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Passive Buzzer

Overview

In this experiment, you’ll use the Raspberry Pi to generate a tone with the passive buzzer. Passive buzzers differ from active buzzers in that, like (electromagnetic) loudspeakers, they require a changing external signal (AC) to drive their tone. (An active speaker generates its own tone, at a fixed frequency; passive speakers can generate different tones depending on the frequency of the alternating current delivered to them.) Passive buzzers are used as tone generators in a wide variety of applications: toys, instruments, telephones, status indicators, etc.

Experimental Materials

Raspberry Pi	x1
Breadboard	x1
Passive Buzzer	x1
Dupont jumper wires	

Experimental Procedure

1. If you have not done so already, prepare your development system by installing the Python interpreter, RPi.GPIO library, and wiringPi library as described in READ_ME_FIRST.TXT.
2. Install the active buzzer in your breadboard, and use Dupont jumper wires to connect it to your Raspberry Pi as illustrated in the Wiring Diagram below. Execute the sample stored in this experiment’s subfolder.
   If using C, compile and execute the C code:

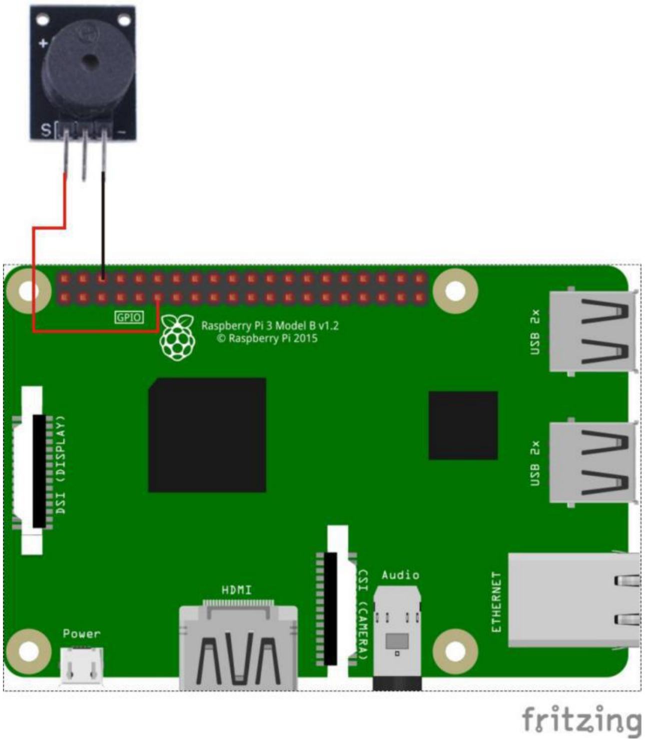
```
cd Code/C
gcc passiveBuzzer.c -o passiveBuzzer.out -lwiringPi
./passiveBuzzer.out
```

If using Python, launch the Python script:

```
cd Code/Python
python passiveBuzzer.py
```

3. Make experimental observations. The buzzer plays a brief tune defined in the source code.

Wiring Diagram



Passive Buzzer pin position:

