Virtual Reality And Ambisonics As Effective Combination Of Immersive Media In Raising Awareness For Indonesia's Birds Conservation Organization

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Virtual Reality arguably has been one of the most popular immersion media for many years, especially 360 Video Camera, but its utilization is only limited to entertainment purposes, thus this research would like to test wider potentials outside its evident field of interest. On the other hand, audio has always been the forgotten elements in many audio-visual productions because its intangibility, this research will explore one of many emerging audio sciences, which is Ambisonics / 3D Spatial Audio. By combining the two powerful elements, this research is trying to prove the user engagement and communication strategy's effectivity especially in raising awareness for Indonesia's bird's conservation NGO called Burung Indonesia, where the 360 Video Camera captures the environment and 3D Spatial Audio captures the sound of Indonesia's birdlife. Therefore, the output of this research is to discover new communication infrastructure through digital fabrication.

Keywords: Virtual Reality, Ambisonics, Digital Media

Introduction

According to Reitmayr et al(1999), a significant increase in the development of such virtual environment systems with applications ranging from distance learning to robotics and medicine has started in the past twenty years ago. Contemporarily, the demand for humanitarian and development aid has risen to an unprecedented level in recent years, areas of conservational field ranging from animal to environmental activism. In a search for new solutions, designers have started using digital fabrication (3D printing, CNC milling and laser cutting) to produce life-saving items. Recently, digital fabrication has been used to produce a range of items including prosthetics, medical tools, emergency shelters, spare parts and communications infrastructure (Corsini and Moultrie, 2019). However, the mentioned digital fabrications are only few of many new media practices, the type of chosen medium depending on the data input specificity that is recorded, e.g., in this research the type of data input is spatial audio, which requires a microphone that has ability to record space's sound.

Sequentially, as the idea of mobile applications that use AR and VR has increased in popularity, a plethora of studies have been conducted, delving into how the technology can be leveraged for education purposes (Phillips, L. et al, 2016). Many virtual reality research papers have focused on graphics and hardware, but there have been relatively few papers about. However, research demonstrates that audio is essential for an immersive virtual reality experience. One showed that 3-D sound greatly increases people's sense of presence in virtual realities (Cedric and de Planque, n.d.). The study showed that people felt more immersed in virtual realities with spatial sound than in virtual realities with non-spatial sound or no sound. To successfully "copy" the real environment, it is crucial to capture the highest resolution of spatial sound as supporting media to user's full immersion.

Figure 1 Initial Media Setup

Methodology

Data collection will be using Qualitative methodology. Researchers will conduct a user-engagement measurement by using User-Engagement Scale (UES) form, which the scale is distributed into several categories. On the other hand, the production method is done by using Research Through Design methodology by iteratively designing artefacts to recognize user-experience feedback, but not limited to discovering best practical methodology. Researchers will explore the best iteration of the project by collecting and evaluating feedback data in daily journal and video form.

Communication Strategy

Based on the meeting with Burung Indonesia team, with a new media approach comes also a new communication strategy. A communication strategy on how to introduce this foreign wearable virtual reality media to the general public of Indonesia. A visual communication strategy that represents the notion of newness, in other words, Burung Indonesia embraces and adapts to modern technology. Having to understand the concept of how Burung Indonesia's thinking of public communication, it brought to our attention to develop the strategy sequence below:

1. Implementing Burung Indonesia brand communication to the project.
2. Visualizing Burung Indonesia brand to a booth design for exhibition purposes where the organization is involved to attract users.
3. Visualizing local content curriculum of Indonesian birds' conservation in a form of infographic animation to educate users that are visiting the booth prior to experiencing the researched media.
4. Persuade users to immerse in the Virtual Reality (VR) and ambisonic media experience of Burung Indonesia's conservation activities as part of the booth's installation.
5. Collecting User Engagement data using Google Form to measure User Experience (UX).

Proposed Media Setup

Immersive media proposed in this practical research is Samsung Gear 360 video camera and ZOOM VR H300 audio microphone. The idea behind choosing ZOOM VR microphone is because they include structural support for 360 cameras, thus it is suitable and applicable to the practical methods initially proposed in this research. The structural support is in a form of

a small tripod attachment or extension for combining both camera and microphone in parallel position. By combining the two media together, theoretically, it will practice a perfect synchronization in capturing 360 degrees visualization as well as auditory experience to maintain the authenticity of the birds' habitat.

