# ECE 476/676 - Homework #3

*Binary Outputs, Binary Inputs, Serial I/O - Due Monday, February 3rd*

## Morse Code (take 1)

*https://morsecode.world/international/morse.html*

1) Write a Python program which

- Turns on the beeper (GP13) when button GP15 is pressed
- Turns off the beeper (GP13) when button GP15 is released.

```
print('Problem 1')

from machine import Pin
from time import sleep_ms

Button = Pin(15, Pin.IN, Pin.PULL_UP)
Beeper = Pin(13, Pin.OUT)

while(1):
    if(Button.value() == 0):
        Beeper.value(1)
    else:
        Beeper.value(0)
```

Result:

- While GP15 is pressed, the buzzer plays
- When released, the buzzer stops

By manually pressing and releasing the button, you can outputs dits and dahs.

2) Using this program, output NDSU in Morse code (manually setting the dits and dahs)

- N: dah - di
- D: dah - di - di
- S: di - di - di
- U: di - di - dah

*Comment:*

- *Works - plays while the button is held down*
- *Timing is a little inconsistent due to manally setting the on and off times*
- *If you had an oscilloscope, you could see this*

## Morse Code (take 2 - iambic paddle)

3) Write a Python program which

- Plays a dit on the beeper when button GP15 is pressed, and
- Plays a dah on the beeper when button GP14 is pressed.

The timing should be

- dit:  on for 200ms, off for 200ms, return
- dah:  on for 600ms, off for 200ms, return
- space between letters:  600ms

```
print('Problem 3')

from machine import Pin
from time import sleep_ms

B14 = Pin(14, Pin.IN, Pin.PULL_UP)
B15 = Pin(15, Pin.IN, Pin.PULL_UP)
Beeper = Pin(13, Pin.OUT)

while(1):
    if(B14.value() == 0):
        Beeper.value(1)
        sleep_ms(600)
        Beeper.value(0)
        sleep_ms(200)
    if(B15.value() == 0):
        Beeper.value(1)
        sleep_ms(200)
        Beeper.value(0)
        sleep_ms(200)
```

Comment:

- When B14 is tapped, a dah is played (600ms)
- When B14 is held down, a series of dah's are played
- When B15 is tapped, a dit is played (200ms)
- When B15 is held down, a series of dit's are played (200ms)
- When both B14 and B15 are held down, it alternates (dah-dit-dah-dit-...)

4) Using this program, output NDSU in Morse code by pressing buttons GP14 and GP15 accordingly

- N: dah - di
- D: dah - di - di
- S: di - di - di
- U: di - di - dah

*Works but shows better in the video*

- *Timing is more precise with an iambic paddle than it is with manual keying*
- *The pause between letters is a little inconsistend due to setting it manually*
- *If you had an oscilloscope, you would see that the timing is precisely 200ms & 600ms*

### oooMorse Code (take 3)

5) Write a Python program which

- Prompts you for a text string of up to 20 characters, and then
- Outputs this message in Morse code.
- Spaces between letters are a 600ms silence;

```
from machine import Pin
from time import sleep_ms

B14 = Pin(14, Pin.IN, Pin.PULL_UP)
B15 = Pin(15, Pin.IN, Pin.PULL_UP)
Beeper = Pin(13, Pin.OUT)

def dah():
    Beeper.value(1)
    sleep_ms(600)
    Beeper.value(0)
    sleep_ms(200)

def dit():
    Beeper.value(1)
    sleep_ms(200)
    Beeper.value(0)
    sleep_ms(200)

def space():
     Beeper.value(0)
     sleep_ms(600)

while(1):
    X = input('String to output: ')
    for i in range(0,len(X)):
        Y = X[i]
        print(Y)
        if((Y == 'A') or (Y == 'a')):
            dit()
            dah()
        :
        if((Y == 'Z') or (Y == 'z')):
            dah()
            dah()
            dit()
            dit()
        if(Y == ' '):
            space()
        space()
```

