Virtual Guitar Simulator using Computer Vision

Final Year Project 2022-23
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Task Description : Simulate the natural playing of a guitar using only a webcam.
Objective : Eliminate the need for an additional device and reduce latency.

Highlights

A software system which accurately models the real life experience of playing a guitar without the need of any additional sensory apparatus

Hosting the trained machine learning model on Google Cloud.

Identification of chord using model developed upon showing hand gesture on left hand.

Playing a soft or a buzzing note depending on the velocity of strumming, i.e., the right hand.

Dataset Description

Dataset contains 1200 jpg images for each of the 7 major chords (A to G)

Total Dataset size is 1200 * 7 = 8400 total jpg images

Validation split = 0.2 of the total dataset

Methodology

Sub-task 1: Chord identification Model Training : Training the CNN model with the dataset of formatted skeletal left hand images to classify chords in real time

Sub-Task 2: Velocity detection of the strumming hand : Velocity that the user strums through the strumming region is classified as fast or slow and plays the appropriate sound when strummed.

Sub-Task 3: Integration of left and right hand modules: Chord detection and strum detection are executed simultaneously in real time to emulate the guitar

Sub-Task 4: Loading the model on the cloud: The chord classification model is loaded onto a cloud VM, where a server is set up to receive and serve HTTP POST requests containing skeletal image to be classified into a chord shape returned as JSON.
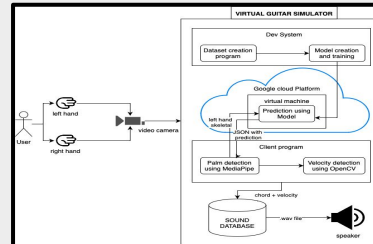
Performance Analysis

The Chord Identification model achieves an accuracy of 99%.
In real-time, the classification accuracy of the system for each chord varies from 75% - 92%.

		Predicted Values					
		A	**B**	**C**	**D**	**E**	**F**	**G**
A	7	-	-	3	-	-	-
B	3	2	-	-	-	5	-
C	3	-	5	-	-	2	-
D	4	3	-	3	-	-	-
E	3	-	2	-	1	4	-
F	1	-	-	-	-	9	-
G	-	-	1	-	-	4	5

(Actual Values)

Inferences