Visvesvaraya Technological University

Jnana Sangama, Belagavi - 590018

A Project Report on

"E-CONVOCATION WEBSITE USING VR"

Project Report submitted in partial fulfilment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

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CERTIFICATE

Certified that the project work entitled **"E-CONVOCATION WEBSITE USING VR"** is a bonafide work carried out by:

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in partial fulfilment for VIII semester B.E., Project Work in the branch of Computer Science and Engineering prescribed by **Visvesvaraya Technological University, Belagavi** during the period of April 2021 to July 2021. It is certified that all the corrections and suggestions indicated for internal assessment have been incorporated in the report deposited in the department library. The Project Report has been approved as it satisfies the academic requirements in report of project work prescribed for the Bachelor of Engineering degree.

.....	.....	.....
Signature of the Guide	**Signature of the HOD**	**Signature of the Principal/ Director**
[Mr. Sanjoy Das] [Associate Professor]	[Dr. Rekha B. Venkatapur]	[Dr. DILIP KUMAR K]

External Viva

Name of the Examiners — Signature with date

1.

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DECLARATION

We, the undersigned students of 8th semester, Computer Science & Engineering, KSIT, declare that our project work entitled "**E-CONVOCATION WEBSITE USING VR**", is a bonafide work of ours. Our project is neither a copy nor by means a modification of any other engineering project.

We also declare that this project was not entitled for submission to any other university in the past and shall remain the only submission made and will not be submitted by us to any other university in the future.

Place: Bangalore
Date: 23/7/2021

Name and USN	**Signature**
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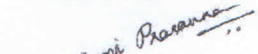
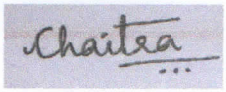
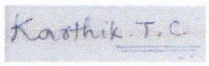
B. LAKSHMI PRASANNA(1KS17CS014)	
CHAITRA(1KS17CS017)	
KARTHIK T. C. (1KS17CS033)	

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ABSTRACT

Due to COVID-19 restrictions, the better way of attending graduation is by VIRTUAL GRADUATION where students and staff members from various colleges can attend the annual convocation in their VR models. While the students are not physically present at the dais, they could be seen getting on dais and receiving their graduation degrees with the same enthusiasm.

This project aimed to establish a platform for ceremonies to happen virtually along with the participation of each and every individual through VR. The degree certificate from the personalized 3d model of the professor is accepted by each graduate's unique 3d model. Despite the limitations imposed by the pandemic, it will give the student the same experience as an in-person event.

Keywords—Virtual Reality, Face Detection and Face Swap

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CHAPTER 1

INTRODUCTION

1.1 Overview

Across the country, due to Covid-19 situations, all the colleges are being forced to do multiple frameworks such as planning from budgets, calendar of events, online learning and more. Casting the graduation ceremony that has to occur on the front end of all that. Some colleges are planning to cancel or postpone the graduation ceremony. But the math of social distancing doesn't add up to even delayed events being a good solution. graduation ceremonies offline then there would be huge amount of health risks. Sanitizing the environment and maintaining the social distancing, and wearing masks.

Does everyone tend to wear the masks? Also, few colleges are planning to conduct graduation ceremonies through video conferencing platforms, but to what extent will the students be satisfied? All these would create uncertainty for the students, parents, teachers and other staffs. Keeping all the above-mentioned points in the mind, we have come up with a solution where colleges can deal with the graduation ceremonies virtually based on Virtual Reality. Thus, in this pandemic period that uses the technology in hand, our virtual graduation ceremony using VR can be more efficient and progressive. This project aimed to establish a platform for ceremonies to happen virtually, which is a website for virtual graduation ceremony.

Tools and Technologies used were Python, its frame work Flask and Blender tool. This tool was used to create male, professor, female 3D models in the stunning graduation attire with an amazing gesture and animation. Python and Flask are used for the backend and frontend of the website. The degree certificate is accepted by the unique 3D model of each graduate from the professor on stage. Despite the limitations imposed by the pandemic, it would provide the learner with the same experience as an in-person event.

1.2 Purpose of the project

We are building a web app where the first user will be allowed to enter the details of the professor (name, image and gender) and the students (name, USN, image and gender).

And then the user can see the face swapped video of the 3D models collecting the certificates from the professor. When it comes to face swap videos, there are two crucial steps: training and creation.

Here, we are using a neural network to encode a face from an image, and reconstruct one with similar features in a video. Imagine you had a snapshot of a person and a video of a celebrity dancing, and you had to manually edit it so that the person in the image was dancing in the same environment as the celebrity. The difficulty of such a task is largely determined by the degree to which the two faces are distinct. Firstly, the images of each and every student and the professor need to be uploaded separately on the web app and then the face detection takes place.

1.3 Scope of the Project

The scope of this projects is as followed accordingly:

This project aimed to establish a platform for ceremonies to happen virtually along with the participation of each and every individual through VR. The degree certificate from the personalized 3d model of the professor is accepted by each graduate's unique 3d model. Despite the limitations imposed by the pandemic, it will give the student the same experience as an in-person event. E-Convocation web app using VR to celebrate convocation at your comfortable place

- Institutions can adopt this VR e-convocation to conduct the graduation day.
- Creating 3D models of the students and professors where students go on the dais to collect the certificate.
- The added feature is that the video of that can be downloaded by the respective college staff for further reference.
- The goal is to make the final-year feel that it is a real event.

CHAPTER 2

LITERATURE SURVEY

The Usually accepted definition for VR is the use of computer-generated 3D environment, that the user can navigate and interact with, resulting in real-time simulation of one or more of the user's 5 senses (Gutirrez, Vexo, & Thalmann, 2008; Guttentag, 2010, Buradea & Coiffete, 2003;).

Virtual Environments and Virtual Worlds are two terms that frequently appear in VR research. According to Guttentag (2010), VR immerses the user in a virtual environment. Singh and Lees (2009) coined the term "virtual environments" in their research on tourism education.

Factors affecting mass gatherings in this COVID situation: -

From the deadly pandemic the most recent and vital events and summits had been postponed and declined or cancelled altogether due to the travel bans and work-from-home policies resulting. The coronavirus pandemic's unpredictive massive impact on events offered a different opportunity for virtual reality.

CHAPTER 3

SYSTEM REQUIREMENT SPECIFICATION

For software in development, a software requirements specification (SRS) is a precise description of the software's intended purpose and environment. The SRS explains in detail what the program will accomplish and how it will be expected to function. Software requirements specifications are approved so that rigorous analyses of needs can begin prior to design, reducing subsequent redundancy.

The software requirements specification document includes all of the required requirements for the project's development. We have a comprehensive and full understanding of the products that will be developed or are being developed in order to extract the requirements.

3.1 Hardware Requirements

We use the following hardware requirements:

- Processor: Intel i3 II generation and above
- RAM:4GB
- HardDisk:500GB

3.2 Software Requirements

We use the following software requirements:

- Framework –Flask
- API - Postman
- Backend - Python
- Blender
- Operating System: Windows 7 and above.

3.2.1 Flask

We have Flask as its high-level Python Web framework, open source which encouraged fast development and clean, pragmatic design. It takes care of a lot of the headaches associated with web construction, allowing us to concentrate on the website's concept and key features.

3.2.2 Postman API

The Postman API always allows you to programmatically use data stored in Postman accounts with ease. The easiest way to get started to links and connected with the API is to check the **fork** buttons to fork the collections to your own works and use Postman to send requests.

Postman is an API client that enables creating, sharing, testing, and documenting APIs simple for programmers. This is accomplished by letting users to make and save simple and sophisticated HTTP queries, as well as read their responses. You'll need to download and install Postman if you don't already have it installed.

