**Outline**

Write a program to blink the on-board LED based on user commands from the serial monitor. Parse commands to turn on and off the LED as well as blink it a specified number of times.

**Objectives**

**Prerequisites**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Prerequisite Module(s)** | **Level** | **Student Initial** | **Teacher Initial** | **Date** |
| None |  |  |  |  |

**Materials**

* Arduino Development Environment (IDE)
* Arduino proto board

**Level 0: Sample Program**

1. Implement and run the sample program defined in Appendix A..
2. Observe the number times the LED blinked.
3. Explain why the LED only blinked 4 times.

The LED blinked only 4 times because the (int times=) was set to 5 and not 4.

**Level 1: Variable Scope**

1. Comment out (remove) line #24 with the code “int times = value;”
2. Observe the number times the LED blinked and explain how this is different from before.
3. Explain how line #24 with the code “int times = value;” changes the program.
4. There are two definitions for “int times”. Once on line #2 and once on line #24.
   1. Explain where each definition applies in the code
   2. Explain if there is any of overlap
5. // global variable for a number of times to blink the LED
6. int times = 5;
7. // the setup function runs once when you press reset or power the board
8. void setup() {
9. // initialize digital pin LED\_BUILTIN as an output.
10. pinMode(LED\_BUILTIN, OUTPUT);
11. Serial.begin(9600);
12. }
13. // the loop function runs over and over again forever
14. void loop() {
15. int timesBlinked = blink(4);
16. Serial.print("The LED was SUPPOSED to blink ");
17. Serial.print(times);
18. Serial.print(" times BUT only blinked ");
19. Serial.println(timesBlinked);
20. delay(1000);
21. }
22. // a new procedure defined by you to blink the LED
23. int blink(int value) {
24. for (int i = 0; i < times; i++) {
25. digitalWrite(LED\_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
26. delay(500); // wait for a second
27. digitalWrite(LED\_BUILTIN, LOW); // turn the LED off by making the voltage LOW
28. delay(500); // wait for a second
29. }
30. Serial.print("The LED blinked ");
31. Serial.print(times);
32. Serial.println(" times.");
33. return times;
34. }

**Level 2: Adding Colored LEDs**

1. Extend your proto-board to add two colored LEDs.
2. Modify your procedure definition on line #23 to look like the following:  
   “int blink(int value, int led) {“
3. Modify the code in your procedure to light up the LED indicated in the procedure parameter.
4. Modify your main loop to correctly use your new procedure definition.

**Level 3: Changing LEDs**

1. Research the Arduino “random()” built-in function.
2. Modify your main loop to randomly change LED colors.
3. Modify your main loop to randomly change blink times.

**Level 4: Quiz**

1. Complete the quiz assigned by your teacher.

**Achievement Record**

|  |  |  |  |
| --- | --- | --- | --- |
| **Attainment Level** | **Student Initial** | **Teacher Initial** | **Date** |
| Level 0: Serial Write |  |  |  |
| Level 1: Serial Read |  |  |  |
| Level 2: Number Blink |  |  |  |
| Level 3: Robustness |  |  |  |
| Level 4: Quiz |  |  |  |

**Appendix A – Sample Program**

// global variable for a number of times to blink the LED

int times = 5;

// the setup function runs once when you press reset or power the board

void setup() {

// initialize digital pin LED\_BUILTIN as an output.

pinMode(LED\_BUILTIN, OUTPUT);

Serial.begin(9600);

}

// the loop function runs over and over again forever

void loop() {

int timesBlinked = blink(4);

Serial.print("The LED was SUPPOSED to blink ");

Serial.print(times);

Serial.print(" times BUT only blinked ");

Serial.println(timesBlinked);

delay(1000);

}

// a new procedure defined by you to blink the LED

int blink(int value) {

for (int i = 0; i < times; i++) {

digitalWrite(LED\_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)

delay(500); // wait for a second

digitalWrite(LED\_BUILTIN, LOW); // turn the LED off by making the voltage LOW

delay(500); // wait for a second

}

Serial.print("The LED blinked ");

Serial.print(times);

Serial.println(" times.");

return times;

}