The chosen type of birds as recommended by the Director of Burung Indonesia, Dian Agista, is songbird. Based on field monitoring and evaluation, Indonesia's songbird is currently endangered and statistically categorised as extinct, because the population is less than 4 birds left. Based on discussion with Burung Indonesia's field leader for Jawa Barat and Jawa Tengah area, Andriansyah, this structure is ideal to be placed near the bird's nest as it will confidently capture the best sound of songbirds.

Media Testing

Indoor Testing using Samsung Gear 360

The initial media experiment conducted in an airy large indoor area mimicking outdoor ambience. The production output needs to be "injected" in Samsung Gear 360 application and exported, before it can be edited in the video editing software, Adobe Premiere Pro.

The media testing and the rendered outcome raise some serious concerns, such as:

1. Overheating camera when recording for 30 minutes.
2. Quality of audio recording does not produce good sound clarity in capturing distant audio source.
3. The audio and video position were not parallel as instructed in the ZOOM VR manual book.
4. Editing and previewing the outcome requires a powerful computer technical specification as Adobe Premiere Pro's VR mode preview is a real-time feature.
5. Long rendering time for 4k video and ambisonics audio duration of 8 minutes, takes approximately 6 hours in a standard iMac 2012 computer.
6. Previewing the result in a VR online platform, Youtube, requires a fast speed internet connection, otherwise it will only visualize the 720s quality.

Figure 2 Indoor VR and Ambisonic result preview on Youtube. Scan QR code to preview.

Outdoor Testing using RICOH Theta V

Due to many technical considerations discovered in the initial media testing, the second proposed media setup is believed to be more appropriate to capture the highest quality of immersion. Samsung Gear 360 is substituted with Ricoh Theta V, which has video quality up to 4K Ultra HD with recording time up to 25 minutes. Ricoh Theta V is the most versatile for research purposes because it has an open-source developer kit, which enables researchers to customize its own software plugin to be installed inside of the camera.

As seen in Figure 3, the second proposed media setup for outdoor testing, which is equipped with Gorilla Pod attachment, so the setup has positioning flexibility. The media was tested in a public park surrounded by songbirds, which is the best environment to test the second setup.
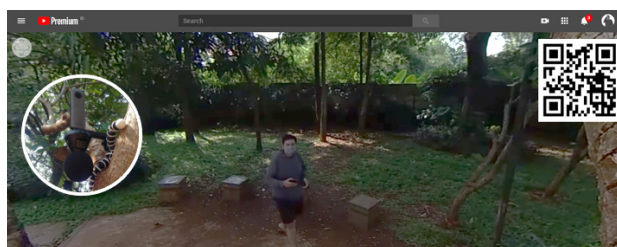

Figure 3 Improved media setup and outdoor testing with 4K UHD quality on YouTube

The result of this second media setup is tested on Oculus Go using YouTube VR app, the entire output, video, and audio, are successful, so it is highly recommended to experience this test by using one of Oculus gears (Go, Quest, or Rift) and YouTube VR app installed in the gear.

To experience the Ambisonics experience, users preview the video on a mobile device as well as wearing a fully functioning average earphone. The experience is enhanced by the moving Ambisonics audio phase as you explore the VR video, reminiscent of a real space. Later in this research by using the final rendered VR and Ambisonics output, such User Experience (UX) will be measured by using the User-Engagement Scale.

Research Location

Mount Patuha

The chosen location by Burung Indonesia is located in Mount Patuha, Ciwidey, Bandung District, West Java. The chosen location is based on accessibility, security and high biodiversity rate, especially endangered bird species such as Javan Eagle (Elang Jawa), Cucak Hijau and many songbirds. It took 2-3 hours to get to the location from the lodging by car, and continued by a short hike.

Figure 4 The confirmed location Mount Patuha, Ciwidey.

Equipment

As previously tested, the equipment that is prepared are as follows:
1. 1 Ricoh Theta V 360 Camera
2. 1 Zoom VR H300 Microphone
3. 2 Joby Guerilla Pod
4. 1 Bullet Time Tripod
5. Powerbank Charging Block (to charge the 360 camera)
6. AA Batteries (for VR Microphone)

Figure 5 Sampoerna University, Burung Indonesia and Aspinall Foundation team.