3.2.3 Python

The project's backend programming language is Python. Python is a general-purpose programming language that is highly interpreted and high-level. It's a language designed for programmers. Python was garbage-collected and used dynamic typing. Multiple programming paradigms are encouraged, including structured (especially procedural), OOPS, and functional programming.

3.2.4 Blender

Blender was utilized because it is a free and open-source 3D creation software. It aided in the development of 3D pipelines such as modelling, animation, and rendering.

3.2.1 Non-Functional Requirements

Non-functional requirements are a type of requirement in systems engineering and systems requirements that focuses on criteria that can be used to judge a system's operations. The following non-functional needs are met by the system:

3.2.1.1 Usability

Usability requirements include:

- User manuals that are well-structured
- Error messages that are informative
- Help options
- Graphical user interfaces that are well-designed.

3.2.1.2 Security

- A system's security criteria are fulfilled to ensure.
- Unauthorized access to the system, as well as data that is not permitted.
- Ensures integrity of the system from accidental or malicious damaged.

3.2.1.3 Reliability

A system's ability to fulfil its needed operations under specified conditions for a certain period of time is referred to as reliability. Restrictions on the system's runtime. Under two distinct titles, it can be considered and recognized:

- Availability: Is the system ready to provide services when end-users ask for them?
- Rate of failure: how often does the system fail to deliver the expected results?

3.2.1.4 Efficiency

The comparison of what is usually produced or performed within what can be accomplished with the same consumptions of Clouds (money, time, labor, etc.). It is an vital Factor in Determination of Productivity.

3.2.1.5 Verifiability

The verifiability (sometime called as testability) of software is easy it is to check your code for bugs. I frequently talk about the importance of making software maintainable but verifiability is another attribute that does not get enough attention.

3.2.1.6 Interoperability

The goal of interoperability is for different systems and organizations to function together (inter-operate). Since the phrase was first developed and articulated in terms of information technology or systems engineering services that allowed for information interchange, a broader definition takes into account social, political, and organizational aspects that could influence system to system performance.

3.2.1.7 Maintainability

Maintainable software is simple to extend and fix, which encourages users to adopt and use it. The Software Sustainability Institutions can help you design and develop maintainable software that benefits both you and your users.

3.2.1.8 Flexibility

The ease with which a system or component can be repurposed for use in applications or environments other than those for which it was built. Because almost no such fact can be said to be "flexible" in absolute terms. A desktop computer's RAM capacity, for example, can be increased only if the hardware and operating system were specially intended to support such upgrades.

3.2.1.9 Portability

The usability of the same software in different contexts is a high-level software programming paradigm. The generalization of abstraction between application logic and system interfaces is a pre-requisite for portability. Portability is a crucial issue for

development cost reduction when software with the same functionalities is displayed for several computing platforms.

3.2.1.10 Expandability

A software system's ability to manage capacity or capability grows. Additional or larger hard discs, more RAM, or a faster video board could all be examples of hardware expansion. Systems design is the process of defining a system's architecture, components, modules, interfaces, and data to meet established criteria.

CHAPTER 4

DESIGN

The process of establishing the architectures, components, modules, interfaces, and data for a system to meet specified criteria is known as systems design. The application of systems theories to product development could be referred to as systems design.

The significance of this phase can be appreciated because it entails identifying data sources, as well as the nature and type of data that is available. There is a purpose for employing inputs such as attendances, leaves details, additions or deductions, etc. in order to construct a salary system, for example. This makes it easier to figure out what kind of data is accessible and who supplies it to the system, allowing the systems to be developed with all important elements in mind.

In part, system design entails ensuring that the system is launched in such a way that it satisfies the needs of the users and keeps them at ease. In terms of adaptability, one of the key goals of this phase is to create a system that is dynamic in nature and receptive to adjustments as needed. Another important goal is that the phase of system design is concerned with constructing a system that can perform efficiently, giving the desired output, and responding to that output within a specific time limit.

4.1 System Architecture

A conceived model of a system's structures, and other viewpoints is called system architecture. An architecture description and its characteristics are a formal description and representation of a system, arranged in a way that allows for reasoning about the system's structures and actions. It could be made up of system components that will work together to create the overall system.

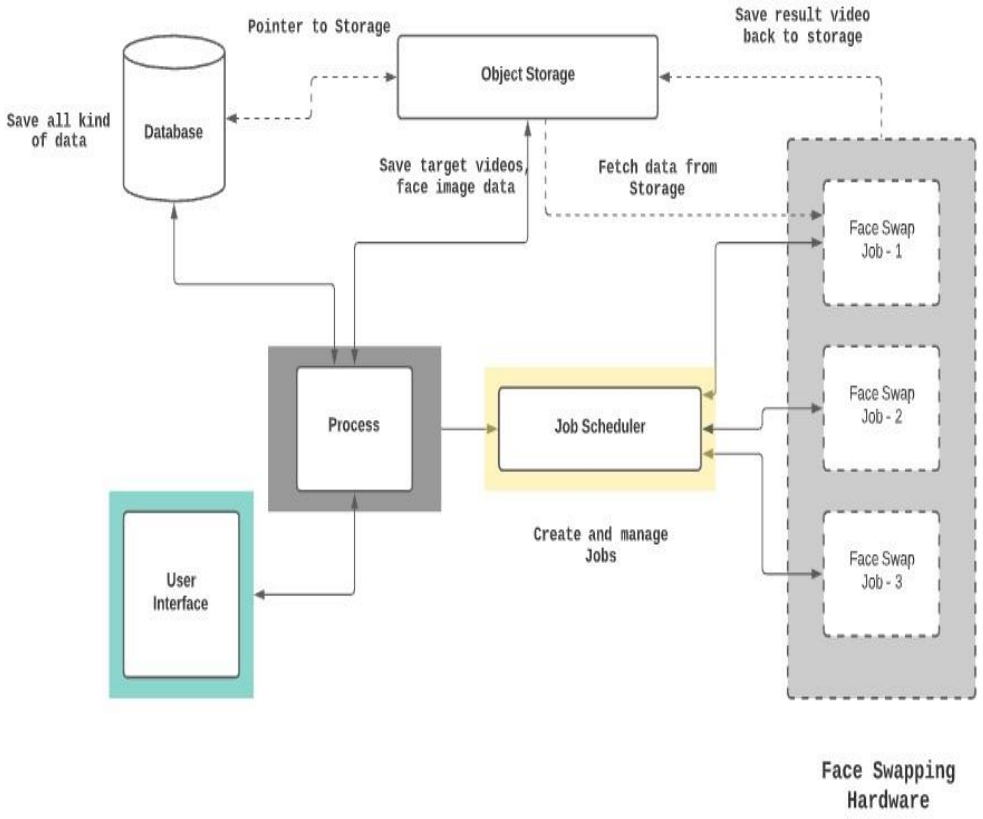


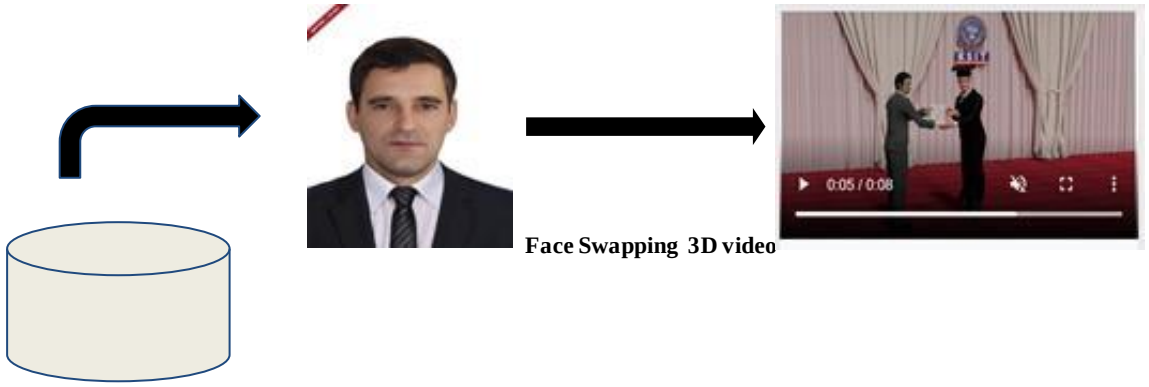
fig 4.1 system architecture

1. The User Interface includes creation of the username, uploading of the required details of the user such as USN, name, gender and image of a student and image of the professor which will be fixed.
2. The details such as USN, name and gender will be sent to the database by the use of backend API and gets stored in that particular username.
3. The image uploaded will be sent to the object storage and get stored there which creates a URL of that image. The database will extract the URL of the image and gets stored in database.
4. Next, the backend API will go through the details of the students (i.e., gender) and extract the image and depending of the gender mentioned it will extract the target video from the object storage.
5. The backend API will send the extracted data (image and video) as input to the job scheduling.

