NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

SCSE19061 – Digital Terpsitone : Old Ideas Meet New Technology

Presented by Thomas Stephen Felix

Supervised by Assoc Prof Alexei Sourin

Background

It has been almost 90 years since a group of ten musicians took to stage at Carnegie Hall, USA, each carrying an instrument that was new and quite popular with the community, the Theremin. Among the ten musicians sat the inventor himself, Mr. Leon Theremin. He was a Russian and Soviet inventor with an avid enthusiasm in both music and physics. His passion for these subjects led to the invention of a multitude of electronic instruments such as Theremin, Theremin cello, Keyboard theremin, Rhythmicon and Terpsitone.

The Terpsitone is an electronic platform, controlled by a musician's movements. Vertical movements above the platform led to changes in pitch while forward movement from the back of the platform led to changes in amplitude. Thus, providing an overall 'dancing' effect. Out of three of these mysterious 'dancing' platforms invented, only one remains today.

Our research aims at finding a new cost-effective and easily available platform to implement and promote the Terpsitone. This is achieved by using modern technologies in order to implement similar functionalities as that of the Terpsitone.
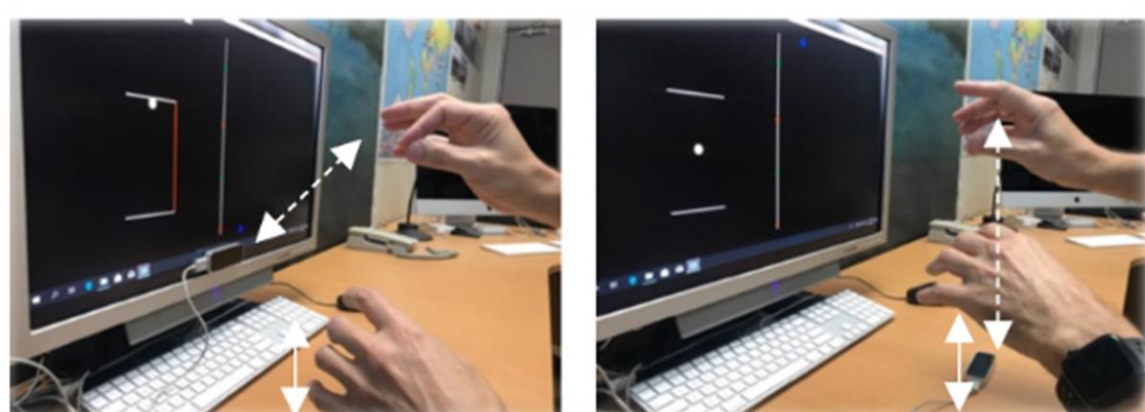

Objectives

- ✓ To re-envision the Terpsitone in an affordable and accessible manner in order to improve its awareness
- ✓ To provide a platform that can help an average music enthusiast to learn and pick up skills quickly
- ✓ To keep the inventor's original vision to develop an instrument that will not inhibit the movement of the musician

Previous Research

Our previous research focused on using LEAP motion technology in order to achieve our objectives. It used advanced finger tracking technology to measure distance between a user's fingers and a flat surface. This allowed the user to control pitch as well as volume with minimal movement and provide adequate properties as that of the Theremin.

- ❖ Leap motion sensor
  - ❖ Optical tracking device
  - ❖ Accuracy of 2.5 mm
  - ❖ Price: approx. $80 USD
  - ❖ Uses include gaming
  - ❖ Moderately available

- ❖ Drawbacks
  - ❖ Limited movement
 - ❖ Required heightened platform
  - ❖ Single user

Ongoing Research

To further push towards our objective, we are currently trying to implement the Terpsitone using Microsoft Kinect technologies.

- ❖ Kinect Sensor
  - ❖ Full body optical tracking device
  - ❖ Infrared technologies
  - ❖ Price : approx. $250 USD
  - ❖ XBOX gaming sensor
  - ❖ Easily available
  - ❖ Support multiples users
  - ❖ High Accuracy

The original Terpsitone is prone to interference from neighboring objects and bystanders making it quite tedious. The Kinect – Theremin allows tracking of up to six concurrent musicians at a time with no interference of one musician's movement with another. Furthermore, it promotes the learning of first time Terpsitone users by allowing them to reflect their instructor's movements. The Kinect – Theremin can also be tailored to the height and arm length of the musician. It also does not impede the musician's movements – features which are absent from the original Theremin.

