TED UNIVERSITY

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CMPE 491

Project Specification Report

Project Name

3DifyMe

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1. Introduction

1.1 Description

The project aims to convert an existing 2D video or a live camera stream taken from a computer camera into 3D by processing it. Our project is designed as a desktop application. 3D videos will be obtained by adding depth layers to the processed images. The resulting video will be displayed side by side as 2D and 3D video in our desktop application and presented to the user. This will be our main feature. We will use a graphical user interface for displaying our features in the project. In this graphical user interface, we are planning to add some other related features, but we need to talk with our supervisor in the implementation time of the project. Also in the project, if we can complete our tasks successfully and if our application works as intended there is a high chance to put our work to an ab site because we have one person that also specializes in web developing. Additionally, until the end of project deadline, we may add features in our application like:

• Camera on/off control option

• Mirror view on/off control option

• Convert 2D image to 3D image

• Start recording with camera

• Download recorded video

• How to use section in application.

Moreover, we do not want to complete this project just for the sake of completing the Senior project course. With this project we would like to have an impact on the field that we are working in.

In conclusion, our project aims to convert 2D videos and live camera streams into immersive 3D experiences. Through the development of our desktop application, we aim to integrate depth layers into processed images, enhancing depth perception and realism for users. While our primary focus is on creating a user-friendly graphical interface, we remain open to further enhancements and collaboration with our supervisor to explore additional features.

1.2 Constraints

1.2.1 Hardware Limitations:

The success of the project hinges on the capabilities of the hardware utilized. Processor speed, RAM capacity, and graphics processing capabilities significantly impact the performance and efficiency of the application. Since our application will show 2d video and 3d processed video side by side, careful consideration must be given to the hardware requirements to ensure optimal functionality.

Also, video quality is very important for the proper processing of videos taken or received live from the camera. Low light and low-resolution videos are difficult to convert or any unusual behavior in the input can cause a problem.

1.2.2 Technological Dependencies:

The project's success may be contingent upon the availability and reliability of external technologies and dependencies. This includes third-party software libraries, APIs, and hardware components. Effective management of technological dependencies is crucial to minimize disruptions and ensure smooth project execution.

1.2.3 Implementation Constraints:

For the project management and for the purpose of working together, we will actively use GitHub. We will use python programming language for most of the project because in the image processing and the other fields, python provides well defined and easy to use libraries. For the graphical interface we are considering using C++ language.

1.2.4 Time Restrictions:

The deadline for completing the project is the first months of 2025. This affects the project planning and development process. Certain stages or reporting must be completed by specified dates. It is expected to communicate with supervisors and juries at regular intervals for quality management of the process.

1.2.5 Resource Constraints:

Because of the complexity of the main feature in the application, as a team we believe this project is a hard one to complete. For that purpose, we will try to start our implementation early so that we can do research and get feedback from our supervisor. We are thinking, from the start of the implementation, we will try to complete small and solid tasks about the project, so each team member needs to allocate time carefully.

1.2.6 Performance Constraints:

The application must be optimized to run efficiently on a variety of hardware configurations, including lower-end devices with limited processing power and memory. Performance optimization techniques such as caching, resource pooling, and parallel processing should be employed to maximize performance across different hardware setups.

1.2.7 Budget Constraints:

Our budget may vary depending on the price of the external cameras and 3D glasses.

1.3 Professional and Ethical Issues

1.3.1 Data Privacy and Security:

The security and confidentiality of sensitive data related to image processing and video recording must be ensured. Users' personal data must be protected and recorded videos must be stored securely. This is important to gain user trust and prevent data breaches by taking appropriate security measures.

1.3.2 Ethical Use of Technology:

Ethical use of the technology used in the project is important. In particular, ethical rules must be followed in cases such as processing or recording images without the permission of the users. Additionally, appropriate user manuals and policies should be developed to ensure the comfort and safety of users of the project.

1.3.3 Collaboration and Ethical Behavior:

Cooperation and ethical values must be respected among the project team. Everyone's opinions should be valued and treated fairly when decisions are made and during the development of the project.

1.3.5. License and Copyright:

Licenses and copyrights of all materials used while developing the project must be observed. Particular care should be taken when using third-party software and libraries. We will ensure that all materials used are properly licensed and that appropriate credit is given to the original creators. By upholding ethical and legal standards, we aim to build a project that is both reliable and sustainable.

2. Requirements

2.1 Functional Requirements:

Functional requirements specify what the system should do. In this project, functional requirements include:

Video Input: The application should allow users to give input as either pre-recorded 2D videos or live camera streams.

Processing: The application will use image processing techniques and some other deep learning approaches (such as: Generative Adversarial Networks (GAN)) to convert the 2D video frames into 3D representations. Since we did not start to implement the project, we did not decide which processing techniques or approaches that we will use.

Depth Layers: Depth layers will be dynamically added to processed images to create realistic 3D visuals with depth perception. Users may have the option to adjust the depth levels based on their preferences, allowing for customizable viewing experiences.

Real-time 3D Conversion: The application will implement real-time 3D conversion capabilities to process live camera streams.

Multi-View Displaying: The application will present processed 3D video alongside the original 2D video in the desktop application with some graphical user interface.

Camera Controls: The application should provide controls to the users such as camera on/off, start live processing …

Recording: The application will enable users to start and stop video recording within the application.

Downloading: The application will provide an option to download recorded 3D videos to local storage. Recorded videos will be saved to the device's local storage for later viewing or sharing.

Customizable Settings: The application will allow users to customize application settings such as video resolution, frame rate, and processing quality to suit their preferences and device capabilities.

User Instruction: The application will include a comprehensive user-friendly interface with clear instructions and tooltips on how to use the application effectively. Help documentation and tutorials may be provided to guide users through the process of capturing, processing, and viewing 3D video content.

Adaptive Processing Quality: The application will try to implement adaptive processing quality settings to automatically adjust processing parameters based on device capabilities because as we know, our accuracy and performance is highly dependent on input quality.

2.2 Non-Functional Requirements:

Non-functional requirements specify how the system should perform. This application includes aspects of such as:

Performance: The application's processing and conversion processes must be fast and efficient and if that is possible, performance of the features should be provided to users.

Availability: The user interface should be simple, clear, and user-friendly. Buttons and controls should be easily accessible for navigation and interaction.

Security: User data must be processed and stored securely, and user privacy must be protected. Encryption and authentication measures should be implemented to safeguard data transmission and storage against unauthorized access or breaches.

Documentation: The application should include a detailed user guide or help document for users. Code documentation and system requirements should be provided for developers to facilitate customization, troubleshooting, and integration with other systems.

Test: The application should be thoroughly tested under different scenarios. Possible bugs and errors need to be reported during the testing process.

Reliability: The application must be reliable and reliability tastings should be performed to identify and address potential points of failure, ensuring continuous availability and functionality.

3. References

[1] ACM Code of Ethics and Professional Conduct

[2] The Software Engineering Code of Ethics, IEEE Computer Society

[3] IEEE Code of Ethics

[4] Computer and Information Ethics, Stanford Encyclopedia of Philosophy