6. The job scheduling will create the jobs and performs face swap. The output video will be sent back to object storage and that creates the URL and which will be sent to the database and gets stored.

fig 4.1.2 Uploading passport to database

When the user uploads the photo from the user interface in the organization employee login from the portal, he uploads the students information like name, age and all other data with the passport size photo of each individual and that photo will be stored in the database of the each individual student with his personal info and then when the process begins and the 3d models of the student gets swapped with the pass port size photo of the each and every student and that video of student receiving the certificate from the professor model is generated and again it is saved in the database, the passport photo of student is swapped with the 3d model using frontal face detection using the facial and marks like eyes , eyebrows , nose and with the other marks available in the face and it is processed.



Uploading the face swapped video to storage

fig 4.1.3 Uploading the face swapped video to storage

When the process begins the images which are uploaded from the user interface by the staff with all the student information along the photo and that photo of the student is stored in the database when in the job scheduler the video of the 3d model gets processed and the photo of the each student from the order gets swapped with the student 3d model of the student and the photo of the professor also gets swapped with the 3d model of the professor and the photo goes to the job scheduler of the 3d model video and generates the individual video for each student swapped face and can also be downloaded for the further references from the user interface and that's how the entire object storage of the each video students gets saved and made available for the later use by uploading the face swapped video to storage which is object storage in the process.

CHAPTER 5

IMPLEMENTATION

5.1 Programming Language Selection

We have several unique programming languages to select from when developing a software solution, and it is easy to get lost in each of the complexities. Many factors can determine your language choices. You can settle for a language you know if this is a personal project or hobby. We could end up with very cryptic approaches if your choice was dependent on the available resources. Or you could spend a lot of time developing reusable components that could make the documentation a nightmare. There is no redundant comparison of procedural, object-oriented, and functional languages in this article. It demonstrated how to select a language for your project with the greatest effectiveness and ease of development. It helps you to examine several aspects of whether it is for a personal user to a large project in an organization when selecting a programming language.

The most overlooked element of this preparation is the choice of language. We may choose a personal favorite when selecting a language for a personal project. Code lines are important here; a language that can do the work in 10 rather than 20 program lines is a common choice. First, you wanted to find the solutions and then worry about the cleanliness or measured performance. It's a different scenario for projects built for a large company. Teams will construct components that will interact and interconnect to solve a specific problem.

Factors to follow when selecting a programming language are:

- Target platform
- Language Elasticity
- Time to manufacture
- Performance
- Community support

The Python language were to be designed with the following properties:

- In the later 1980, Guido van Rossum designed Python as successor to the ABC programming language at the Wiskunde and Information Center (CWI) in the Netherlands, which was initially inspired and instructed by the SETL to perform, to manage exceptions, and to connect with the operating system of Amoeba. It was launched in December 1989.
- Python used dynamic typing and the combination of reference counting and memory collection by cycle detection. It also has a dynamic name (late binding) resolution that binds method and variable names during program execution.
- programs that normally use virtual machines as an abstraction and do not access directly to the operating system. This is very portable for programming. On all supported platforms, for example, Windows or Linux, the programs (that comply with the standard and follow the standard rules) can operate. Object -orientated programming language: Except the primitive data types, all elements in the objects.
- Strongly-typed programming language: Python is dynamically strongly-typed, e.g., the types of the used variables must be pre-defined and conversions to other objects is relatively strict, e.g., must be done in most cases by the programmer.
- Interpreted and compiled language: source code is transferred into the bytecode format which does not depend on the target platform. These bytecode instructions will be interpreted by the Virtual machine. This contains a so called Hotspot- Compiler which translates performance critical bytecode instructions into native code instructions.
- In bytecode format source code is transferred that does not depend on the target platform. The Virtual Machine interprets these Bytecode instructions. This includes a Hotspot compiler whereby critical Bytecode performance instructions are translated into native code instructions.
- Automatic memory management: Python is responsible for memory assignment and de-allotment of new objects. There is no direct link or memory connection to

the program. The garbage collector deletes objects to which there is no active pointer automatically.

5.2. Platform Selection

Blender is the open-source 3D creation suite that is freely available. The 3D pipeline is fully modeled, rigged, animated, simulated, rendered, composed and traced, video edited, and 2D animated pipeline, Apply Changes.

Apply changes to your code without restarting your site—and, in some cases, without restarting the current activity—to push the resources and code to change your current app. This flexibility helps you to control how much your app is recreating when small incremental changes are deployed and tested while maintaining the current status of your device.

- Intelligent code editor

The code editor helps you create better and more efficient code, work more quickly, and produce more quickly by providing advanced code completion, refactoring, and code analysis. This provides recommendations as you type in a drop-down list. To insert the assigning code, simply press the tab.

- Fast and feature-rich emulator

The app is installed and started faster than a real device and can be tested and installed on several configurations: phones, tablets, wear, and Android television devices. A range of software features like GPS location, network latency, movie sensors, and multi-touch input may also be simulated. Blender helps you create the best possible code at every step.

- Testing tools and frameworks

The Postman API provides highly comprehensive tools for testing your applications with the JUnit 4 and functional UI access test frames. You can generate test code by recording

the interactions with the application on a device or emulator by using Espresso for the Test Recorder. On a device, emulator, continuous integration environment, or Firebase Test Lab, we may run your tests. It's a robust and flexible build system

The Postman API provides highly comprehensive tools for testing your applications with the JUnit 4 and functional UI access test frames. You can generate test code by recording the interactions with the application on a device or emulator by using Espresso for the Test Recorder. On a device, emulator, continuous integration environment, or Firebase Test Lab, we may run your tests.

Designed for teams

Blender incorporates GitHub and Subversion version control tools to keep your team in touch with your project and create changes. The Gradle open-source build system enables you to customize the build and run on an integration server like Jenkins.

- Optimized for all websites

In Blender, 3D models for phone, tablet, wears, Android TV, and Android auto animation can be built-in unified environments. You can divide your project into functionality units, which you can build, test, and debug independently.

- C++ and NDK support

Fully supported by Blender, you can build JNI components quickly in your application, by editing C/C++ project files. The IDE provides highlighted syntax, and C/C++ refactoring, and an LLDB debugger that enables your Java and C/C++ to be debugged at the same time. These tools can also run your C-Make and n-DK-build scripts for the implementation without any purpose.

We have been using the Blender tools free of charge and an open-source 3D creation. It supports the creation, modeling, rigging, animation, simulation, rendering of the 3D

pipeline. It's good for us and has benefited from its unified pipeline and response process, an inter-platform that runs just as well on Linux, Windows, and the models.

5.3 Other Considerations

5.3.1 Elasticity

The language's "elasticity" is the easiest way to add new capabilities to the existing program. Elasticity can include adding new functions or adding new features by using an existing library. Take into account the following elastic questions.