Result, Analysis and Discussion

Site Observation
Upon the arrival at Ciwidey with 3 members of Burung Indonesia, we were also meeting the team from Aspinall Foundation that responsible in conserving Javan Primates in the area as well as a forest ranger from Ministry of Environment and Forestry of Indonesia. The first impression and most important senses prior to practice any research methodologies on site is not relatable to the research topic itself.

Figure 7 Coffee cherries in Alam Endah, Ciwidey

it is witnessing the mutualism of each party involves and committed in conserving Indonesia's ecosystem. All focuses on sharing any valuable information collected by the observation teams in the forest, which more looks like a collective action despite animal species discrepancy. Feeling the spirit of such action does helps to inspire the research in intangible ways, and it is suggested to reconnect with the parties involved prior to step into the nature.

Aside from the positivity, there are tangible similarities between the organization, one of which is both birds and primates shares the same diet, forest fruits. Obviously, there are many types of forest fruits, but one that is available abundantly is coffee cherry, which is also the growing economic and cultural commodity of Ciwidey. This may be one of the reasons that bird's life are popular in this district, as the team mention that we do not need to look for birds, just plant many kind of fruits and they will all come. Coffee is not only a cultural pride and economical support of the district but also beneficial for the ecosystem.

Arboretum Alam Endah
One of the areas that Burung Indonesia recommended is the Arboretum Alam Endah, it is a newly developed natural tourism that the locals believe there are still endemic birds flying around the area. There are two sites that were recommended, one is located near a small waterfall and the other is a small valley believed to be the best location to witness bird activities. The media was tested near the small waterfall, and it was not the most conducive place because the sound of the birds is covered by the sound of the waterfall. Figure 6 shows

the position of the media setups on the preferred site, which is the small valley and the result of the recording.

Figure 6 Example of media recording setup and the result at Arboretum Alam Endah

Aspinall Foundation Conservation Area
Because the location of the Arboretum is near the main road, the recording is frequently interrupted by vehicles sound passing the area. Thus, Burung Indonesia suggested that Aspinall Foundation's conservation area to be a research site, as it is the closest we can get to the boundary between conservation area and the wild forest, so it is much more quiet and expected to have many bird activities. However, the regulation is very strict due to too much primate's exposure to human, so we cannot spend a lot of time hunting for good locations instead one of the employees suggested us a location where bird sounds are dominant.

Figure 8 Example of media recording position and result in Aspinall Foundation's conservation area.

Media recording at Aspinall Foundation Conservation Area is significantly better than the one in Arboretum Alam Endah, although it is not the best result as we are still hearing motorcycle from the nearby villager passing by but not as frequent and as aggressive as the sound in Arboretum. The result was then uploaded to the Youtube channel and analysed in YoutubeVR app using Oculus Go VR set. My initial reaction that the sound is what makes the entire *immersiveness* experience successful, the sound and the direction of where the birds' sound came from is very clear.

It is hard to detect bird's activity, I can see branches are moving that is a good indication of birds' movement, but it is in a very tall trees and far from where the media recording was placed. Although on minute 1:21 there is a bird flying pass the camera, but it was too fast to see it clearly. However, the good news is where I noticed the direction of bird's sound, there are tree branches movement.

An important side note to the research is that the user-engagement test is not conducted due to COVID-19 pandemic that restricts us to measure the user experience result using Oculus Go VR and User-Engagement Scale. Further activities on brand communication strategy will be further discussed outside of this research with Burung Indonesia, as the activity is more relevant as Community Service.

Conclusions and Future Work

As discussed with Burung Indonesia team, this result is as good as it gets to recording birds, as mentioned by one the survey team's biologist, Achmad Ridha, that it is not seeing birds, but it is more of hearing birds. What is captured on the camera is considered as visual aid to the entire experience. The experiment is considered successful by Burung Indonesia team, although there many other forest environments with entirely different challenges needs to be explored by using 360 camera and Ambisonics setup. This research opens a wider door of inspiration to us, especially in ways technology contributes to wildlife conservation.

Upon inspecting Aspinall Foundation's conservation area, my main concern is that the media recording needs to be placed higher on the tall and big trees to have a clear view of bird activities and clear direction of the bird's sounds. We need a flexible yet sturdier and stronger camera mount structure, so it is possible to place the media on trees with bigger diameter trees, strong wind, and heavy rain. Although, this is not the scope of this research, but I would like to pursue in the

future to research on the best camera mount structure for wildlife conservation.

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