Title:	Leap Motion Controller Application In Music, Biometrics And Security
Author(s):	Kesharwani, Sushil
Supervisor(s):	Venkatesh, K S
Keyword(s):	Leap Motion Controller Anthropological Biometric Theremin
Subject(s):	Musical instrument Authentication system

Abstract: In this work, we present the applications of Leap Motion controller in different areas of music, biometrics and security. Since the world is moving towards touchless interaction, this technology will bring revolution in many fields of digital world. Most of the existing works in touchless interaction are on image-based and sensor-based systems, but they have some limitations and complexities. The Leap Motion controller is a 3D motion capturing device designed for hand and finger tracking, with precision very high. Touchless interaction with Leap Motion controller gives a solution to the limitations of earlier systems and emerges as a better alternative. One of the applications we present is based on the touchless musical instrument Theremin (Leap-Theremin) where frequency and volume are controlled through fingers. Another application is in anthropological and biometric authentication. In anthropological authentication, we create anthropological gestures which contain some criteria which are known only between the authenticated individual and the authenticating system. This criteria needs to be satisfied for successful authentication, which is very difficult for any unauthorized user to decipher even after observing the gesture being performed by the authorized user any number of times. We achieved results which are comparable to state of art technique. For biometric authentication, we create a setup using Leap Motion controller in which a user places his/her hand above the Leap Motion controller, and the algorithm extracts the features and classifies them using KNN (k-Nearest Neighbor). After classification, the person is identified as an authorized/unauthorized user.
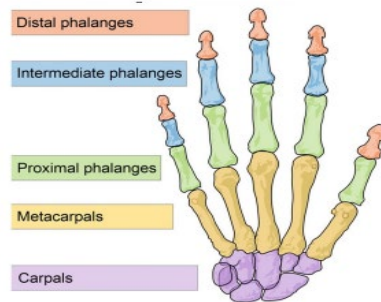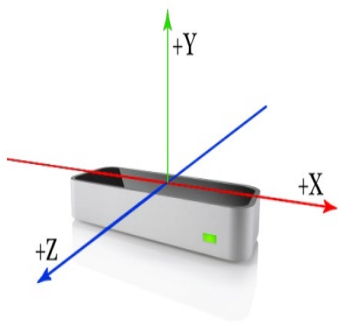
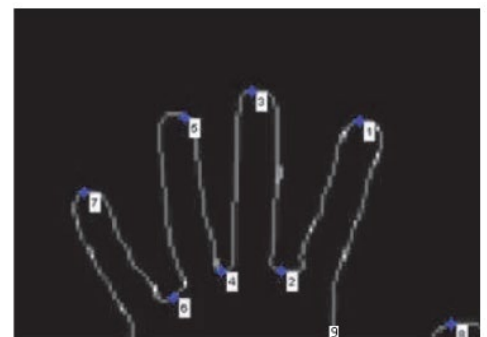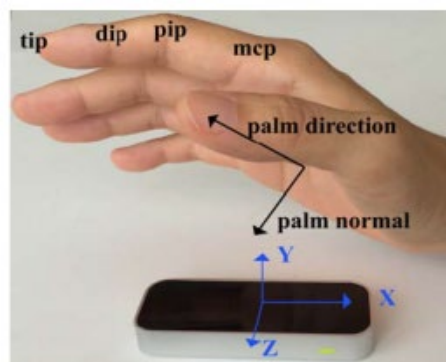Figure 2.2: Bone structure of Hand

Figure 3.3: Leap-Theremin

Figure 3.1: Theremin

Figure 4.3: Finger tips and Valley point