- Can I begin to use language skills without a new library?
- If not, are the language library capabilities available?
- Which effort is made to build the feature from scratch if it isn't native capable and not available as a library?

You need to know how the developed program and the feature have been set aside for future improvements before making a decision.

5.3.2 Time to production

It is the time to produce, when the code is ready for production and it works as intended, that is the time to deliver the programs. When evaluating time to production, the presentation logic must be added to the control logic. Time to manufacture depends very much on the program sizes. Theoretically, less time to live in the less easy it is to learn a language, less the program. For instance, a content administration site can be built with many scripts over days, in comparison with servlet code that can take months, if you learn both languages from scratch. The whole system is constructed homogenously and has no too many reliabilities.

5.3.3 Performance

You can hold only so much performance out of a program and a platform, and the language used to develop the program affects performance. There are certain studies comparing how fast programming languages are in the same environment. You can see different computer benchmarks to use as our reference, though the figures are not for concrete assessments of the performance of any language.

By developing a web-applications for the distress relief application, it is easily accessible on any device with a web browser. However, if the application developed is too heavy, it can perform less efficiently on lower power devices such as mobile phones. Since an application for distress relief has to be easily accessible to the public, it is important to have low system requirements for better performance. It can encourage more people to use the system while also increasing accessibility.

5.3.4 Support and Community

Like best software, a community that helps to grow should also have a strong community with a programming language. A language with an active forum is probably better known than a great language with no help. The community supports wiki generation, forums, tutorials, and, above all, other libraries that support the growth of language. The days when people were operating in silos are gone. People don't want to skip all of the documentation to solve a small problem. If a language is good, it is best to face another problem and write about it in a forum or wiki.

5.4 Coding

This section will covers some of the sample code snippets used in the implementation of this system.

5.4.1 Creating face swap:

This snapshot includes the code for the face swap of the 3D Model of the student , this code uses face swap algorithm for the swapping of the faces of the both students male and female , where it first detects the face of the 3D model by the facial marking and

uses frontal face detection algorithm to detect and the input which gets swapped with 3D model in order to create a face swap.

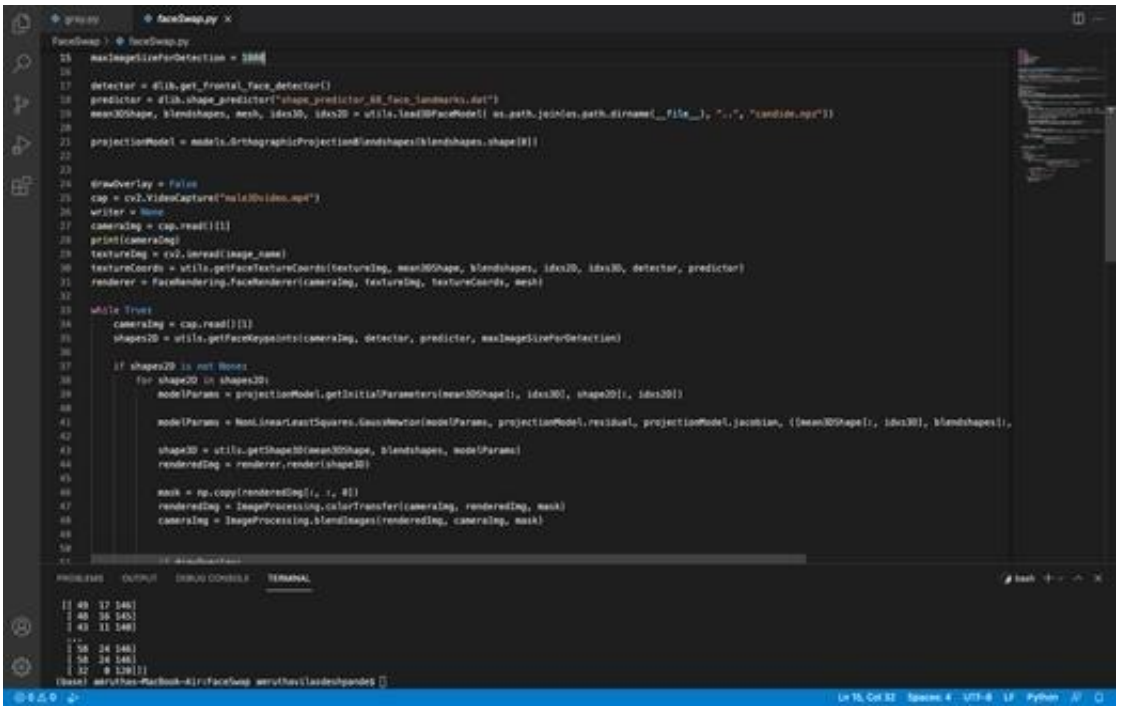


Fig. 5.4.1 Creating a Face swap

5.4.2 Output of Face Swap

This snapshot is the output of the face swap of the 3D model of the male student receiving the certificate from the professor where the passport photo the particular student is swapped with the 3D model of the female student.

Fig.5.4.2.1 Output of the face swap

We have built a website where the credentials of all the students are collected and entered into the website such as details of the professor (name, passport size photo and gender) and the students (name, USN, passport size photo and gender). And then the uploaded passport sized photo is utilized for face-swapping in the rendered Blender 3D male and female animation models based on the gender which depicts exactly same as the student receiving the degree certificate from the professor with the graduation attire. The face swapped video of the 3D models collecting the certificates from the professor will be uploaded back to the website and also can be downloaded by each one of the students of a college.

Here, we had extracted the face from an image, and reconstruct one with similar features in the 3D video. Imagine you had an image of two people and the celebrities dancing and to make it look like you must mechanically edit those people in the images are dancing with same surroundings as the celebrities. The complexity of the task depends largely on the difference between the two faces, without changing the same face at once.

5.4.3 Face Detection

We used the model for shape predictor 68 face landmarks to estimate their poses on frontal human faces. This is the form of 68 points of reference. These are the points on the faces of the eyes and edges of the mouth, the eyebrows, eyes, etc.

5.4.4 Face Swapping

After the face is detected, the picture and the video are used to swap the face. Face Swap refers basically to an activity where the face of the person is exchanged for the time being with a particular person or animal's face or with an inanimate object.

5.4.5 Bilinear interpolation

We'll be using bilinear _interpolate () method which interpolates over every image channel. This returns an array of interpolated pixels with the same shapes as coordinates.

Bilinear interpolation has to performed the task using linear interpolation first in one direction, and then again in the other directions as required.

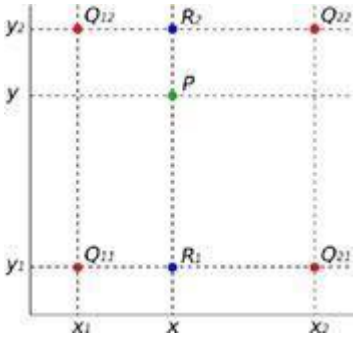


fig 5.4.5: The four red dots show the data points and the green dot is the point at which we want to interpolate.

5.4.6 Warp Triangles Affine

The next step to face alignment consists of focusing the corresponding triangles between the source face and the target face. We are using the triangular_ affine_ matrices () methods to calculate the affine transformation matrix for each triangle (x, y) vertex from destination points to source points.

5.4.7 Alpha Blending

This is the process of combining an image with a background to create the appearance of partially or full transparency. It returns the result image which will be the summation of source image and frames captured from the destination videos. And then the face swap takes place with the video.

