Research Plan

1. Introduction

Composing music is challenging and hard to learn as it requires multiple skills, such as playing instruments and understanding music theory. People still are interested in composing their own music but most people never have the time or enthusiasm to start practicing it. Also there are lots of people who are never even able to compose their own music the same way as traditional composers due to different kinds of illnesses or disabilities. This project is about creating a way for those kind of people to explore the magic of creating music without having to learn much base skills before starting the composing process.

1.1 Background

Studies show the importance of music as a promotion in the recovery of multiple kinds of diseases. Study from Harvard shows that music can help reduce side effects of cancer therapy, aid pain relief, improve quality of life for dementia patients [1]. Also, study from University of Helsinki shows that listening to music improves stroke patients' recovery [2]. Furthermore, music also has a positive influence on emotion improvement [3-5]. If patients are able to express themselves in a creative way, it could also be a catalyst in their emotional healing process[6]. In addition, hospital bedside entertainment has positive impact on patient experience. However, currently the forms of entertainment in hospitals are still limited (e.g., TV, radio, video games), thus patients prefer using their own devices [7]. Most of those devices have graphical user interface [7-10].

1.2 Solution

This project aims to increase the experience of patients in hospitals by providing a new form of entertainment - composing music easily via simple tools by collaboration with other people, without requirement of instrument playing techniques and knowledge of music theory. We are trying to create easier way for patients to compose and listen to music by interacting with the system with various interfaces. By physical objects and body motions, user can create sound which makes it really much easier to use especially for disabled or blind people.

2. Target users

This product can generelly be used by anyone but there are a couple of smaller groups that we are trying to reach with this solution:

1. People with disabilities
2. People who are bored in the hospital
3. People who need company and are too shy to collaborate with people
4. People who want to create their own music but don't have the time to learn it otherways
5. People suffer from disease or addiction who need music to facilitate the recovery

3. Technology

The baseline of the music comes from the webcam feed by reading the feed from left to right and identifying different objects in the way similar to keysheets in music. Each object responds to a unique sound and when the sounds of each

object are added together they form melodies. The melodies can be altered by changing the place of objects in the area.

According to the findings from the webcam feed the system plays certain background music which can be altered by moving the objects in the webcam area or using other available sensors. At first we will identify the placement and color of the object. Other characteristics such as shape can be added later. However, we are going to keep image processing simple because we want software to process signals in realtime.

The sensors are used to modify the audio output, the music. Each sensor control different properties of the melody, such as pitch or rhythm. We will include proximity sensor, pressure sensor, and gyro/accelerometer.

We need to buy or borrow webcam for image input, but in the beginning we will start by using just pictures. Pictures are enough for developing a code needed image and audio processing. After we get the code working with pictures, we can implement the webcam into the system and possibly adjust it to work in real time. There are a few possible problems with using the webcam feed in real time as the hand of the user gets in the way of camera if camera is positioned above the area.

We will use Arduino to process sensor inputs. Matlab is used to analyze the sensor input from Arduino and webcam to control the audio output [11]. It is a great platform for processing images and music due to its wide variety of audio and image processing libraries. In addition, Matlab is available to all Aalto students.

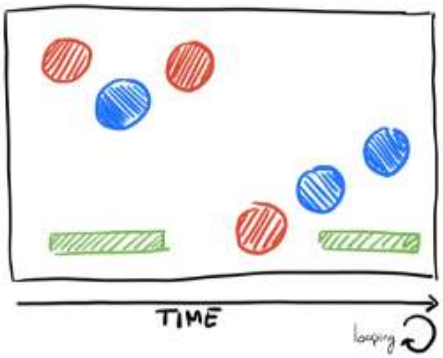

Figure 1. The objects placed on the area will control the melody our music creating system produces. The camera will be located above the objects.

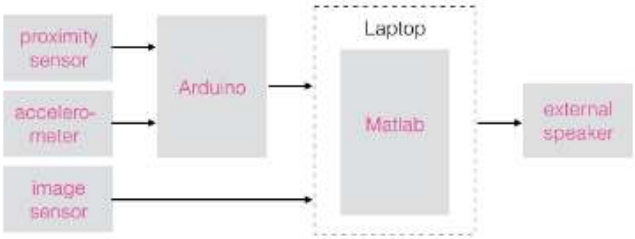

Figure 2. The basic block diagram of our solution.

4. Schedule

We already have all the sensors we plan to use expect for webcam which can be acquired later.

Next steps:

- Connect sensors to Arduino and test what kind of input we get and plan how they could be utilized the in the project. We also have to take care that the required sensor movements feel natural to use.
- Decide the setting and take a few photos. Create code which can detect colors and position of the objects in the picture.
- Decide what is the initial audio we are going to control and what parameters we want to change. Explore the audio processing library to see what is possible.
- Agree on who focuses on which parts of the software.
- Create the software by combining sensors and webcam feed.

5. Team information

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6. Summary

By combining multiple sensors and a web camera, we believe this project will definitely be usefull in various conditions. The benefits are especially great to those patients who spend their time and worry health conditions often or for longer periods of time. This system also encourages people to collaborate, which is important for everybody.This idea can bring happiness and delight the atmosphere of hospitals. For example disabled people or kids that suffer from autism can use this for making new friends and having fun. Also the function to distinguish color would help people who have color blindness to feel colors from a new perspective.

7. References

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