REAL TIME AUGMENTED REALITY BASED TOOL FOR DIGITAL MEDIA PRODUCTION

Project Id: 2021-075

Individual Project Proposal Report

B.Sc. (Hons) Degrees in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

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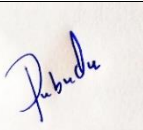
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DECLARATION

We declare that this is our work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

At present, the span of digital media is humongous. So do the impact it carries to society. This research is a lot focused on News broadcasting and presenting. The crucial factor here is to keep the audience engaged during these live on-air programs. Various methods have been used for this purpose since the early days of television. Most of it came out through the power of voice, sound effects, and facial expressions of the anchorperson. This research is aiming to enhance it to the next level by detecting common hand gestures and manifest them to display additional information on the broadcasted footage. This whole process can be identified as a real-time human-computer interaction as well. With the touch detection system, it is possible to control 3D objects in an augmented reality environment. Introducing live-action touch and 3D object movement will escalate the attractiveness of the broadcast. In addition to that, mobile journalists and social media content creators can also benefit greatly from this inexpensive automation to improve the quality of their work.

Keywords; Hand Gesture Detection, Control 3D Movement, Augmented Reality, Attractive News Broadcast.

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01. INTRODUCTIONS

Digital Media mainly deals with humans. So, human interaction is very important. This system has an augmented reality background, which is most trending and attractive technology. The system which includes point tracking, object placement, gesture detection and data visualization as one tool as we focus on news broadcasting. The all features connect with augmented reality. This tool will be commercialized in the future under one brand name "Lumoz". Lumoz is a system designed to help daily news creators, mobile journalist, live media creators and social media content creators to easily create daily live media content with 3D objects and augmented reality technology with time efficiency, budget friendly way and accurately.

Gesture Detection, it's my part. It is very important to keep the audience hooked on each news item when presenting the news. Various methods have been used for this purpose since early times. They are different according to the broadcast medium. The newspapers were the first to arrive in the news delivery of the media field. Its focus is on the pattern of the words. There the people are attracted to the headline of an article or the attractiveness of the author's words. Then the radio news communication came into the sector as the second. Radio-based communication was only in audio mode. It only gave priority to the voice. That time, the news presenter used his/her voice for the news attractiveness. Their voice strength, voice control, and voice intensity were the only things that were used to improve the attractiveness of the news delivery. Then the television came into the news presenting. Television uses audio and video modes for news delivery. With that transformation in Sri Lanka, radio news presenters joined television. Radio presenters are used to presenting the news with their voice and their focus was to manage their voice. Because of that fewer facial movements or emotions were shown by the presenters. But it changed with the international influences and by stepping into technology. Then the news production started to add more attractive elements to the news delivery. Not only the voice but also facial expressions changed and now the news presenters express some emotions during the broadcasts. Not only facial expressions and emotions but also gestures of the presenter were added to increase the attractiveness. To detect gestures of hands and body [01], the gesture detection system is created. Through the gesture detection system, the 3D objects that are used in

Augmented Reality can be controlled. Having a live-action such as gestures and 3D motion will create attractive news delivery which will entertain the viewers alongside voice delivery. Additionally, mobile journalists and social media content creators can also make the most out of this affordable automation to further enhance the quality of their work.

02. BACKGROUND & LITERATURE SURVEY

Digital Media is a very large area. As Television Broadcast, News Broadcast, Advertising, Documentary, Story Telling, Interviews, Social Media, Mobile Journalism, many more. So, in our research, we select one category from the digital media. Which is News Broadcast.

Accompanied by the evolution of professional news broadcasts, community attraction takes a prominent place. When the news was published in newspapers, radio, television, social media, etc. various elements and various attempts were made to attract people to it. Those different things were framed within the framework of the media, in those moments, in those abilities.

In news broadcasts on television, it is important to include the news media as well as the news programs, rather than just listening to them. With the commencement of television news broadcast in the great field of Sri Lankan Media, the same News presenters presented News on television, though visuals were introduced they adhered to the same method of presenting: the focus was only on the voice. [02] Although the mode of news broadcast was focused on video yet, it could only be understood by hearing. Broadcasters lacked using proper visual media due to a lack of facilities and knowledge. Later, with the influence of different countries and technology, the pattern of presenting this News modified. With the advancements in News reading, presenters were introduced to new modes such as using facial expressions, liveliness, the presentation of data analysis graphically, and so on was added to news broadcasts, while the monotony of conventional news reading was eliminated. There were also various live animations. The purpose of all this was to get the viewer's attention into the newsreel of each news item on the television and to provide a clear explanation to the viewer ensuring that they are exposed to the accurate information.[03]

Today, television news broadcasts in Sri Lanka include a variety of animations. These animations are created by dedicated animation software. These are made as templates and used for news broadcasts. But they do not add these animations to the various news items that are broadcast daily. This is because it takes a lot of time and effort to create these animations and the practical difficulty of integrating such animations into a live broadcast.