shell

```
String to output:  eis
e
i
s
String to output:
```

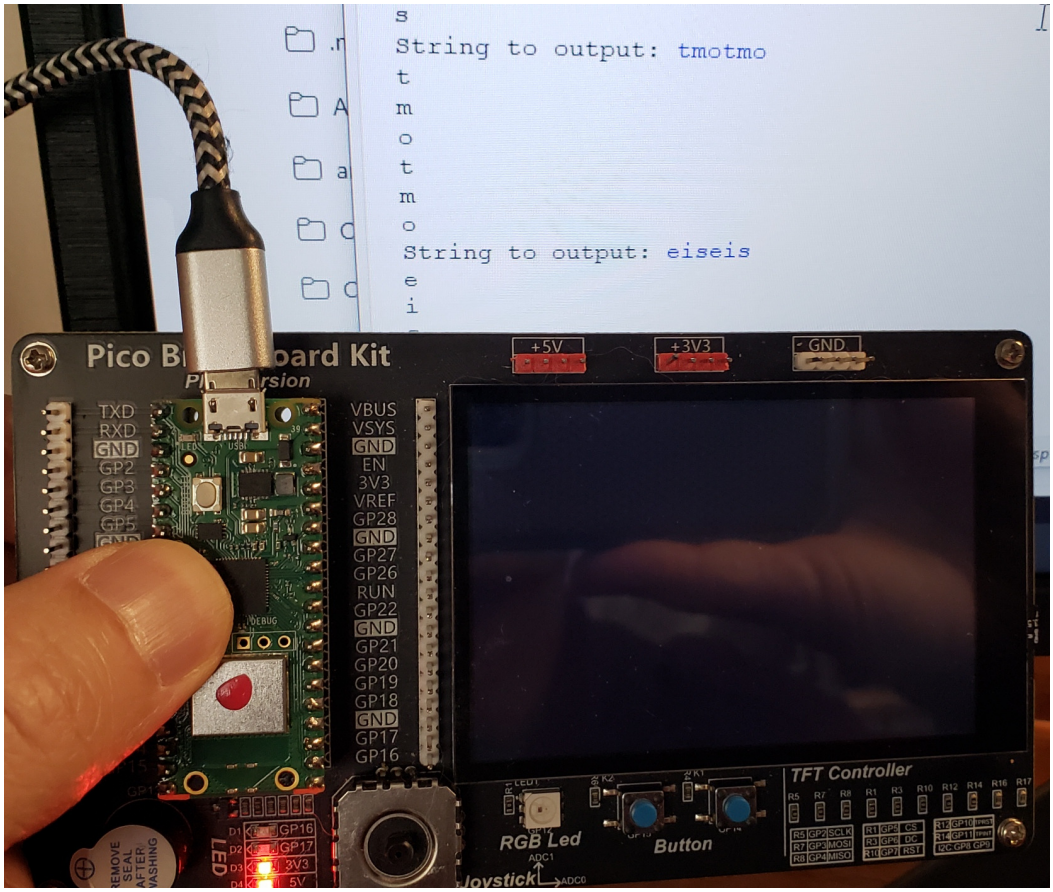
Comment:

- Typing in 'eiseis' plays one dit (e), two dits (i), then three dits (s)
- Typing in 'tmotmo' plays one day (t), two dahs (m), then three dahs (o)

6) Demo your Morse Code program

Shows off better in the video

- *Type in a message then hit return*
- *The message is output on the beeper*




| | |
|---|---|
| A | dit-dah |
| B | dah-di-di-di |
| C | dah-di-dah-di |
| D | dah-di-di |
| E | di |
| F | di-di-dah-di |
| G | dah-dah-di |
| H | di-di-di-di |
| I | di-di |
| J | di-dah-dah-dah |
| K | dah-di-dah |
| L | di-dah-di-di |
| M | dah-dah |

| | |
|---|---|
| N | dah-di |
| O | dah-dah-dah |
| P | di-dah-dah-di |
| Q | dah-dah-di-dah |
| R | di-dah-di |
| S | di-di-di |
| T | dah |
| U | di-di-dah |
| V | di-di-di-dah |
| W | di-dah-dah |
| X | dah-di-di-dah |
| Y | dah-di-dah-dah |
| Z | dah-dah-di-di |

| | |
|---|---|
| 0 | dah-dah-dah-dah-dah |
| 1 | di-dah-dah-dah-dah |
| 2 | di-di-dah-dah-dah |
| 3 | di-di-di-dah-dah |
| 4 | di-di-di-di-dah |
| 5 | di-di-di-di-di |
| 6 | dah-di-di-di-di |
| 7 | dah-dah-di-di-di |
| 8 | dah-dah-dah-di-di |
| 9 | dah-dah-dah-dah-di |