Project Proposal: Portable Piano with Enhanced Features

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Objective

Our team, united by a shared passion for music, aims to create a simplified piano that integrates our hobbies with our professional knowledge. The Portable Piano, featuring 15 white keys from lowC to highC, is designed to produce sound using buzzers and includes two innovative features: a pitch adjustment knob and pressure sensors under each key.

The pitch adjustment knob was inspired by our personal experiences practicing singing. Many of us can only remember chords in C major on the piano, limiting our ability to experiment with different pitches. The knob allows us to adjust the overall pitch of the piano, facilitating our singing practice.

Additionally, the pressure sensors under each key visualize the intensity of key presses, adding a visual element to our design and providing valuable feedback to the user. We hope this piano enhances the user's musical experience, making it both functional and enjoyable.

High-Level Descriptions

1. **Fifteen White Keys**: The heart of our Portable Piano lies in its fifteen white keys, each corresponding to a note from lowC to highC. These keys form the primary interface for the user to interact with the piano, allowing them to play a wide range of melodies. Each key has been carefully designed to provide a tactile response that mimics the feel of a traditional piano key. This design choice ensures that even though our piano is simplified, it still provides a satisfying playing experience that is reminiscent of a full-sized piano.

2. **Pitch Adjustment Knob**: One of the standout features of our piano is the pitch adjustment knob. This innovative feature allows the user to adjust the overall pitch of the piano, providing a level of customization that is not typically found in traditional pianos. By simply turning the knob clockwise, the user can increase the pitch by a semitone, and by turning it counterclockwise, they can decrease it. This feature is particularly useful for singers or musicians who wish to experiment with different pitches without having to learn complex chord structures. To make the process even more intuitive, we have included a display above the knob that indicates the current pitch. This visual feedback ensures that the user always knows the exact pitch they are playing at, further enhancing the user experience.

3. **Pressure Sensors and Display**: To add an extra layer of interactivity, each key on our piano is equipped with a pressure sensor. These sensors detect the intensity of each key press and translate it into a visual representation on a serial screen located behind the keys. When a key is pressed, a block on the screen bounces to a height corresponding to the pressure applied, with greater pressure resulting in a higher bounce. This feature not only adds a fun visual element to the piano but also provides valuable feedback to the user about their playing technique. By observing the bounce of the blocks, users can learn to adjust their key press intensity, improving their overall playing technique over time.

Functional Block Diagram

The Functional Block Diagram of our project, the Portable Piano with Enhanced Features, provides a high-level overview of the system's architecture. It illustrates the interconnections between different functional units and how they contribute to the overall operation of the piano. The main components include fifteen white keys, each corresponding to a note from lowC to highC, a pitch adjustment knob for modifying the overall pitch, and pressure sensors under each key to visualize the intensity of key presses. The diagram also includes a serial screen behind the keys that displays a block bouncing to a height corresponding to the pressure applied on the keys. This diagram is crucial for understanding the flow of information and the interaction between different components in our system.
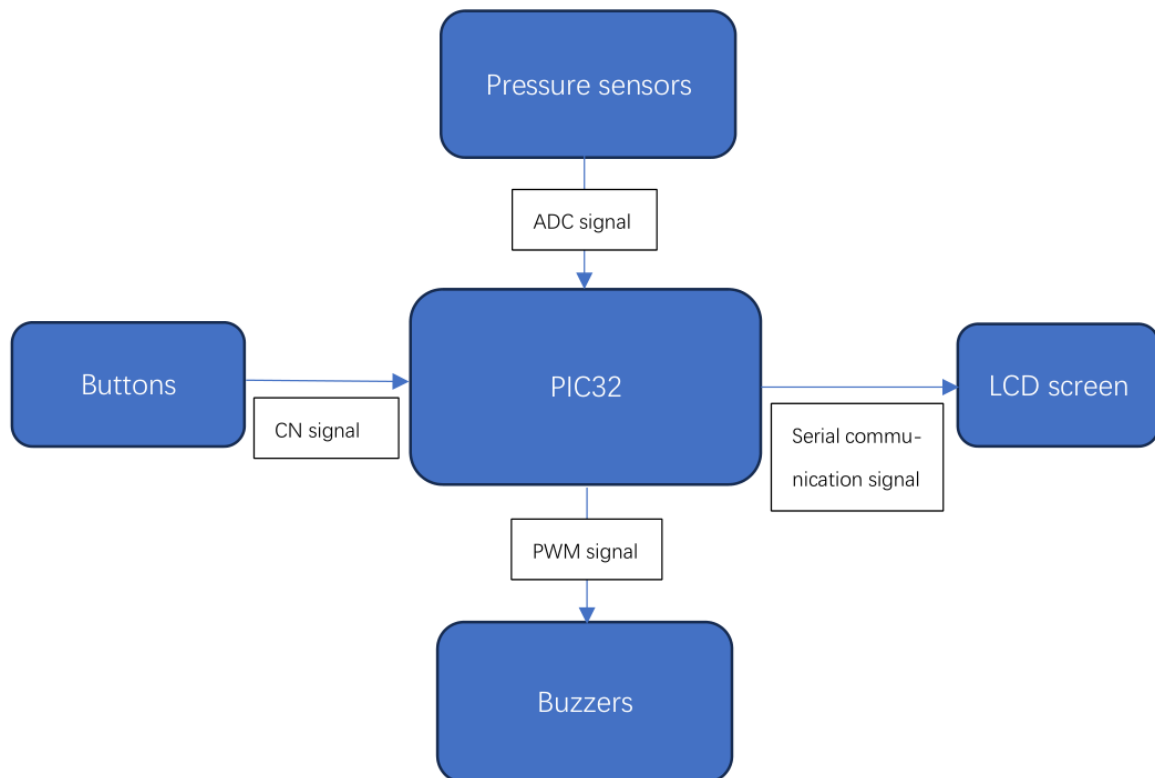
Components Level Diagram

The Components Level Diagram delves deeper into the individual components that make up our Portable Piano. It provides a detailed view of each component and its role in the system. The primary components include a buzzer for sound production, fifteen white keys for note playing, a pitch adjustment knob for pitch control, pressure sensors for each key to detect the intensity of key presses, and a serial screen for visualizing key press intensity. This diagram is essential for understanding the specific functionalities of each component and how they work together to achieve the desired output. It also aids in identifying potential areas of improvement and optimization in our design.

Button

Pressure sensors

PIC32

LCD screen

Buzzers

Preliminary Component Lists

1. Buzzer

2. 15 white keys

3. Pitch adjustment knob

4. Pressure sensors for each key

5. Serial screen for visualizing key press intensity

Preliminary Project Timeline

	June					July																						
	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Purchasing components	█	█	█	█	█																											
Buzzers implementation						█	█	█	█	█	█																					
Pressure sensors implementation												█	█	█	█	█	█															
Buttons implementation																		█	█	█	█	█	█									
LCD implementation																								█	█	█	█	█	█	█		
Demonstration																																█