Furthermore, such animation programs are already used in Sri Lanka for live news broadcasts, but they have to incur huge costs. Events are another reason not to use this to incur such a high cost for everyday news broadcasts. This project aims to increase the attractiveness of a daily news broadcast in a minimal amount and minimum production time, to maintain a good relationship between the viewer and the presenter, and to explain the news to people of different levels of knowledge.

When the delivery in the video broadcast, we focus on how to catch the audience frame by the fame in the video. What is needed is a one-of-a-kind presentation. Here's how the presenter's style changes, the camera angles, voice control, Presenter's facial expression, studio background, lighting, a lot of things like this add up.

The new technologies of mobile and digital media have revolutionized the entire media. For example, Mobile journalism is the new way of reporting incidents live. The Incident proves to spread fast using mobile and social platforms. There are different applications that have been developed for community reporting. Therefore, the significance of online mobile journalism and mobile tools, as the past decade used television to broadcast any news. In the future people may see many other technologies far better than mobile journalism. Cell phones are now much more productive in news recording from even in hand or pocket. To capture a young audience we use mobile journalism, for this social media, the internet, and the web contributes much more to collect information. Nowadays learning new technology, changing daily bases work habits, and adaptation of new job requirements to maintain job security and to be successful in career, as mobile journalism also disrupts the transmit news market. It is important to enhance the viewer's experience more than ever because it seems to be the successor to television.

On my part, 3D animation aims to create a better connection between the presenter and the audience by providing movement and eliminating the monotony they feel. Then to make it easier

for the presenter to interpret the things that gesture detection technology is used for the concert to make it easier for the audience to understand.

In the literature survey I have to focus on the uses of new media technology and gesture detection research articles in the recent years. There are many new media technologies used in media industry. Augmented reality, virtual reality are several new trends.

2.1 Augmented Reality (AR)

When the computer-generated content was bound into specific places or activities in order to make a better expression for the consumer with the intention of clearing out the context, we call it augmented reality [04]. There is a considerable improvement in using AR for mobile applications over the past decade. AR started its journey across digital media with the involvement in audiovisual media such as news, sports, and entertainment and then spread to the commercial sector as well [04]. It came in a tangible and attractive way to the customers without even visiting the places to buy what they need. This approach turned the commercial sector upside down positively.

2.2 Evolution of Media with Technology

This section describes how AR can be used as a technique to explore new mediums to improve the digital media sector. A medium cannot be defined just using technology. It is never just technology [05]. While technology focuses on bringing up new features, AR focuses on presenting them to the community in an attractive and exciting way. When it comes to the evolution of media with technology, filming cameras, projectors, and distributing systems come to our mind in the very first place. It was never a small journey as it took around 4 decades from 1890 to 1930 to bring these technological solutions up to improve the media sector. By 1920, television was invented. It was capable of converting images to electrical impulses that are transmitted through radio waves/wires and then reconverting to images that existed even before the second world war. By 1947, due to the increased production of televisions, demand for the

radio, cinema, and live theatre went down. There the media sector got a new opportunity to broadcast their content in a much clearer way using audio-video technology. [06]

2.3 AR Involvement in the Media Sector

The recent advancement of augmented reality technology made it easier than ever to implement it in the mainstream media. International media giants like BBC, CNN, and mainstream national channels in developed countries are making the most out of it right now. However, when it comes to the Sri Lankan media industry, live interactive visual automation is still not available in general and costly to implement. We have seen some local television networks run their election coverage using augmented reality, but it is kind of faulty and flawed. For example, TV Derena election broadcasting reportedly costs Millions of Rupees and often presents inaccurate graphs and charts throughout the entire coverage. They even managed to squeeze in some augmented reality technology, but it has cost them around thirteen Million rupees per day. We were able to find out the present solutions in the country are much more inconvenient and do not stand up to the expected outcome.

2.4 Human Gesture Detection

Gestures are important for communicating information among the human. Nowadays new technologies of Human Computer Interaction (HCI) are being developed to deliver user's command with others. Users can interact with others through hand, head, facial expressions, voice and touch. There are many techniques use to gesture detection. Sometimes using sensors and collect data & classified human gestures, after predicting movements. Sometimes the artificial intelligence model trained and use it.

Gesture detection is not a new topic to the society. Those methods are used in many things. Some robots, IoT devices, tools are used for different purposes. Sometimes they use some sensors like Kinect. Sometimes use image processing, computer vison algorithms and train the models and use it. All methods and techniques I found are added in the research gap section. And it also includes comparison their features.

3.0 RESEARCH GAP

In the research gap, many research papers regarding the research component are gathered, analyzed and them to compare with the research component.

There are many methods and technics use for gesture detection which can be found in the past research papers.

