

SE 101 Lab Proposal

The Project

For our project, we have decided to replicate an instrument called a Melodica. The Melodica is a musical keyboard with an air tube connected to it, and it is played by blowing air through the instrument while pressing on the keys. Our device will have push buttons to represent the piano keys and a wind sensor that the user will blow onto. The wind sensor will determine whether a tone should be played. It will also determine the volume of the tone based on the wind speed (faster wind equals louder sound). This project can be expanded to include additional features such as recording and playback of melodies, the ability to switch octaves, and the ability to play multiple tones at once.

Major Software Components

The major software components include (in arduino language):

- Receiving input from wind sensors and the buttons
- A function that determines which button is pressed
- A function that returns whether or not to play a tone based on whether there is wind or not. It will also give information on how loud the sound should be based on the wind speed.
- A function that returns the frequency the buzzer should play depending on which button was pressed (only if there is also wind speed).
- Continuously check for wind speed and button pressed to know if should keep playing tone
- Implement a recording feature that keeps track of the frequencies, volume, and duration of each note, so that it can play back the identical melody
- Implement a switch octave button that moves all possible tones up or down an octave
- Implement the ability to play multiple tones at once

Prototype Plan

Our prototype plan includes two vertical prototypes (V1 and V2) and an evolutionary prototype (E1). V1 is a project that changes the volume of a piezo buzzer using software. It uses a breadboard, resistors, piezo buzzer, and an arduino. The purpose is to write a program that can vary the volume of the buzzer. This will allow us to explore the challenge of changing the volume of the buzzer using software before the additional challenges of integrating with button and wind sensor input are included. V2 is a project that allows a user to change the pitch of the buzzer using push buttons. It uses a breadboard, resistors, piezo buzzer, push buttons, and an arduino. This will allow us to explore the challenge of changing pitches based on which button is pressed, before we integrate it with all the other features. E1 is a preliminary model of our project that will evolve to become our final project. It will use all of the components of the end design with at least basic functionality. E1 will use the wind sensor to determine whether to play a tone, use the push buttons to pick which tone is played (from V2), and change the volume of the tone using input from the wind sensor (from V1). E1 will not take input for the duration of each note, do recording and playback, switch octaves, or play multiple tones at once.

Hardware Needed

➤Arduino Uno R3 ➤Breadboard ➤Connecting wires ➤Resistors ➤Push buttons ➤Piezo Buzzer ➤Wind Sensor Rev. C (from moderndevise.com)

Anticipated Challenges

Based on our brainstorming and research, we understand that there will be numerous challenges in this project. First of all, it will be difficult to design a circuit that uses all the components, including resistors, to allow the arduino to receive the correct input from the buttons and wind sensor. In addition, it will be difficult to change the volume of the Piezo Buzzer, since we are trying to use software to change it rather than a potentiometer that can be manipulated physically. To help us, we've decided to make prototypes V1 and V2 so we can focus on these specific challenges. Then, we will be able to create our preliminary model E1 that performs the general functions of our project. From there, we will focus on solving some of our other anticipated challenges. These include making the device strong enough to withstand use, allowing the user to play multiple notes at a time (such as chords), and changing tone length based on whether the user is blowing and/or holding down a button.