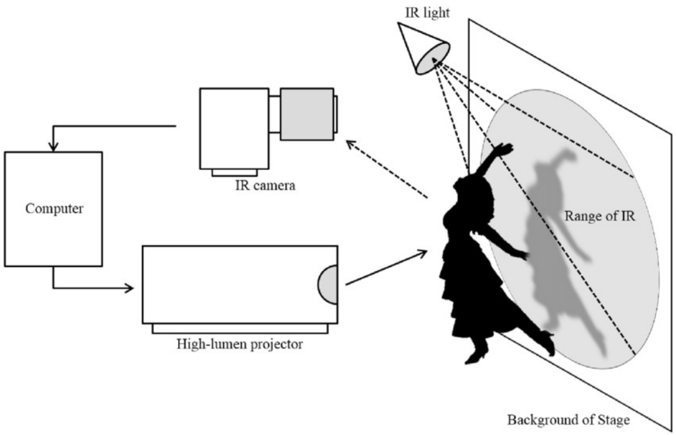

Figure 5: Hardware Configuration For Real-Time Projection Based AR

However, in the case of the depth-camera, its effective-range is too short to be used in a big theater. To solve the problem, we used an IR camera device with a zoom function in order to capture the actor in a large space as well. Capturing only one particular area reflecting IR light, the IR camera can effectively separate the background and the actor precisely [20,21].

V. Conclusions

We introduced a projection-based virtual reality technique for a complex object in the performing arts in this paper, which can be effectively used by combining performance costume and digital technology.

To boost method even further in terms of aligning latency, we can refine the GPU-based algorithm, and a technique that generates the composed picture ahead of time at the predicted positions by predicting an actor's future movement from previous frames.

VI. References

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