Below are some methods and technics found,

- Image Processing (HGCARS) [06]
- Computer Vision algorithms (VECAR) [07]
- Surface Electromyogram (EMG) [08]
- Passive RFID tags (In-Air Gesture Interaction) [09]

| Features	HGCARS	VECAR	EMG Gesture Recognition	In-Air Gesture Interaction	Lumoz
Real-time gesture detection	Yes	Yes	Yes	Yes	Yes
Showing a preview for the object	Yes	Yes	No	Yes	Yes
Is there a live connection according to the presenter?	Yes	No	No	No	Yes
Can it real-time connect with 3D objects	No	Yes	Yes	No	Yes
Detecting movements (rotate, up , down, scaling) using gesture detection	Yes	No	Yes	Yes	Yes
Prior training giving to use the system	No	No	No	Yes	Yes

Table 1: Research Papers Comparison

Below is the product comparison included with these features and it focuses on the tools incorporated with the broadcasting industry. [10]

Features	VMix	NewTek	VidBlaster X	Zoom	Wirecast	OBS	Vizrt Engine	Lumoz
Adding 3D object to the video	No	No	Yes	No	Yes	Yes	Yes	Yes
Adding 3D object to live video stream in real-time	No	Yes	Yes	No	No	No	Yes	Yes
Prior training on the system is required	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Spending higher budget	Yes	Yes	Yes	No	Yes	No	Yes	No
Lowest latency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is there a live connection according to the presenter?	No	No	Yes	Yes	Yes	Yes	Yes	Yes
can it real-time connect with 3D objects	No	No	Yes	No	Yes	Yes	Yes	Yes

Table 2: Product Comparison

Below graph shows the characteristics in the use of these features.[11][12][13][14][15][16][17]
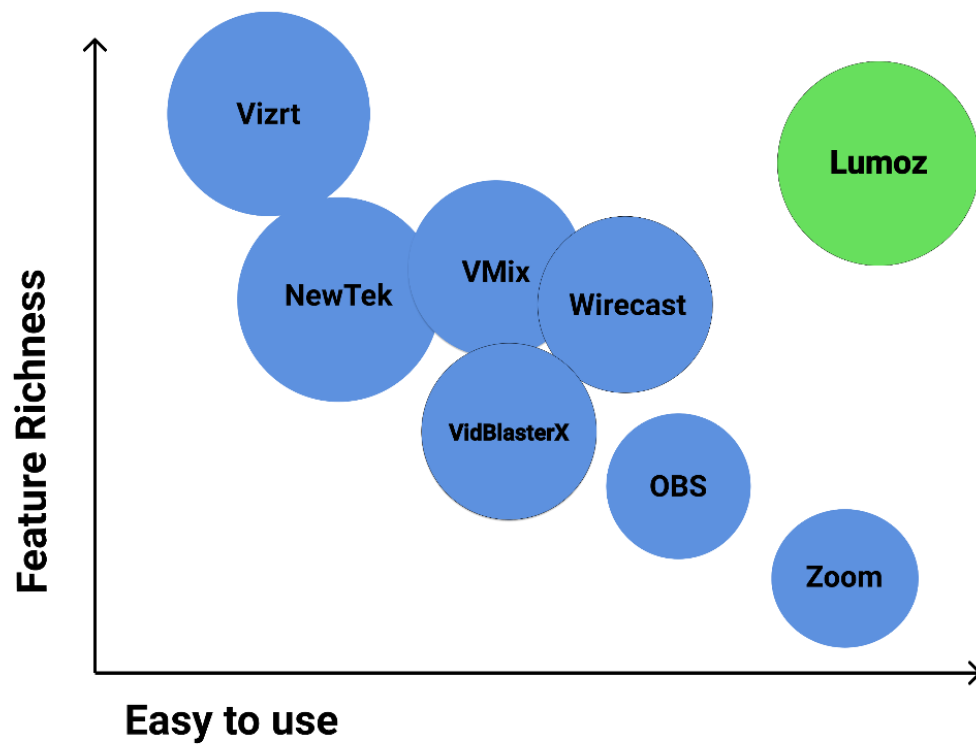
Figure 1: Live Streaming Software Overview

04. RESEARCH PROBLEM

Media hosting is an important skill, the acquisition of which requires dedicated and time-consuming training. In recent years, researchers have begun to look for ways to support presenting skill training. These methods include an assessment of the trainee's oral delivery skills that can be achieved with an automatic understanding and continuation of the behavioral and behavioral strategies demonstrated by the presenter. In this study, we propose an automated real-time data visualization system to enhance the presentation.

The voice and words are the dominant factors to a radio host. The key factor here is that person should maintain the program flow for the purpose of entertaining the audience. The purpose of programs can vary like interviewing, presenting, reading news and sports, informing the audience about the weather, or creating and controlling the conversation. So, radio hosting basically depends on broadcasting appealing audio because the only factor within the limits of control is the sound. However, anchoring a television program or any other live audiovisual media is poles apart from radio.

The traditional television news anchoring used to be a mundane expressionless presentation and it was intentional because hosts were advised not to manifest any judgment regardless of what they present. However, the modern news host is much more engaging and most of the time the viewers can see the rich expressions of the presenter. All these positive changes made these programs much healthier and more natural to the audience. We can further enhance the experience with an automated visual effect system. The large costs associated with the implementation are the major pushbacks faced by the media industry. So, we are looking forward to a lesser expensive solution to overcome that issue.