5.4.8 Workflow of the Project

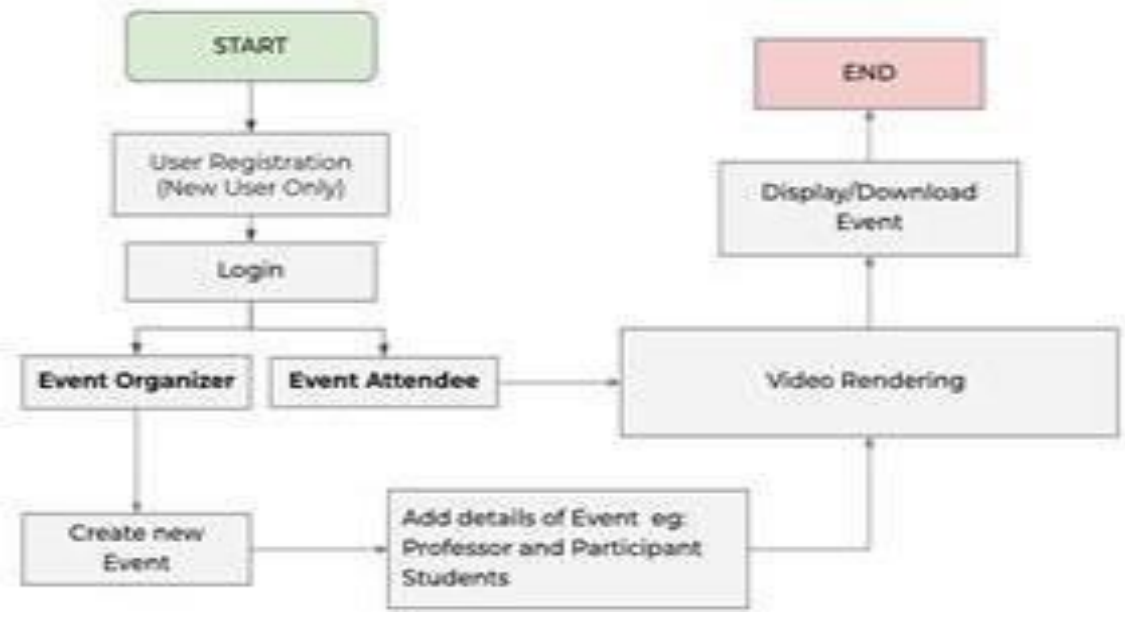


Fig 5.4.8 Workflow of the project

1. The user registration takes place where the user has to enter the details of his/her email id and college details.

2. The User can login only after entering the college details.

3. There will be two options available after login. One is the Event Organizer and the other one is Event Attendee. The user if he/she is organizing the event then has to select the Event Organizer option.

4. Upon selecting the Event Organizer option that leads to creating a new event (i.e., graduation in our case).

5. After selecting the Create new event option a new window will pop up where the user has to fill in the details of the professor and the students.

6. After submitting the details, it undergoes several processes explained above and the video rendering takes place.

7. Final output will be a video of 3D models with the face that will be extracted from the uploaded images.

8. This video can be downloaded for further reference.

CHAPTER 6

TESTING AND RESULTS

The primary goal of testing is to identify and correct problems. Testing is the practice of attempting to find all possible flaws or flaws in a work output. It gave a rationale and a path for testing the component's functionality. It is the process of testing software to ensure that its systems meet the software's requirements and users' expectations, and that it does not fail in an unacceptable way. There are many different kinds of tests. Each test type was designed to fulfil a distinct testing need.

6.1 Testing Levels

All the main activities of various testing level are described below:

6.1.1 Unit Testing

6.1.2 Integration Testing

6.1.3 Functional Testing

6.1.4 System Testing

6.1.5 White Box Testing

6.1.6 Black Box Testing

6.1.1 Unit Testing

Unit testing entails the creation of test cases to ensure that the program's internal logic is working properly and that program inputs result in legitimate outputs. All decisions must be checked, as well as internal code flow. It is the process of putting certain software components of an application to the test. Before integration, it is done after the completion of each individual unit. This is an intrusive structural test that relies on prior knowledge of the structure. Unit tests were used to test a specific business process, application, and/or system configuration at the component level. Unit tests guaranteed that each step of a

business process followed the published specifications and had clearly defined inputs and outputs.

6.1.1 Integration Testing

Integration tests are used to determine whether or not two or more software components can run as one code. Testing is event-driven, with a focus on the screen or field's core consequence. Integration tests revealed that, while individual components were satisfied, as evidenced by successful unit testing, the components' integration is proper and consistent. Integration testing is aimed at revealing flaws that have arisen as a result of the integration of components.

6.1.2 Functional Testing

Functional tests demonstrated that the functionalities evaluated are delivered as defined by the business and technical requirements, system documentation, and user manual in a systematic manner.

The following items are the focus of functional testing:

Valid Input: All verified input classes must be accepted.

Invalid Input: Types of invalid input must be detected and discarded.

Functions: It is necessary to use the functions that have been identified.

Output: The outputs of the applications that have been detected need to be examined.

Interfacing systems and procedures can be called at any time.

The requirements, important functions, and special test cases are used to organise and prepare functional tests. Furthermore, systematic coverage of identified Business processes into flows, data fields, established processes, and subsequent processes must be considered for testing.

Previously it has been completed, new tests have been identified, and the current tests' effective value has been established.

6.1.3 System Testing

The integration software system was thoroughly tested to ensure that it met all of the requirements. It performs tests on a customizable to guarantee that the outcomes are known and predictable. The configurable-oriented systems integration test is a good example of system testing. The majority of system testing is based on process descriptions and flows, with a focus on pre-driven process connections and integration points.

6.1.4 White Box Testing

It is a type of software testing in which the software tester has complete knowledge of the software's internal workings, structure, and languages, or at the very least its purpose. Its goal is to test locations that are not accessible from a black box level.

6.1.5 Black Box Testing

It is tried that the computer program without any understanding of the interior workings, structures or dialects of the module being tried. Dark box tests, as most other assortment of tests, must be composed from authoritative sources report, such as details or prerequisites record, such as detail or necessities report. It may be a testing in which the program beneath test is tried, as a dark box you cannot "see" into it. The test given inputs and reacts to yields without considering how the computer program works.

The few important features that are being examined in the Project are outlined below:

Application Characteristics - The testing team is given information about the application to aid them in their testing efforts.

Stability — Concentrating on programs that are stable on devices.

Application Launch - An application must start (launch) and end correctly in relation to a device and other applications on the device after it has been executed.

Functionality - Reported highlights are actualized and executed within the apps, and they work appropriately.

Connectivity - the programs must demonstrate their ability to communicate effectively over a network. It should be able to handle both network and server-side issues.

Personal Information Management (PI) - The program that allows and accesses user information wants to be able to do so safely and without destroying the data.

CHAPTER 7

SNAPSHOTS

A snapshot is at a certain point in time the state of the system. It can be referred to as an actual system status clone or a capacity of certain systems.

One way of safeguarding live data is by deactivating temporary write access to data, either by stopping accessing applications or by using the operating system's locking API to enforce the exclusive read access. For less available systems this is tolerable (on desktop computers and small workgroup servers, on which regular downtime is accepted). However, a 24/7 highly available system does not tolerate stop-page service. Highly available systems can instead back up the data set frozen at a time in a snapshot-one read-only copy and let applications keep on writing to their data to avoid downtimes.

The most efficient and progressive deployments and executions of snapshots can create O snapshots (1). The time and I/O needed to create and implement a snapshot in other words and for doing so do not increase with the data set size; by contrast, the time and I/O required for a direct backup are equal to the dataset size. Some systems only use a system of pointers to reference their initial snapshot, once the original snapshots of a dataset are taken, snapshots afterward copy changed data. The pointer-based snapshots are low in disc space than if the data set has been cloned again and again. In this context, snapshots are the pictures representing different phases of the program execution and they serve as a proof for the working of the project in stepwise manner. Some of the snapshots of this project presented in this section.

