Piano using Arduino Uno, Bluetooth Module and Android app

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***Abstract*—This project proposal provides an overview of probable modifications made taking inspiration from existing projects 'Paper Piano with Arduino', 'Arduino Piano using 4x4 Keypad', and 'A Simple, Five Button, Polyphonic, Arduino Uno-Based Piano'. This report outlines the modifications that would be made, hardware components, and software required to make the modifications and milestones with stretch goals. It would provide the complete picture of what would be the final product.**

***Index Terms*—Arduino Uno, Paper piano, 4x4 Keypad, Polyphonic**

I. Introduction

THE use of digital media and devices has increased nowadays to gain knowledge and learn about analog devices or physical instruments like guitar, piano, keyboard, etc. The original projects have made the digital piano using Arduino but they have a different way of passing inputs to the Arduino to make Piezo create music. Ikashan has used paper and lead pencil as shown in Fig. 1 to make paper piano to pass input as it is a well-known fact that lead and body touch creates capacitive touch which can be used instead of buttons[1]. As shown in Fig. 2 Adewale has used a 4x4 keypad to pass inputs to the Arduino[2]. Whereas Arduino Enigma has used push buttons to pass inputs to the Arduino[3] as shown in Fig 3. All mentioned projects can be considered as the base for creating a digital Piano.

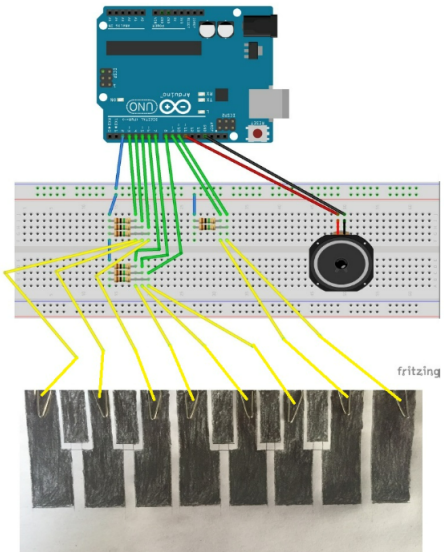

Fig. 1. Paper Piano with Arduino

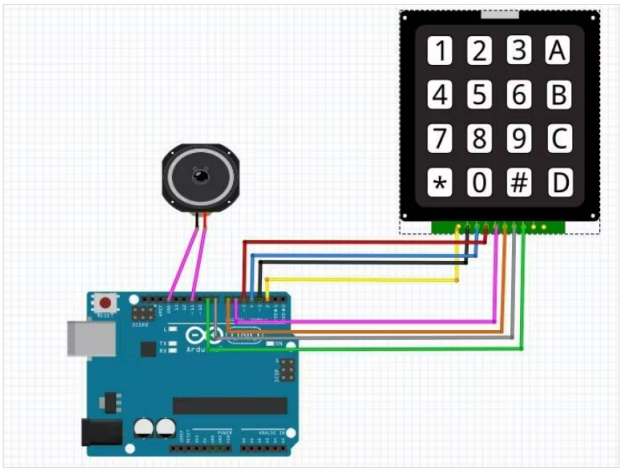

Fig. 2. Arduino Piano using 4x4 Keypad

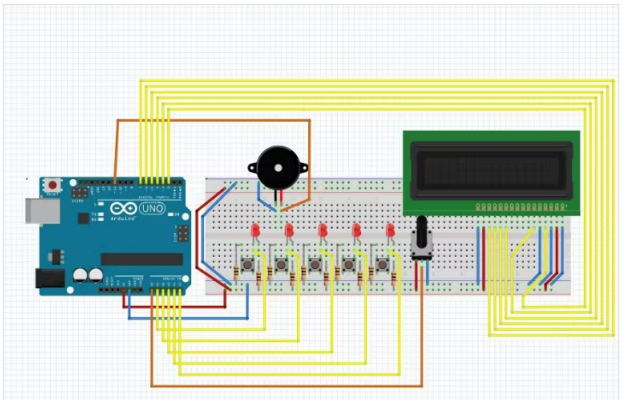

Fig. 3. A Simple, Five Button, Polyphonic, Arduino Uno-Based Piano

II. Modification

This project aims to adapt all the functionality achieved by the above-mentioned projects but it would take inputs from an android device through an app over a Bluetooth module that would be connected to Arduino. The android app will probably have an interface similar to the 4x4 keypad shown in Fig. 2 which will pass input when pressed and will try to make it more creative if time permits. Additionally, it will also provide additional control over frequency, pitch, and tempo of tone. As a stretch goal as shown in Fig. 3, I will try to add a digital screen that will display important information like frequency, pitch, etc. related to the tone currently playing.

III. Motivation

For a long time, I wanted to learn a musical instrument and wanted to know about how different sounds are produced and how those sounds can be used to make different tones. Apart from that, everyone uses a digital device like a Mobile phone to learn something new, even musical instruments. As part of the research to complete this project, I would gain the working knowledge of how sound is created and how it is used to create different tones. Additionally, as the final product, I would be making a digital piano which can be considered a base for making a well-sophisticated and complete piano in the future.

IV. List of Materials Required

The list of Hardware components and software required to implement Piano with Arduino Uno, Bluetooth Module, and Android App are as mentioned below.

- Hardware Components
  - Arduino Uno
  - Bluetooth Module
  - Piezo (Buzzer)
  - Breadboard
  - Jumper wires
  - Various resistors
  - Android Mobile
- Software
  - Arduino Software (IDE)
  - Android App making platform (not decided yet)

V. Team Roles

This is a solo project meaning it would be implemented solely by me including research, hardware design, android app development, testing, maintaining an online GitHub repository, and writing the final project report.

VI. Milestones

Below are the milestones with probable due dates to complete the project.

- **Milestone 1**
  - Gather components and get working knowledge of piano including but not limited to what is tone, pitch, tempo, amplitude, frequency, etc.
  - Due 7th July
- **Milestone 2**
  - Built 1st prototype of a piano with Arduino using physical components and experimenting with Piezo on how to change the amplitude, frequency, pitch, tempo, and tune.
  - Due 17th July
- **Milestone 3**
  - Create Android app with interface which can be used as piano.
  - Due 27rd July
- **Milestone 4**
  - Combine what we achieved in the 2nd and 3rd milestones using the Bluetooth module so that we can use the app as a piano to send input to Arduino.
  - Due 7th August
- **Milestone 5 (Stretch Goal)**
  - If possible give more flexibility to play with frequency, amplitude, tempo, and pitch by giving additional options in-app.
  - Due 13th August

VII. Summary

The proposed project when completed would have an android app that will serve as input when connected with a Bluetooth module attached to Arduino. On pressing the buttons in-app, the corresponding tone will be played using the Piezo buzzer. If time permits to implement stretch goals, it will also give an additional command to change frequency, pitch, and tempo of tone.

References

[1] Ikhsan, *Paper Piano with Arduino*, 2018. Available at: https://www.hackster.io/Barqunics/paper-piano-with-arduino-e27da7

[2] Adewale Paul, *Arduino Piano Using 4x4 Keypad*, 2019. Available at: https://www.hackster.io/drwale2000/arduino-piano-using-4x4-keypad-f5ff8c

[3] Arduino Enigma, *A Simple, Five Button, Polyphonic, Arduino Uno-Based Piano*, 2018. Available at: https://www.hackster.io/arduinoenigma/a-simple-five-button-polyphonic-arduino-uno-based-piano-b367be