Anchoring a live broadcasting televised program needs some exceptional presenting skills. Important aspects like talking speed or body language are well recognized, and many good practices exist, but they are difficult to evaluate. [18] Our aim here is to make the first step towards an automatic feedback system for presentation skills by using common motion-detection technology[20]. We expect to develop a software tool using captured gestures, eye-contact, movement, speech, and the speed of slide changes.

05. OBJECTIVES

5.1 Main Objective

What this does is give the presenter the opportunity to take a 3D object and explain it to the audience. Explain it in such a way that it makes a person feel monotonous and to get a person's attention and explain this.

The goal of interpreting human gestures via mathematical algorithms. It is a subdiscipline of computer vision. Speaking of Gestures, it can originate from any bodily motion or state but commonly originate from the face or hand [19]. Gestures allow individuals to communicate a variety of feelings and thoughts, from contempt and hostility to approval and affection, often together with body language in addition to words when they speak and join to provide emphasis and context to the presentation. This system can further enhance the visual experience by manifesting gestures to the next level.

The aim and objectives of media are to educate society. This is one of the most important roles of media to educate society. One can explore and analyse various product reviews, do price comparisons for various items, read news about politics, fashion, war, weather, health, and much more with the help of media. At present, media is considered one of the most powerful tools that can impact humankind. The great power comes with a great responsibility to be always one step ahead in tomorrow than it was in yesterday. So, it is a much-needed improvement to the modern media.

5.2 Specific Objectives

- Identifying the gestures of the presenter. When the presenter moves his/her hands or location the system detects these movements. Using cameras, the gestures can be identified. It occurs when a presenter places specific palm or finger motions before the camera, and the system interprets that pattern of images as a particular gesture in which can taught to display related computer-generated imagery on the broadcasting footage.

- Giving the presenter a preview of the location of the 3D object, so that the presenter knows the location that the 3D object is at and the presenter can adjust him/herself to continue the delivery. So, by means of this, the presenter can take a look of his or her own imagery exactly as the broadcasting one and make the adjustments they prefer. It is used for inspecting a picture source before it is switched to transmission.

06. METHODOLOGY

The research team will identify the research by identifying the real-world need for this solution. We will be further analyzing literature materials and commercial markets to find any existing studies, research, and commercially available products which try to address these problems. In addition to that, few site visits also will be planned to identify the actual user need because we believe that most of the systems and projects fail because they are unable to address the real-world issue but the ones in theory. Our attempt is not only to identify what functions to be included in the system but also to identify the non-functional requirements that the stakeholders are looking for. Few industrial experts or professionals will also be interviewed to get their views and suggestions to improve the solution.

With the above-mentioned techniques, we will be identifying the potential features for the software, development methods, technologies, hardware, and other infrastructure on their pros, cons of each, feasibility, and alignment with our general and specific research objectives. With the potential solutions identified, a more focused literature study will be carried out. A test

platform will also be created to test and monitor each suggested solution, ideas with the intention of identifying the best.

Once the parameter declaration is completed, the team will start working on combining parameters with the software components in order to monitor the accuracy that each parameter adds to the solution. Once we get a satisfactory accuracy level the final solution will be implemented along with the frontends that reach the stakeholder approved levels of UI/UX components.