The first page upon opening the application is the home page, as shown in Figure 7.1. There are predefined four destinations list and the app has been divided into two modules: Admin mode and user mode. Admin’s basic functionality is to create a map whereas user’s functionality is to navigate from source to destination.

fig 7.1.1 Home Page

The above figure is the frontend of the E-convocation website where it consists of the colleges, schools and organization, where the staffs of the particular organizations can upload the details of the students and the professor the generation of the 3D video of graduation and can be downloaded by them and can stream on any of their platform as they desire to do, where it facilities the students and staffs to attend the event by sitting at their homes safely by attending .

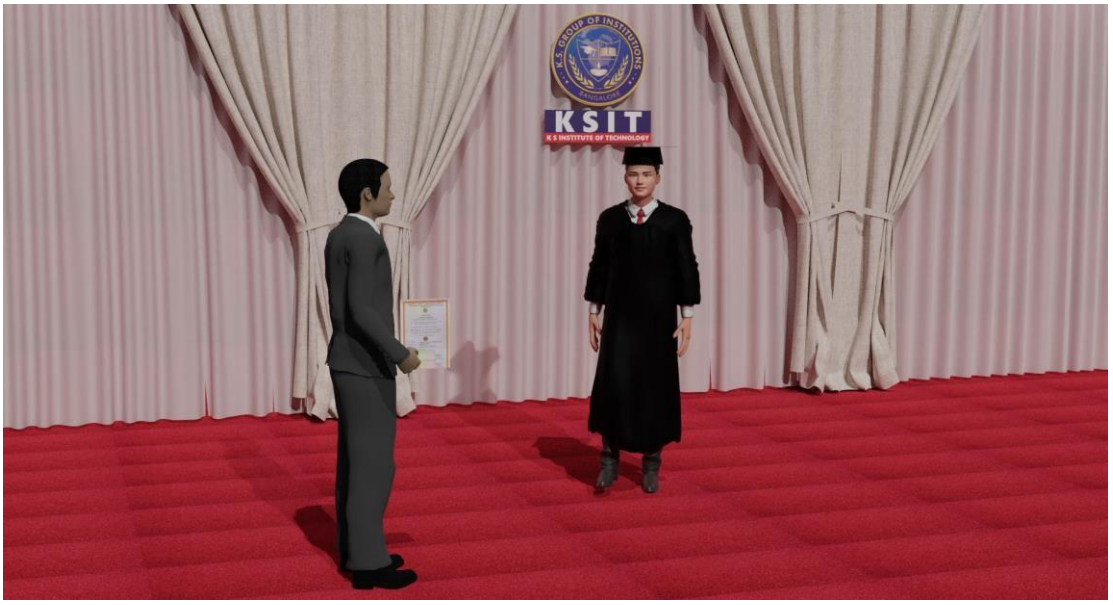


fig 7.1.2 face detection of male student model

Face Detection For Face Detection we have used Frontal Face Detector algorithm. This basically estimates the pose and detects the frontal face in the image that will be uploaded by the user and the video that will be sent as an input to the face swap. This will be performed for every frame in the video since a video is a collection of images The face detector consists of an images-pyramid and a sliding windows-detection scheme, combining the classic photograph of orientation gradients (HOG) with a linear classifier. After face detection we need to locate the landmarks on the face in order to crop the face part in the image. So, for that here we have used shape_predictor_69_face_landmarks model to locate the landmarks on the face. The spots are the corners of the face, the eyebrows, the eyes, and so forth.

fig 7.1.3 face detection of female student model

Swapping of the face After the face is detected and the landmarks located, the image and the video are swapped. Face Swapping is a kind of activity where the face of a person is replaced with that of a person or animal. Triangulation in Delaunay triangulation is one of the steps in the face swap. This creates a triangular mesh on the face by connecting all the sites of Shape Predictor 69. This creates smaller triangles on the side so that the face can be divided into smaller parts.

fig 7.1.4 face swap of male model

Once the face detection for the male 3D model is done, it is then using the face detection algorithms and face swapping algorithm it starts to swap the face of the 3D model of the male student as the selection of the 3d model either as male or female model depends on the data given uploaded in the database.

If the 3D model is the male student, then the passport photo of the male student would be swapped with the model using frontal detection and swapping algorithm and the model is finally gets swapped with the student photo so that it makes the Virtually realistic for the student when watching the video.

fig 7.1.5 face swap of female model

Face detection for the male 3D model is done for the female , it is then using the face detection algorithms and face swapping algorithm it starts to swap the face of the 3D model of the female student as the selection of the 3d model either as male or female model depends on the data given uploaded in the database , if the 3D model is the male student then the passport photo of the female student would be swapped with the model using frontal detection and swapping algorithm and the model is finally gets swapped with the student photo so that it makes the Virtually realistic for the student when watching the video. It can also be able to render all the videos of the student for the entire class and can be merge into single video can be streamed or can also be able to download by the students.

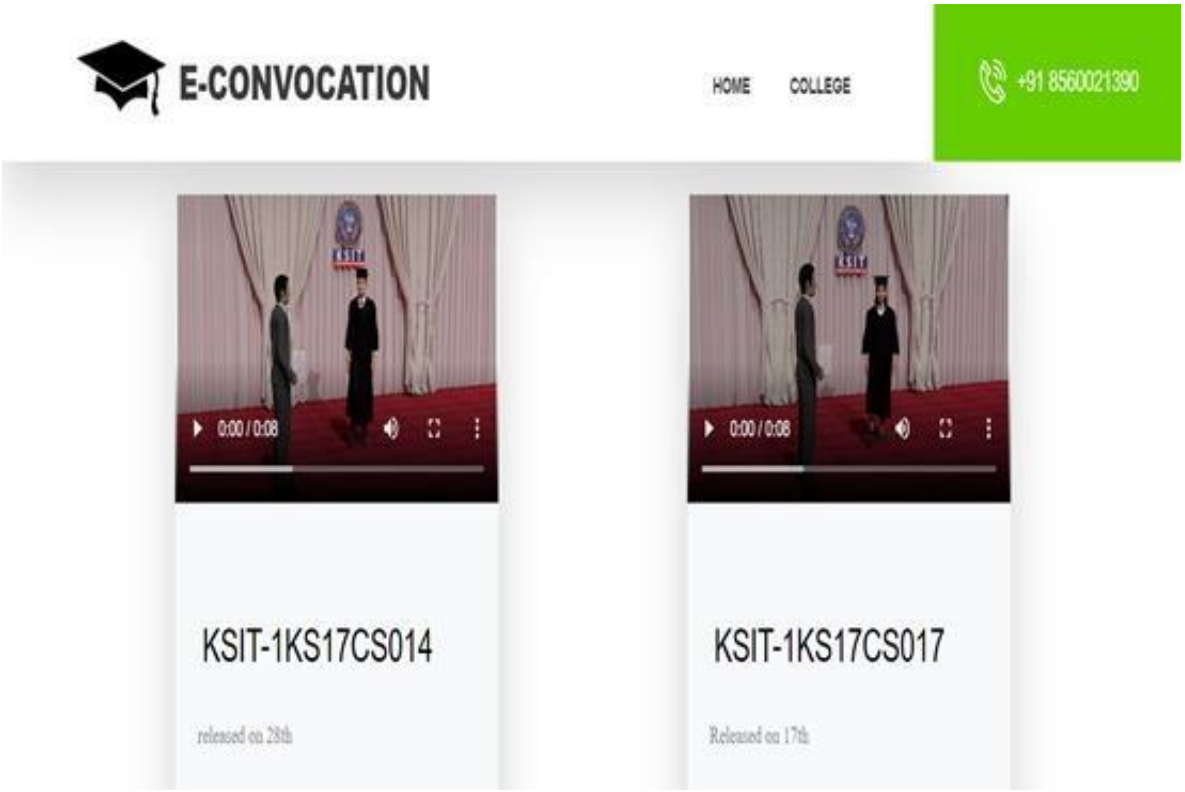


Fig 7.1.6 face swap video of both male & female model

Once the face swapped video of the both male student and female student is done and the same way it happens for all the students' data in the database and all the videos can be merged in the database using the scheduler in the database and the student can also be able to download the video of the graduation individual for all the students for the memory and proof of graduation which is an added advantage in the project. It can also be able to render all the videos of the student for the entire class and can be merge into single video can be streamed or can also be able to download by the students.