Volume

Pitch
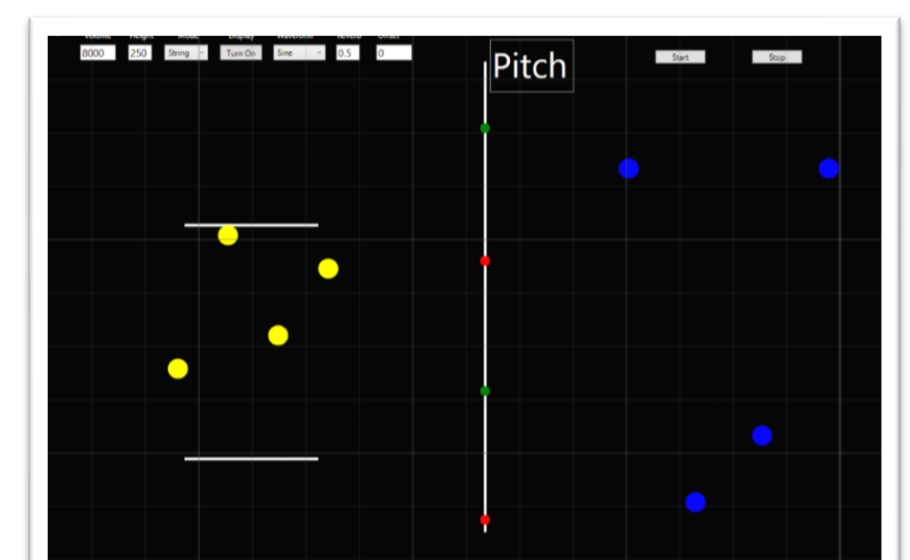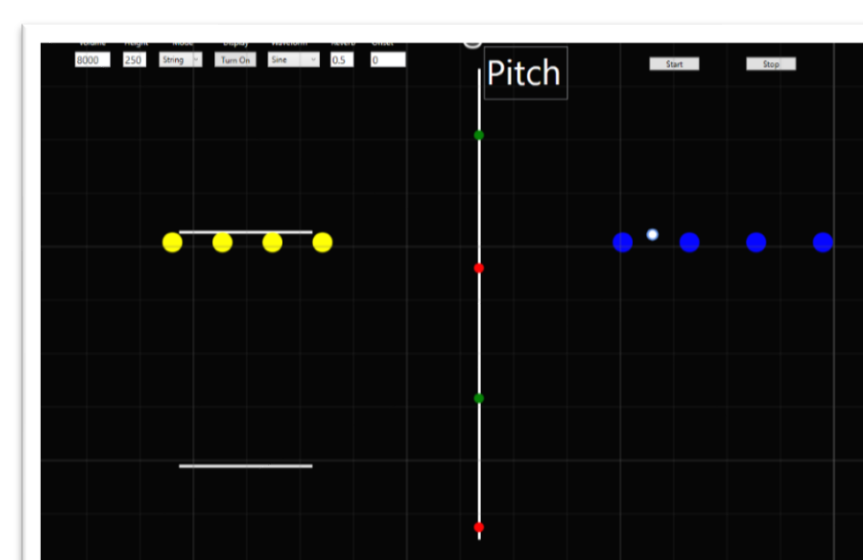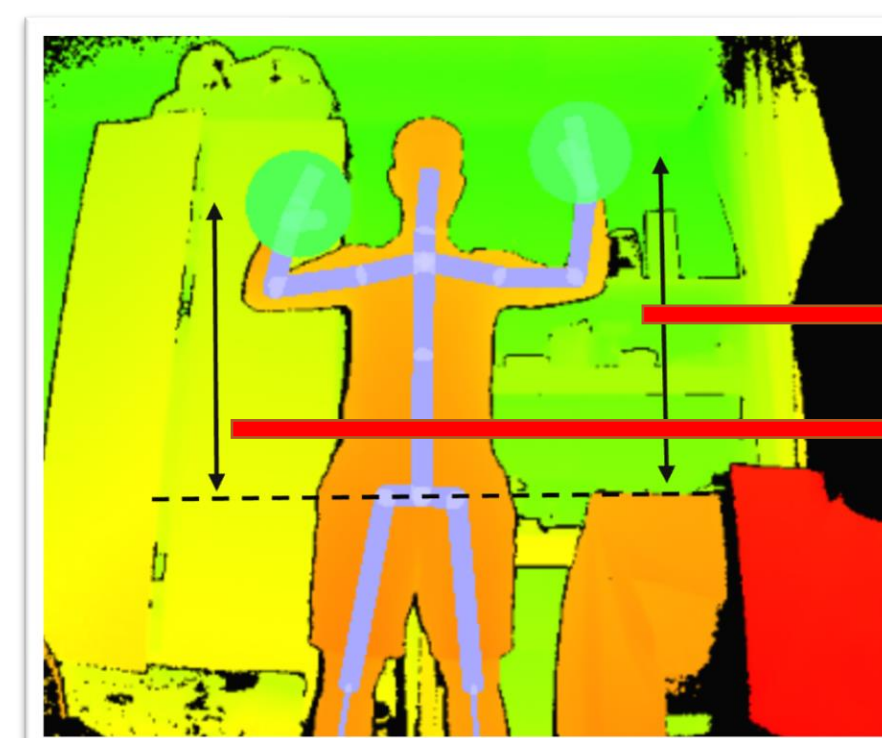
Future Work

The Kinect – Theremin has endless possibilities at this stage. With our goal in mind to promote awareness of the Theremin and Terpsitone, these are some of the few directions we aim to take this research in:

- ➢ Implement Polyphonic sound – The Theremin and Terpsitone use electronic properties to produce a mundane monophonic tune. The use of new technologies allow us to extend this monophonic sound to a polyphonic sound generated by the machine. We believe a polyphonic sound would be more attractive to the everyday Theremin player.

- ➢ The Kinect sensor allows more than just arm tracking; its full body tracking capabilities makes room for additional features. For example, a base sound controlled by the movement of legs or feet. This would promote a wider range of movements required from the musician, almost like a dance.

- ➢ A MIDI file player – This would allow a novice or first-time Theremin player to learn the Theremin at a faster pace by simply following the movements projected on the screen.