With the analysis further conducted, the below high-level model will be improved to generate a better research outcome.
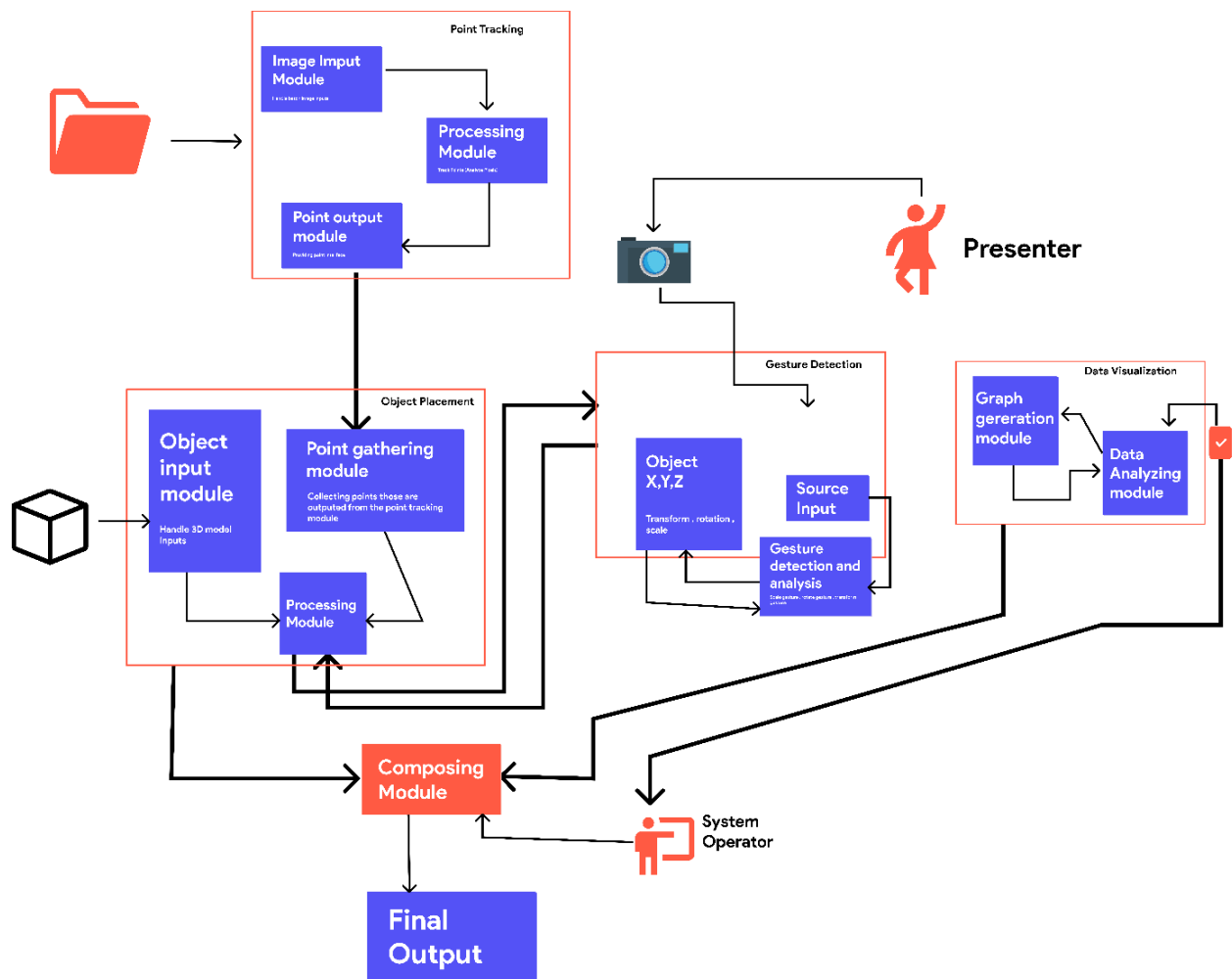

Figure 2: Overall System Architecture

In the overall system diagram, the process starts from the Point tracking, then those points are used for the object placement. Then the Gesture detection and Data Visualization components are taken place accordingly.

The gesture detection system will be using OpenCV in order to detect hand gestures. OpenCV is a library of programming functions mainly aimed at real-time computer vision. After detecting hand gestures, specific commands are then created such as zoom in/out effects, rotating effects, and up/down commands.[21] With the presenter's gestures, the coordinates of the object can be changed. [22]
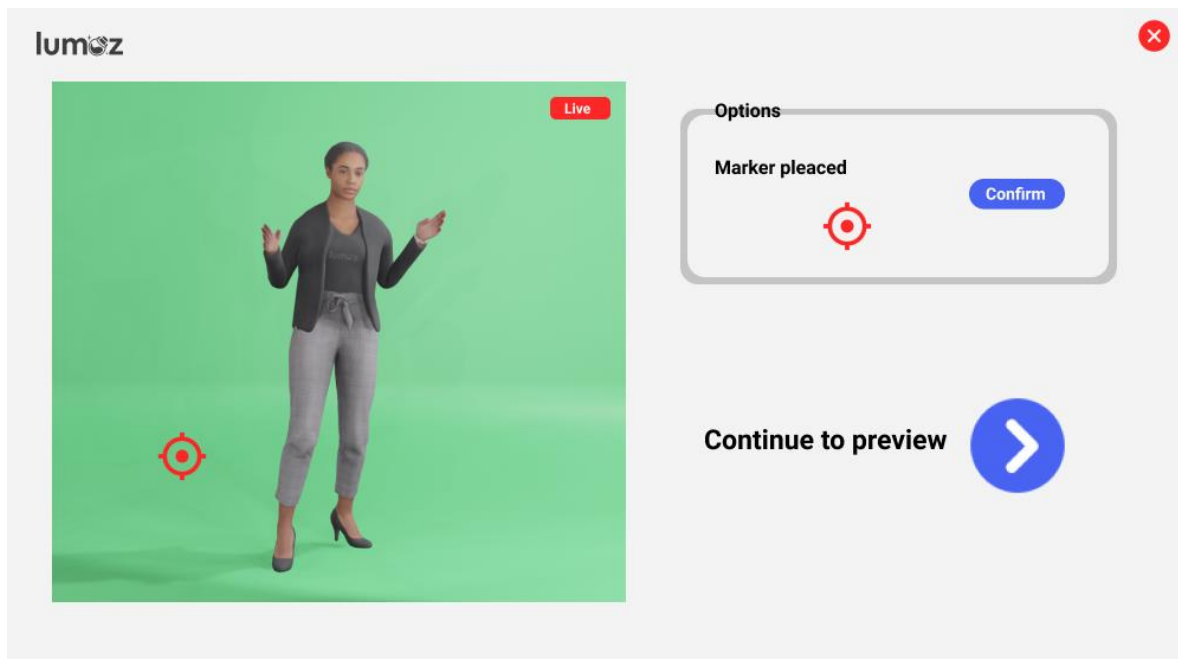

