

Rhythm Render

Interim Report

TU856

BSc in Computer Science

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Abstract

This project presents the development of an innovative software tool that bridges the realms of digital music composition and 3D animation through the medium of Virtual Reality. The core of this tool is virtual MIDI sequencer interface that allows users to compose and manipulate musical sequences intuitively. Once a sequence is created, the software translates the data into a dynamic 3D visualization of a virtual performer or ensemble playing the sequence in real time. The VR environment is designed to enhance the immersion of this auditory experience.

The project aims to enhance the creative process by providing composers with a new medium for visualizing and experiencing their music. It also offers educational benefits, serving as a tool for learning about musical structure and performing dynamics. By merging MIDI sequencing with 3D animation, this software introduces a novel approach to interactive music visualization, with applications spanning music production, live performances, and multimedia art.

Declaration

I hereby declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

Signed:

\_\_John Hinch\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

John Hinch

30/11/2024

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# 1. Introduction

**As least 2 pages, but as many as you like**

## Project Background

Music Composition and visual art have long been intertwined, evolving parallel and influencing each other in various ways throughout history. The advent of digital technologies has expanded the boundaries of both fields, creating new opportunities for integration and real-tie interactivity. The development of multimedia software has made it possible to bridge auditory and visual experiences, offering new and exciting ways to express artistic vision and increase audience engagement.

Along with advancements in music technology, virtual reality (VR) has emerged as an incredibly powerful medium for creating immersive experiences that can engage multiple senses. While primarily used for gaming and simulation development, VR technology has found many applications in fields as diverse as education, art, therapy, etc. The use of VR to immerse users in a 3D environments opens up new ways for how people interact with and experience digital content, including music.

The core idea of this project takes inspiration from the increasing need for dynamic visualization tools in the world of music production, performance art and education. Traditional MIDI sequencers allow musicians to compose and arrange music digitally, however, they usually lack any integrated visual component that could enhance the user’s experience and understanding of their composition. Nowadays, 3D animation technology has reached a level of sophistication where it can now simulate a realistic, complex visual, such as a musical performance. By combining these technologies, this project aims to change how musicians and audiences alike interact with music, offering both creative and entertaining benefits.

## Project Description

This project is primarily designed for entertainment purposes, though there is the potential for educational applications as well. The system presents the user with a virtual environment and a simple MIDI sequencer. Here the user is free to create their own sequence of notes using the sequencer. Once the user is satisfied with their sequence, they simply press the perform button, this will create a 3D animation of a person playing the sequence the user created. The user will be able to select from a variety of instruments and will be able to play several animations at once.

The system is implemented using the Godot 4 games engine and Meta Quest 3 virtual reality headset. Users can interact with the system using the controllers of the Quest 3. I hope that this project will provide an entertaining and user-friendly way of creating and experience music.

## Project Aims and Objectives

The overall aim of this project is to provide a new entertaining and immersive way to create and experience music. It will provide people, both new and old to music production, a brand-new way for to create and experience their music in real time. I would also like to learn and utilize a range of different production approaches and different software.

* Provide users an immersive environment to create music
* Render music sequence into 3D animation
* During operation, system should be simple and easy to follow for users with clear and concise explanations of system and controls.
* Meta Quest 3 us used to provide Virtual Reality environment and methods of control. It will also be used to allow user to interact with the environment
* The 3D environment is implemented using Godot game engine and scripts are written in GDScript programming language.
* XR plug ins will be used to create VR solutions in Godot
* Implementing a control scheme to allow the user to interact with the system
* Implementing algorithms to ensure smooth animation transitions

## Project Scope

This project focuses on creating a VR environment for users to create music using a virtual MIDI sequencer and then creating an animation for said sequence. This project will not feature any online functionality, including

Project scope, what the project isn’t about

## Thesis Roadmap

One sentence explaining what each of the following chapters is about.

# Literature Review

## 2.1. Introduction

In this chapter …

## 2.2. Alternative Existing Solutions to Your Problem

Software you’ve looked into

## 2.3. Technologies you’ve researched

Programming languages, operating systems, etc.

## 2.4. Other Research you’ve done

Domain specific research

## 2.5. Existing Final Year Projects

## 2.6. Conclusions

# 3. System Design

## 3.1. Introduction

For this project I am using various

## 3.2. Software Methodology

## 3.3. Overview of System

## 3.X. Other Sections

## 3.X. Conclusions

# 4. Testing and Evaluation

## 4.1. Introduction

## 4.2. Plan for Testing

## 4.3. Plan for Evaluation

## 4.4. Conclusions

# 5. Prototype Development

**As least 2 pages, but as many as you like (but lots of code samples).**

## 5.1. Introduction

## 5.2. Prototype Development

## 5.3. Other Sections

## 5.4. Conclusions

# 6. Issues and Future Work

## 6.1. Introduction

## 6.2. Issues and Risks

## 6.3. Plans and Future Work

### 6.3.1. GANTT Chart

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