

Project Description:

This project demonstrates how to create a simple **Piano using Arduino**. The project uses 8 pushbuttons to generate different musical notes through a **piezo buzzer**. When a button is pressed, the Arduino plays a corresponding tone on the buzzer, simulating a piano keyboard. This project is a fun and educational way to learn about sound generation using Arduino and the working of basic electronic components like pushbuttons and buzzers.

Components Used:

1. Arduino Uno

- **Description:** The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, and a USB connection for programming.
- **Working Principle:** It executes programmed code to control connected devices like sensors, motors, and other peripherals.
- **Application:** Used for prototyping, learning programming, and controlling various devices.

2. Piezo Buzzer

- **Description:** A piezoelectric buzzer is a small electronic device used to generate sound through the piezoelectric effect. When a voltage is applied, it vibrates and produces sound waves.
- **Working Principle:** The piezoelectric material inside the buzzer deforms when voltage is applied, creating vibrations that result in sound. Different frequencies of voltage produce different pitches.
- **Application:** Used in alarms, musical instruments, and other devices to produce sound signals.

3. Pushbuttons

- **Description:** A pushbutton is a basic mechanical switch used to open or close an electrical circuit. When the button is pressed, it allows current to flow through.
- **Working Principle:** When the button is pressed, it connects two electrical contacts, completing the circuit and allowing current to flow.
- **Application:** Commonly used for user input in electronic projects, such as switching on devices, changing modes, etc.

4. Resistors (10k Ω and 220 Ω)

- **Description:** Resistors are components used to limit the current in a circuit and protect other components from damage.
 - **Working Principle:** A resistor resists the flow of electrical current, converting electrical energy into heat. The resistance is measured in ohms (Ω).
 - **Application:** Used to limit current, divide voltage, and protect sensitive components.
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Working Principle of the Project:

- **Pushbutton Inputs:** Each pushbutton acts as an input device. When pressed, the circuit is completed, and the Arduino detects this change in state. Each pushbutton corresponds to a different musical note.
 - **Buzzer Output:** The piezo buzzer is connected to the Arduino, which generates a tone at a specific frequency when a pushbutton is pressed. The `tone()` function in the Arduino code generates the appropriate frequency for each note.
 - **Button Detection:** The Arduino checks the state of each pushbutton. When a button is pressed, it plays the corresponding note by generating a tone. If the button is not pressed, no tone is played.
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Applications of the Project:

- **Educational Purpose:** This project is a great way to learn about Arduino programming, sound generation, and working with basic components like buttons and buzzers.
- **Music Instruments:** This concept can be expanded into a more advanced electronic musical instrument, such as a digital piano.
- **Interactive Learning Tools:** It can be used in schools or learning environments to teach students about electronics and programming in a fun and interactive way.
- **Sound Generation Projects:** Can be used as a base for other sound-generating devices, such as alarms or simple musical devices.