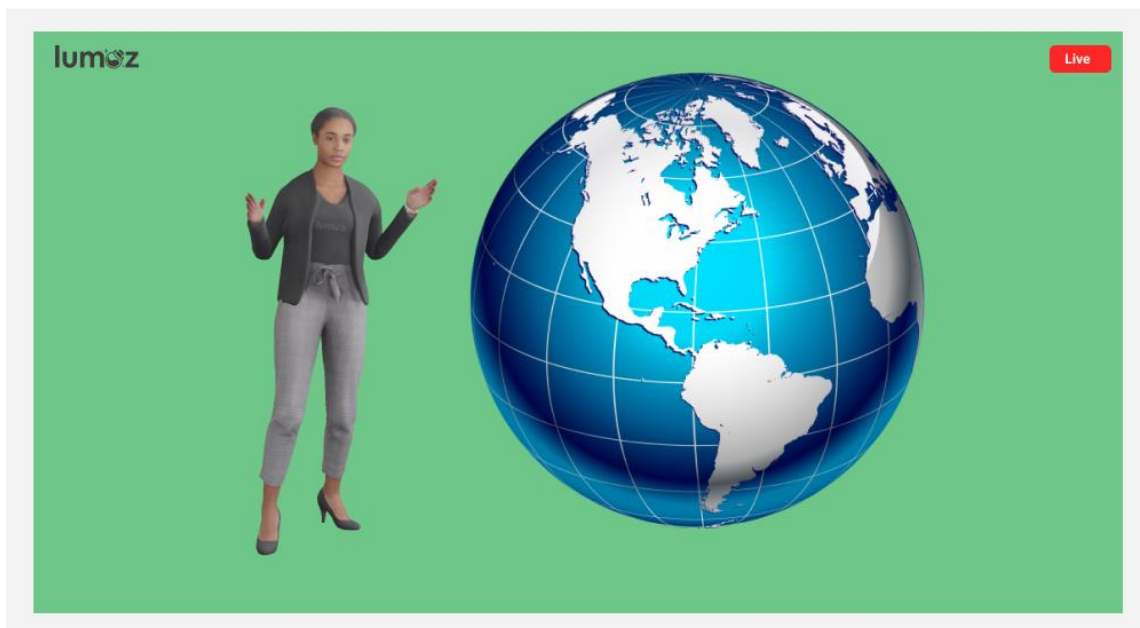*Figure 3: Scaling*   *Figure 4: Rotation*

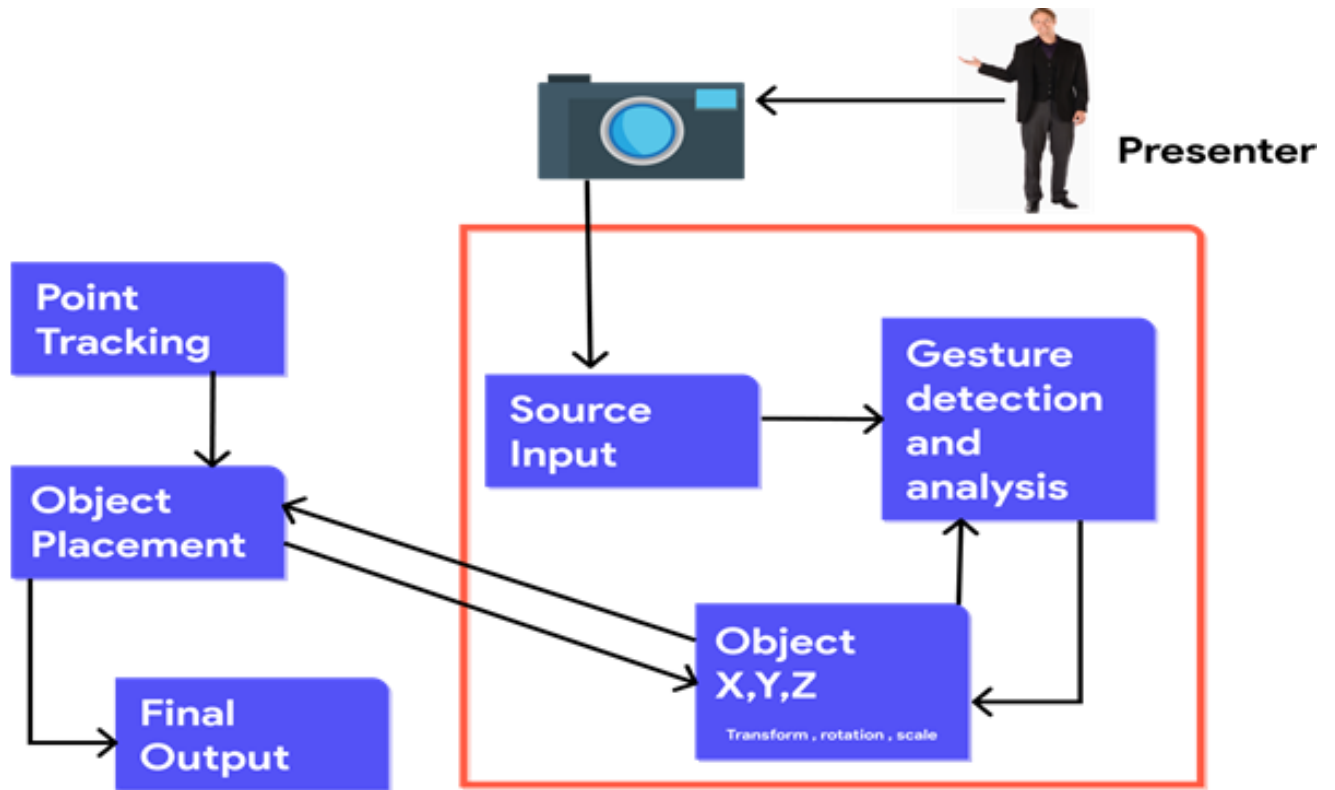As frontend, will be using JavaScript base library, Electron.

