

EMBEDDED SYSTEMS

LAB PROJECT

COE17B010

Group Details

- Group number: 8
- Group members:
 1. COE17B010
 2. COE17B036
 3. COE17B047
 4. CED17I001
 5. CED17I046

Project Title

Create a DAC using R-2R Ladder for Piano using Switch and Resistance for 8 bit.

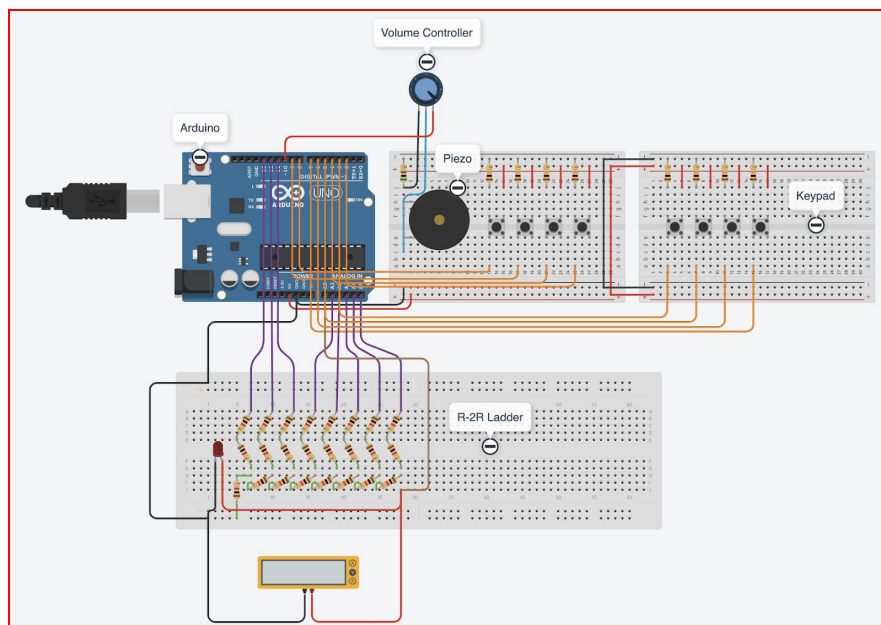
Diagram

Components Used

- Arduino Uno R3
- Buttons
- Multimeter
- Potentiometer
- Piezo speaker
- 10k Ω resistors - 8
- 1k Ω resistors - 24
- 500 Ω resistor - 1
- 1 Red LED

Pin Configurations

Pin Name	Pin Type	Connection
8	DIGITAL INPUT	BUTTON 0



9	DIGITAL INPUT	BUTTON 1
4	DIGITAL INPUT	BUTTON 2
2	DIGITAL INPUT	BUTTON 3
3	DIGITAL INPUT	BUTTON 4
5	DIGITAL INPUT	BUTTON 5
6	DIGITAL INPUT	BUTTON 6
7	DIGITAL INPUT	BUTTON 7
10	DIGITAL OUTPUT	Terminal 2 Potentiometer
13	DIGITAL INPUT	R-2R Ladder BitPosition 1
12	DIGITAL INPUT	R-2R Ladder BitPosition 2
11	DIGITAL INPUT	R-2R Ladder BitPosition 3
A0	ANALOG OUTPUT	R-2R Ladder Output
A1	DIGITAL INPUT	R-2R Ladder BitPosition 4
A2	DIGITAL INPUT	R-2R Ladder BitPosition 5
A3	DIGITAL INPUT	R-2R Ladder BitPosition 6
A4	DIGITAL INPUT	R-2R Ladder BitPosition 7
A5	DIGITAL INPUT	R-2R Ladder BitPosition 8

Group Contributions

- **Arduino Connections:**
 - Button configuration setting: COE17B010, COE17B047
 - Wiring: CED17I001
 - R2R ladder: COE17B036, CED17I046
- **Arduino Code:**
 - Setup: CED17I001
 - Button click checking: COE17B036
 - Frequency generation using DAC: COE17B010, COE17B047, CED17I046

Code Logic

1. Setup

- a. Initialise all required pins as INPUT or OUTPUT and set initial values for frequencies in binary

2. Button Click Checking

- a. Check Button Click and detect which button is clicked by checking input from respective digital pins
- b. If digital input is HIGH - Clicked in that instance

3. Frequency generation using DAC

- a. Read Corresponding Binary value of frequency for the button and input the values to DAC 8 bits input
- b. DAC R-2R Ladder circuit converts this digital value to analog
- c. Capture the analog output from DAC and multiply 2 to get actual piano note frequency
- d. Use tone() function to send output to Piezo to play specific frequency sound