CHAPTER 8

CONCLUSION

- Our project, a virtual graduation ceremony platform is certain in this pandemic period which utilizes the technology in hand, can be more efficient and progressive.

- This project aimed to establish a platform for ceremonies to happen virtually along with the participation of each and every individual through VR.

- Colleges can arrange graduation ceremonies online then there would not be huge gathering in this pandemic time.

CHAPTER 9

FUTURE ENHANCEMENTS

- Our project, a virtual graduation ceremony platform is certain in this pandemic period which utilizes the technology in hand, can be more efficient and progressive.

- This project accomplished to establish a platform for ceremonies to happen virtually along with the participation of each and every individual.

- Colleges can arrange graduation ceremonies online, then there would not be huge gathering in this pandemic time.

- 3D models height, weight and skin complexion could be implemented.

CHAPTER 10

REFERENCES

[1] Face Feature Extraction E. Bagherian and R. W. O. K. Rahmat, "Facial feature extraction for face recognition: a review," 2008 International Symposium on Information Technology, Kuala Lumpur, 2008, pp. 1-9, doi: 10.1109/ITSIM.2008.4631649.

[2] Automated Face Swapping Y. Zhang, L. Zheng and V. L. L. Thing, "Automated face swapping and its detection," 2017 IEEE 2nd International Conference on Signal and Image Processing (ICSIP), Singapore, 2017, pp. 15-19, doi: 10.1109/SIPROCESS.2017.8124497.

[3] Srushtika Neelakantam and Tanay Pant,"Learning Web based Virtual Reality". "Build and Deploy Web based Virtual Reality Technology".

[4] V. T. Nguyen, R. Hite and T. Dang, "Web-Based Virtual Reality Development:," 2018 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR), Taichung, Taiwan, 2018, pp. 11-18, doi: 10.1109/AIVR.2018.00010.

APPENDIX – I

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E-Convocation Website using VR

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Abstract - Due to COVID-19 restrictions, the better way of attending graduation is by VIRTUAL GRADUATION where students and staff members from various colleges can attend the annual convocation in their VR models. While the students are not physically present at the dais, they could be seen getting on dais and receiving their graduation degrees with the same enthusiasm.

Key Words: *Virtual Reality, Face Detection and Face Swap*

1. INTRODUCTION

Across the country, due to Covid-19 situations, all the colleges are being forced to do multiple frameworks such as planning from budgets, calendar of events, online learning and more. Casting the graduation ceremony that has to occur on the front end of all that.
Some colleges are planning to cancel or postpone the graduation ceremony. But the math of social distancing doesn't add up to even delayed events being a good solution.
In this pandemic time even if colleges plan to arrange graduation ceremonies offline then there would be huge amount of health risks.
Sanitizing the environment and maintaining the social distancing, and wearing masks. Does everyone tend to wear the masks? Also, few colleges are planning to conduct graduation ceremonies through video conferencing platforms, but to what extent will the students be satisfied? All these would create uncertainty for the students, parents, teachers and other staffs.
Keeping all the above-mentioned points in the mind, we have come up with a solution where colleges can deal with the graduation ceremonies virtually based on Virtual Reality.
Thus, in this pandemic period that uses the technology in hand, our virtual graduation ceremony using VR can be more efficient and progressive.
This project aimed to establish a platform for ceremonies to happen virtually, which is a website for virtual graduation ceremony.

Tools and Technologies used were Python, its frame work Django and Blender tool. This tool was used to create male, professor female 3D models with a stunning graduation attire with an amazing gesture and animation.

Python and Django are used for the backend and frontend of the website. The personalized 3D model of each graduate accepts the degree certificate from the personalized 3D model of the professor on the stage. It would provide the student with the same experience as an in-person event despite the restrictions posed by the pandemic.

2. Methodology

We have built a website where the credentials of all the students are collected and entered into the website such as details of the professor (name, passport size photo and gender) and the students (name, USN, passport size photo and gender).
And then the uploaded passport sized photo is utilized for face-swapping in the rendered Blender 3D male and female animation models based on the gender which depicts exactly same as the student receiving the degree certificate from the professor with the graduation attire.
The face swapped video of the 3D models collecting the certificates from the professor will be uploaded back to the website and also can be downloaded by each one of the students of a college.
Here, we had extracted the face from an image, and reconstruct one with similar features in the 3D video. Imagine you had an image of two people and the celebrities dancing and you had to manually edit
to make it look like those people in the images are dancing with same surroundings as the celebrities. The complexity of such a task largely depends on how different the two faces should be, without swapping same face to both the individuals at a time.

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Firstly, the images of each and every student and the professor should be uploaded separately on the website, then the face detection happens.

For our project we will be using Computer Vision technology (open cv library) and D-lib library. We are using Pygame platform to play the output video along with the audio. The algorithms and models that we will be using for our project are **Shape_predictor 69 points landmark model** to locate the points on the face and **Frontal Face Detector algorithm** for face detection. A "Shape predictor 69 points landmark" is trained with iBug 300w dataset which consist of 135 images with highly expressive faces, difficult poses and occlusions. For face detection we will be using Frontal Face Detector algorithm to perform face detection. We are also using **Object Storage** here to store the images and videos in order make the increase the performance of the system. That will be consisting of two 3D model video (male & female 3D model videos). Initially, a user will create a username and upload the images and the details such as USN, Name, Gender and Image of the Student is supposed to be uploaded. After uploading the details such as(USN, name and gender) will be stored in normal database and the image will be stored in the object storage. After that the backend API will go through the details of particular username and look through the details such as gender. After that the API will extract the image and if the gender is male, it will extract the male 3D model video or if it is female, then it will extract female 3D model video. Next, the image and the target video will be sent as an input to the **Job Scheduling**. The job scheduling basically creates jobs. So here our job is face swap. When the image and the target video is sent to job scheduling it stands in a queue which performs in FIFO order. So, the image and video will be sent to the job which gets created and perform face swap. After that, the output video will be sent back to the object storage which creates a URL of the output video and that will again be fetched by the database and will be saved in that particular username, so that the user can download individual video from the URL.
Additional to that there will be an option where the individual video can be merged and played one after the other.

1. The image that the user will upload should be a passport size image only in order to get good clarity face swap.

2. The face in the image should consist of frontal face (i.e., face facing forward).

3. Image should not be blurry.

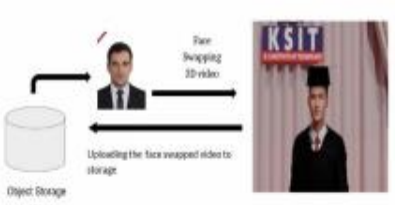

Fig -1: Designing process of the e-convocation project.

Techniques include: -
3.1. Django framework
We used Django as it is high-level Python Web framework, open source which encouraged rapid development and clean, pragmatic design. It also took care of much of hassle of Web development, so we focused on the reinvention and vital features required for the website.

3.1.1. Blender
We used the tool Blender as it is free and an open-source 3D creation suite. It supported in creation of the 3D pipelining, modelling, rigging, animation, simulation, rendering. It well suited for us and got benefit from its unified pipeline and responsive development process which is a cross-platform and runs equally well on Linux, Windows and the models developed are shown in the Figure 2.

Fig -2: Professor and Student 3D models

3.2. Face Detection
For Face Detection we have used dlib's Frontal Face Detector algorithm. This basically estimates the pose and detects the frontal face in the image that will be uploaded by the user and the video that will be sent as an input to the face swap. This will be performed for every frame in the video since a video is a collection of image frames.