Figure 5: Gesture Detection User Interface

Figure 6: Preview User Interface

The gestor detection system diagram of this solution can be shown as follows.

Figure 7: Gesture Detection System Diagram

The suggested technology stack for the solution will be as follows.

WebRTC

Web real-time communication (WebRTC) is an open-source project that allows web browsers and mobile applications to communicate in real-time through APIs. It uses peer-to-peer communication to support audio-video communications within web pages, eliminating the need for plugins. Google, Apple, Mozilla, Microsoft, and Opera, all support WebRTC. W3C and the Internet Engineering Task Force, also known as ISTF, publish its standards. [23]

Python

Python is a high-level, general-purpose programming language that is interpreted. Python's design philosophy prioritizes code readability, as evidenced by its extensive use of indentation. Its language constructs and object-oriented approach are designed to assist programmers in writing clear, logical code for both small and large projects.[24]

Flask

Flask is a Python-based microweb framework. It is referred to as a microframework because it does not necessitate the use of any specific tools or libraries. It doesn't have a database abstraction layer, form validation, or any other components that rely on third-party libraries to perform common tasks. Extensions, on the other hand, can be used to add application features as if they were built into Flask itself. Object-relational mappers, form validation, upload handling, various open authentication technologies, and other framework-related tools all have extensions. [25]

OpenCV

The OpenCV library is primarily used in human-computer interaction, robotics, biometrics, image processing, and other fields where visualization is critical. It analyzes the camera input data and converts it into a useful action. The proposed system's main aim is to recognize unique human gestures so that we can use them to communicate information or control any device or robot in offices and homes. A stance may be described as a static hand setup pose. A dynamic pose, on the other hand, can be defined as a gesture that involves the physical movement of body organs such as the hands, arms, and face to communicate information. In other words, real-time machine vision is now possible. [26]

JavaScript

JavaScript (also known as JS) is a programming language that follows the ECMAScript specification. JavaScript is a multi-paradigm, high-level programming language that is often compiled just-in-time. Curly-bracket syntax, dynamic typing, prototype-based object orientation, and first-class functions are all features of this language. JavaScript is one of the core technologies of the World Wide Web, alongside HTML and CSS. JavaScript is a programming language that enables interactive web pages and it is an important component of web applications. Vast majority of websites use it for client-side page behavior, and all major web browsers support it with a dedicated JavaScript engine. JavaScript supports event-driven, functional, and imperative programming styles since it is a multi-paradigm language. It has APIs for text, dates, regular expressions, standard data structures, and the Document Object Model (DOM). There are no input/output (I/O) facilities in the ECMAScript standard, such as networking, storage, or graphics. In practice, JavaScript APIs for I/O are provided by the web browser or another runtime system. [27]

Electron

GitHub created and maintains Electron, an open-source software framework. It integrates the Chromium rendering engine and the Node.js runtime to facilitate the development of desktop GUI applications using web technologies. Atom, GitHub Desktop, Light Table, Visual Studio Code, Evernote, and WordPress Desktop are all open-source projects that use Electron as their primary GUI framework. [28]

Part	Technology
Gesture detection	OpenCV, Python
Real time communication between two or more computers	WebRTC
Back End	Python, Flask
Front End	Electron

Table 3:Technologies Stack

Why we choose OpenCV, it has a module containing basic image processing and computer vision algorithms. Optical flow functions ,Motion tracking functions, Affine transform function etc. WebRTC supports video, voice, and generic data to be sent between peers, allowing us to build powerful voice and video-communications. Flask for APIs. Electron can develop very lightweight desktop app. Heavy desktop apps like Twitch.tv, Visual code studio are built with Electron.

