


# Production of instructional videos using a virtual presentation room on a mobile head-mounted display

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## Abstract

*Instructional videos are frequently used in education and it is important for teachers to produce the materials with minimal time and efforts. In this article, I report SlidesGo, a "virtual presentation room" software for a mobile head-mounted display. It allows a user to record a slide presentation video with an avatar in a virtual environment as well as to record head orientations during a presentation. and produce a heatmap to characterize the visual attention of the speaker during the recording. Instructional video productions using a mobile head-mounted display is far more time and cost efficient and give more insights into the teacher's non-verbal behaviour than those in a physical studio.*

## CCS Concepts

• **Human-centered computing** → **Virtual reality**; • **Applied computing** → **E-learning**;

## 1. Introduction

While a large number of educational videos are available on video streaming sites and online courses like edX and Coursera, it is still important for teachers to produce their own video materials to match the specific needs of students they teach. However, it is not straightforward for teachers without media production experience to prepare high-quality videos which can satisfy young audiences who are accustomed to highly polished videos they watch daily. In fact, it has been shown that preparing for online courses is more time-consuming than traditional classroom courses [Lea15]. Therefore, it is important for educators to have video production tools which can minimize the time and cost to prepare effective instructional videos.

The style of instructional videos varies. While screencasts with voice-over are commonly used because of the ease of production, video styles with the instructor present on the screen, like talking-head, are known to be more engaging than those without an instructor [GKR14]. However, the production of the videos with instructors present is far more costly and time-consuming than screencasts, because it requires long hours in a studio with a chroma key setup or a large display, rather than recording from the desktop.

To address these issues associated with instructional video production, the author has been developing a "virtual presentation room" app called SlidesGo for a mobile head-mounted display (HMD) [Yan19], where an instructor can record a presentation using an avatar in a virtual environment. While the virtual environment for lecturing and presentations has been tried for a long time, it has not been commonly used by teachers for instructional video production, because the cost and time were higher than recording

in a studio. However, the recent development of consumer HMDs with body trackings has made the cost of virtual studio less than the physical counterpart.

SlidesGo employs a mobile standalone HMD and enable an instant recording of fully voiced slide presentations in a virtual studio using a customizable avatar controlled by a HMD and a 3DOF controller. Although the body tracking is limited to the head and an arm and the position of the avatar is fixed, it still allows a variety of body gestures and the use of a laser pointer. The author has been using SlidesGo for producing more than 70 lecture videos, and it is significantly more convenient than recording in a physical studio and the videos produced have been well received by the students in the author's classroom.

In this article, I report a modified version of SlidesGo, with an added function to record and display the gaze directions during a presentation as a heatmap for characterising the behaviour of the instructor during the recording, as well as the modifications to improve the visibility of the virtual pointing device.

## 2. The setup of the virtual presentation room

The overall setup of the virtual presentation room has not been changed from the first version the author reported previously in Japanese [Yan19], but I briefly explain it for reader's convenience. The virtual presentation room has a camera which also works as recording button and a large screen for a slide as well as a smaller live camera monitor (Figure 1).

An avatar for the user stands next to the display and it can use a laser pointer for pointing on the display and moving to the next



Figure 1: the virtual presentation room

or previous slide. In order to improve the visibility of the pointer when the recorded video is shown in a classroom, the pointer has been enlarged in the current version and a trail renderer has been added to it, alongside a simple drawing function on the display. A screenshot of the video incorporating these changes is shown in Figure 2.

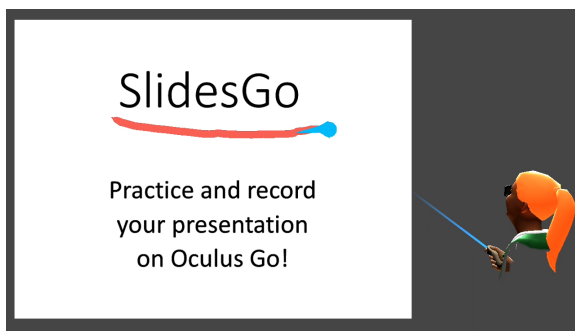


Figure 2: An video output from SlidesGo

### 2.1. Recording and displaying head orientation

A small spherical raycast target was placed around the head position of the avatar and a raycast was sent from the head continuously during the recording to accumulate the data on its hit positions on the target. After the recording, a heatmap of the hit positions was produced and projected onto a rectangular map in the equirectangular format. The heatmap can be saved in PNG format or overlaid onto the player's view in VR (Figure 3).

### 2.2. Discussion and future directions

The new version of SlidesGo, presented in this article, improved the visibility of laser pointing and enabled for teachers to reflect on their behaviours during the video lecture using the heatmap of their head orientation. It is difficult to specify exactly how the visual attention should be distributed between the camera (or the students watching the video) and the teaching material (or the display in the virtual room). It has been shown that looking at the teaching material is important for turning the viewer's attention to the



Figure 3: A heatmap of the head orientation overlaid on the player's view

material [WPH19], while achieving mutual gaze, by looking at the students, can give them more positive attitudes toward the speaker and make them feel engaged [Bre71]. The heatmap will help the instructors to monitor their visual attention and make it consistent across the lectures, so that they can improve their teaching in a more systematic manner.

It should also be noted that not only the distribution of the head orientation, but other characteristics of head movement can be useful for the analysis of the speaker's behaviour. For example, the patterns of yaw movement of the head is known to be related to the anxiety of the speaker [WPFB16], and the viewer can perceive the speaker's emotion from the patterns of head movement [LP16]. Therefore, further analysis of head movements can help the teachers reflect on their mental status during the presentation.

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### 2.3. Acknowledgement

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