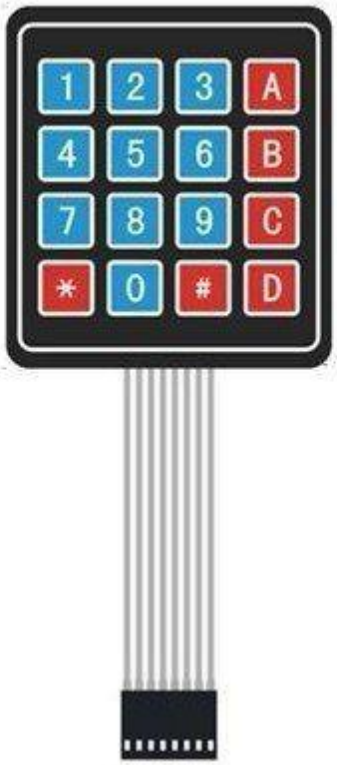
ME 105

Final Project – a Keypad Controlled Pink Panther and Detective Game

A keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. Keypads are commonly found on many alphanumeric keyboards and on other devices such as calculators, telephones, microwaves, combination locks, and digital door locks, which require mainly numeric input.

The keypad that comes with the Starter Kits has buttons arranged in 4 rows and 4 columns. A connection is made between the corresponding row line and column line when a button is pressed. When none of the button is pressed, there is no connection between the row or column lines.



Connect the left most pin of the keypad to the Uno's digital I/O pin 9 and connect the remaining pins in succession, so that the right most pin of the keypad connects to the Uno's digital I/O pin 2.

Since the keypad is using Uno's digital I/O pin 2 through 9, the buzzer and lights can't use digital I/O pin 2 through 9.

Connect the buzzer to the Uno's digital I/O pin 10.

Install a circle of 8 LED lights on the bread board. The following light numbers can be used to identify the location and wiring of each light:

3	4	5
2		6
1	8	7

Connect 3 LEDs to the Uno's digital I/O pin 11, 12, and 13 to represent the LED light #1, #2, and #3.

The Arduino IDE Serial data connections, **Serial.begin() and Serial.println() functions, use digital I/O pin 0 and 1.** Therefore, if we want to use the 9600 baud rate window to print debug statements, the use of digital I/O pin 0 and 1 should be avoided.

The 6 Analog pins (A0 – A5) on the Uno board can also be used to send digital output as digital pins 14-19.

The analog pins are mapped to be extra digital pins as follows:

Analog Pin Number	Digital Pin Number
A0	14
A1	15
A2	16
A3	17
A4	18
A5	19

Connect the fourth (4th) LED to the Uno's analog pin A2 (digital I/O pin 16) to represent the light #4.

Connect the fifth (5th) LED to the Uno's analog pin A3 (digital I/O pin 17) to represent the light #5.

Connect the fifth (6th) LED to the Uno's analog pin A3 (digital I/O pin 18) to represent the light #6.

Connect the fifth (7th) LED to the Uno's analog pin A3 (digital I/O pin 19) to represent the light #7.

Connect the fifth (8th) LED to the Uno's analog pin A3 (digital I/O pin 15) to represent the light #8.

Write a c program, using the Arduino's integrated development environment (IDE), to make a Pink Panther and Detective Game that utilizes a keypad to obtain the player inputs.

Keypad #			
1	2	3	A
4		6	
7	8	9	
*	0		D

The following table contains the keypad key functions:

Keypad Key	Function
A	**Start the game.**
D	**End the game and report score.** Blink light 1 and buzz frequency 262 for 50 ms for each score point.
*****	**Turn on all 8 lights when not playing the game.**
0	**Turn off all 8 lights when not playing the game.**
7	During the game, if **light 1** is on, turn off **light 1**,buzz frequency 262 for 25 ms., and score 1 pt.
4	During the game, if **light 2** is on, turn off **light 2**,buzz frequency 262 for 25 ms., and score 1 pt.
1	During the game, if **light 3** is on, turn off **light 3**,buzz frequency 262 for 25 ms., and score 1 pt.
2	During the game, if **light 4** is on, turn off **light 4**,buzz frequency 262 for 25 ms., and score 1 pt.
3	During the game, if **light 5** is on, turn off **light 5**,buzz frequency 262 for 25 ms., and score 1 pt.
6	During the game, if **light 6** is on, turn off **light 6**,buzz frequency 262 for 25 ms., and score 1 pt.
9	During the game, if **light 7** is on, turn off **light 7**,buzz frequency 262 for 25 ms., and score 1 pt.
8	During the game, if **light 8** is on, turn off **light 8**,buzz frequency 262 for 25 ms., and score 1 pt.

Install a circle of 8 lights.

The following table suggests the mapping between the light numbers and the Keypad numbers.

Light #			Keypad #		
3	**4**	**5**	**1**	**3**	**2**
2		**6**	**4**		**6**
1	**8**	**7**	**7**	**8**	**9**

The program should automatically turn on each light by looping through the circle clockwise one at a time.

When the program starts, each light stays on for 1 second during the first circle. During the second circle, each light stays on 90% of the previous duration, 900 milliseconds (1000 ms * 90 / 100 = 900 ms). During the third circle, each light stays on 810 milliseconds (900 ms * 90 / 100 = 810 ms)**. The lights loop faster and faster after each circle by reducing the duration 10% each circle.**

The **millis**() function in the Arduino Library (http://arduino.cc/en/reference/millis) can be used to track time in milliseconds after the game starts. The **millis**() function returns the number of milliseconds since the Arduino board began running the current program. This number will go back to zero after approximately 50 days. To calculate the actual game time in milliseconds, the value returned by the **millis**() function call should be compared to a value returned by a previous call to the **millis**() function. The **millis**() function call output is a **unsigned long** data type.

The player can turn off the light by pressing the keypad key when the light is on. A successful hit scores 1 point. Pressing the keypad key when the light is off will not score any point.

Add sound effect from the buzzer when each light turns on.

An example Pink Panther sound effect can be as follows:

Situation	Frequency	Duration in Milliseconds
Light 1 turns on	1109 then 1175	25 then 75
Light 2 turns on	1319 then 1397	25 then 75
Light 3 turns on	1109 then 1175	25 then 75
Light 4 turns on	1319 then 1397	25 then 75
Light 5 turns on	1865 then 1760	25 then 75
Light 6 turns on	1175 then 1397	25 then 75
Light 7 turns on	1760 then 1661	25 then 75
Light 8 turns on	1661	100

Additional game functions are always welcome!

Other project ideas with equal or more complexities are also welcome. Please discuss with the instructor **in advance** to determine the project complexity.

Projects with additional hardware or different hardware settings must be presented in class.

If you are not able to demo the Final Project in person, I will grade the project with my circuit board using the pin numbers specified in this project.