System requirements are the need of high processing power, high capacity, and ability to handle graphic work, good stable internet connection and also need a camera as the hardware requirement.

This system highly focuses on availability, because this is a live process and Lumoz, live preview can be seen by the presenter. It is very important to the presenter's confidence. Also, performance, usability and reliability are the important, good usability is much better for a user-friendly interface which needs to create attractive visual elements. Good performance is essential for the creators of visual elements with less time and easily manageable interface. Good reliability, correct 3D object movement is needed for right functioning. We can manually test this gesture detection process. I think it is very practically and tester can see the live result in the same time. E.g :When presenter moves his hand right, the 3D object should move to right.

This is the work breakdown system.

Table 4: Work Breakdown

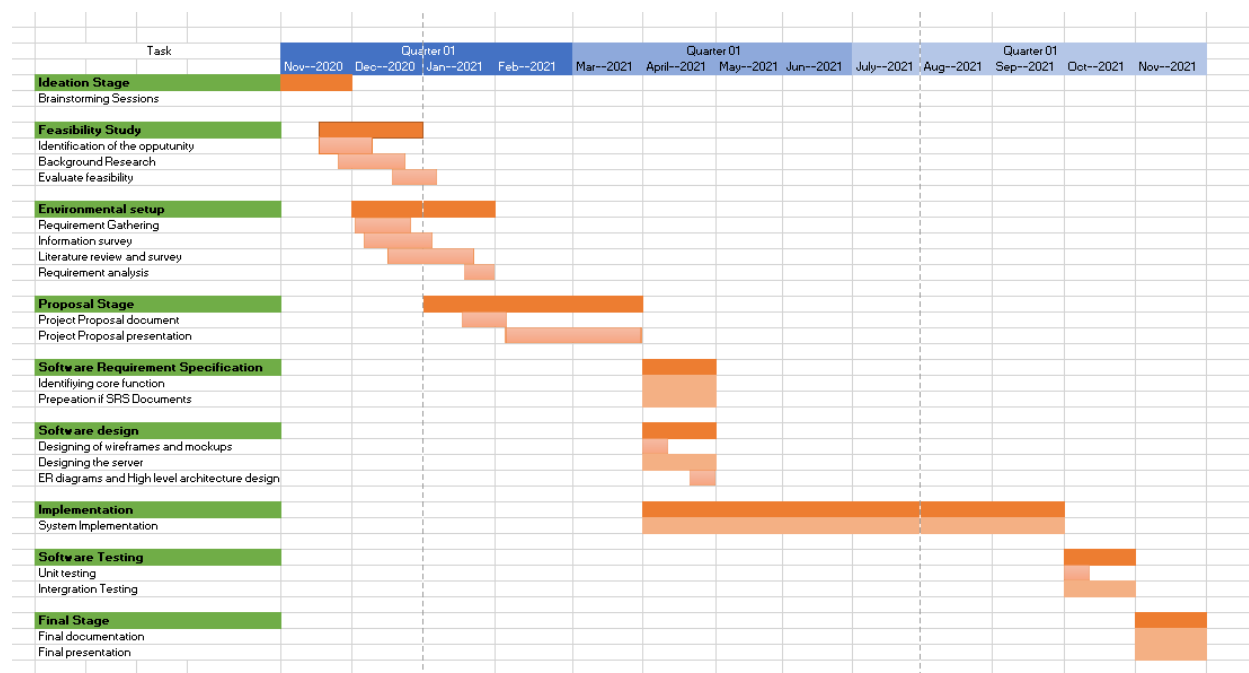This is the grant chart. This shows how I plan to complete my component.

Table 5: Gantt Chart

07. BUDGET AND BUDGET JUSTIFICATION

Resources	Prices (LKR)
Electricity	2000.00
Stationary	1000.00
Internet	2000.00
Communication	1000.00
Paper Publish Cost	5000.00
Software Purchasing	2000.00
Total	13000.00

Table 6: Budget

08. COMMERCIALIZATION ASPECT OF THE PRODUCT

With the individual experiences of all tasks of us in the media field, we can easily commercialize our product. We did a market analysis, and we contacted some graphic designers in local news channels to get information about difficulties in their current graphic designing work. We also contacted the graphic designer head in Derana 24 news channel and Hiru News channel. On top of that, I have been actively involved in media field since school days to this day. With all the information gathered, we can say that this tool might be very important in Sri Lanka. We can also target this tool for mobile journalists, social media journalists', Live event, or as daily use tool for digital media producers. So, the sales plan can vary with the target audience and we can create social media marketing plan including these target audience. We can offer a free trial period for the users with limited features with the option to buy the product or a premium subscription method if they are interested.

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APPENDICES

Appendix A : Plagiarism Report

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