"S"	↔	Raspberry Pi pin 11
"-"	↔	Raspberry Pi GND

Sample Code

Python Code

```
#!/usr/bin/env python
import RPi.GPIO as GPIO
import time

BuzzerPin = 11   # pin11

SPEED = 1
```

```
# List of tone-names with frequency
TONES = {"c6":1047,
    "b5":988,
    "a5":880,
    "g5":784,
    "f5":698,
    "e5":659,
    "eb5":622,
    "d5":587,
    "c5":523,
    "b4":494,
    "a4":440,
    "ab4":415,
    "g4":392,
    "f4":349,
    "e4":330,
    "d4":294,
    "c4":262}

# Song is a list of tones with name and 1/duration. 16 means 1/16
SONG = [
    ["e5",16],["eb5",16],
    ["e5",16],["eb5",16],["e5",16],["b4",16],["d5",16],["c5",16]
,
    ["a4",8],["p",16],["c4",16],["e4",16],["a4",16],
    ["b4",8],["p",16],["e4",16],["ab4",16],["b4",16],
    ["c5",8],["p",16],["e4",16],["e5",16],["eb5",16],
    ["e5",16],["eb5",16],["e5",16],["b4",16],["d5",16],["c5",16]
,
    ["a4",8],["p",16],["c4",16],["e4",16],["a4",16],
    ["b4",8],["p",16],["e4",16],["c5",16],["b4",16],["a4",4]
    ]

def setup():
    GPIO.setmode(GPIO.BOARD) # Numbers GPIOs by physical location
    GPIO.setup(BuzzerPin, GPIO.OUT)

def playTone(p,tone):
    # calculate duration based on speed and tone-length
    duration = (1./(tone[1]*0.25*SPEED))

    if tone[0] == "p": # p => pause
        time.sleep(duration)
    else: # let's rock
        frequency = TONES[tone[0]]
        p.ChangeFrequency(frequency)
        p.start(0.5)
        time.sleep(duration)
        p.stop()

def run():
    p = GPIO.PWM(BuzzerPin, 440)
    p.start(0.5)
    for t in SONG:
        playTone(p,t)

def destroy():
    GPIO.output(BuzzerPin, GPIO.HIGH)
    GPIO.cleanup()                    # Release resource

if __name__ == '__main__':            # Program start from here
    setup()
    try:
        run()
    except KeyboardInterrupt:
        destroy()
```

C Code

```
#include <wiringPi.h>
#include <softTone.h>
#include <stdio.h>

#define BuzPin    0


#define  CL1  131
#define  CL2  147
#define  CL3  165
#define  CL4  175
#define  CL5  196
#define  CL6  221
#define  CL7  248

#define  CM1  262
#define  CM2  294
```

```
#define  CM3  330
#define  CM4  350
#define  CM5  393
#define  CM6  441
#define  CM7  495

#define  CH1  525
#define  CH2  589
#define  CH3  661
#define  CH4  700
#define  CH5  786
#define  CH6  882
#define  CH7  990

int song_1[] =
{CM3,CM5,CM6,CM3,CM2,CM3,CM5,CM6,CH1,CM6,CM5,CM1,CM3,CM2,CM2,C
M3,CM5,CM2,CM3,CM3,CL6,CL6,CL6,CM1,CM2,CM3,CM2,CL7,CL6,CM1,CL5}
;
int beat_1[] =
{1,1,3,1,1,3,1,1,1,1,1,1,1,1,3,1,1,3,1,1,1,1,1,1,1,2,1,1,1,1,1,
1,1,1,3};
int song_2[] =
{CM1,CM1,CM1,CL5,CM3,CM3,CM3,CM1,CM1,CM3,CM5,CM5,CM4,CM3,CM2,C
M2,CM3,CM4,CM4,CM3,CM2,CM3,CM1,CM1,CM3,CM2,CL5,CL7,CM2,CM1};

int beat_2[] =
{1,1,1,3,1,1,1,3,1,1,1,1,1,1,3,1,1,1,2,1,1,1,3,1,1,1,3,3,2,3};

int main(void)
{
    int i, j;

    if(wiringPiSetup() == -1)
    {
        printf("setup wiringPi failed !");
        return -1;
    }

    if(softToneCreate(BuzPin) == -1)
    {
        printf("setup softTone failed !");
        return -1;
    }
    while(1)
    {
        printf("music is being played...\n");

        for(i=0;i<sizeof(song_1)/4;i++)
        {
            softToneWrite(BuzPin, song_1[i]);
            delay(beat_1[i] * 500);
        }

        for(i=0;i<sizeof(song_2)/4;i++)
        {
            softToneWrite(BuzPin, song_2[i]);
            delay(beat_2[i] * 500);
        }
    }

    return 0;
}
```