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The face detector is made using the classic Histogram of Oriented Gradients (HOG) feature combined with a linear classifier, an image pyramid and sliding window detection scheme. After face detection we need to locate the landmarks on the face in order to crop the face part in the image. So, for that here we have used dlib's shape_predictor_69_face_landmarks model to locate the landmarks on the face. The landmarks are the points on the face such as the corners of the mouth, eyebrows, eyes, and so forth.

3.3. Face Swapping

After detecting the face and locating the landmarks, the face swap takes place with the image and the selected video. Face Swapping is a type of activity in which a person's face is swapped with that of another human or animal.

3.3.2. Delaunay Triangulation

One of the steps in face swap is Delaunay triangulation. This will create a triangular mesh on the face by connecting all the points that's located by Shape Predictor 69 landmarks model. This creates smaller triangles on the face which allows us to divide the face into smaller parts.

3.3.3. Affine Warp Triangles

The next step in face alignment is to consider corresponding triangles between the source face and the target face, and affine warp the source face triangle onto the target face. Aligning the face and placing one face on top of the other hardly looks unnatural because of this method.

3.3.4. Alpha Blending

It's the process of merging a picture with a background to provide the impression of partial or complete transparency. It returns the result image which will be the sum of source image and frames captured from the destination video. And then, the face swap takes place with the video.

3.3.5. MinIO Object Storage

We employed it as an object storage system that separates data into smaller pieces and distributes them across numerous discs, providing redundancy and protection against disc failure. This is primarily used to store image and video files. We have used it in order to increase the performance of our system and not make the process slow. Since it is used only to store image and video files, we have also used it to store our 3D model videos and images uploaded by the user. This creates a URL of an image and video and that will be extracted by the database on successful establishment of communication.

Here is the workflow of the project.

In the website, the user first needs to create a username. After successful creation of user-name the user must upload the details and image.

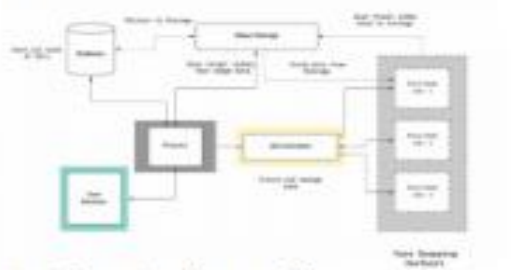

Fig -3: System Architecture of the e-convocation project

1. The User Interface includes creation of the username, uploading of the required details of the user such as USN, name, gender and image of a student and image of the professor which will be fixed.
2. The details such as USN, name and gender will be sent to the database by the use of backend API and gets stored in that particular username.
3. The image uploaded will be sent to the object storage and get stored there which creates a URL of that image. The database will extract the URL of the image and gets stored in database.
4. Next, the backend API will go through the details of the students (i.e., gender) and extract the image and depending of the gender mentioned it will extract the target video from the object storage.
5. The backend API will send the extracted data (image and video) as input to the job scheduling.
6. The job scheduling will create the jobs and performs face swap.
7. The output video will be sent back to object storage and that creates the URL and which will be sent to the database and gets stored.

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8. The user will be able to download individual video by clicking on the URL.

9. There will also be an option to merge multiple videos to play each video back to back.

Fig -4: Face-swapped 3D models

3. CONCLUSIONS

Our project, a virtual graduation ceremony platform is certain in this pandemic period which utilizes the technology in hand, can be more efficient and progressive. This project accomplished to establish a platform for ceremonies to happen virtually along with the participation of each and every individual.
Colleges can arrange graduation ceremonies online, then there would not be huge gathering in this pandemic time.

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REFERENCES

1. Face Feature Extraction E. Bagherian and R. W. O. K. Rahmat, "Facial feature extraction for face recognition: a review," 2008 International Symposium on Information Technology, Kuala Lumpur, 2008, pp. 1-9, doi: 10.1109/ITSIM.2008.4631649.

2. Automated Face Swapping Y. Zhang, L. Zheng and V. L. L. Thing, "Automated face swapping and its detection," 2017 IEEE 2nd International Conference on Signal and Image Processing (ICSIP), Singapore, 2017, pp. 15-19, doi: 10.1109/SIPROCESS.2017.8124497.

3. Srushtika Neelakantam and Tanuy Pant, "Learning Web-based Virtual Reality". "Build and Deploy Webbased Virtual Reality Technology".

4. W. Zhao, A. Krishnaswamy, R. Chellappa, D. Swets and J. Weng. Discriminant analysis of principal components for face recognition, pages 73-85. Springer Verlag Berlin, 1998.

5. D. Bitouk, et al. "Face swapping: automatically replacing faces in photographs." ACM Transactions on Graphics (TOG). Vol. 27. No. 3. ACM, 2008.

6. C. Prema, and D. Manimegalai. "Survey on Skin Tone Detection using Color Spaces." International Journal of

7. Applied 2.2 (2012): 18-26R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

APPENDIX – II


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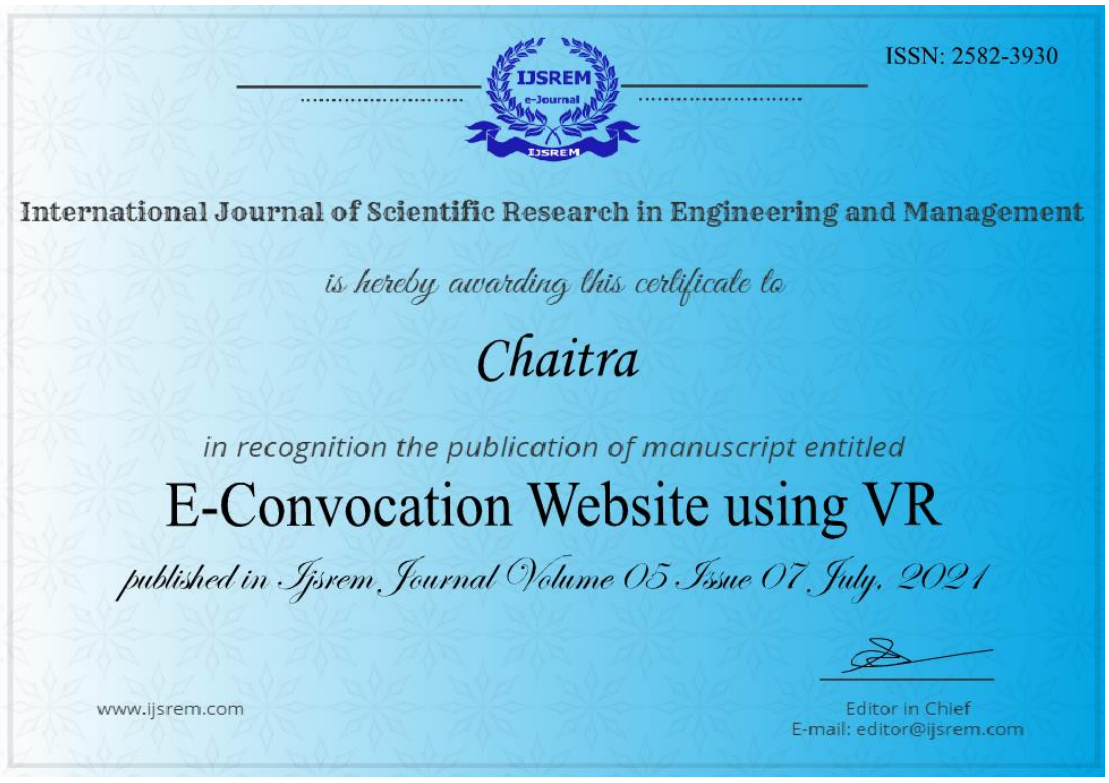

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