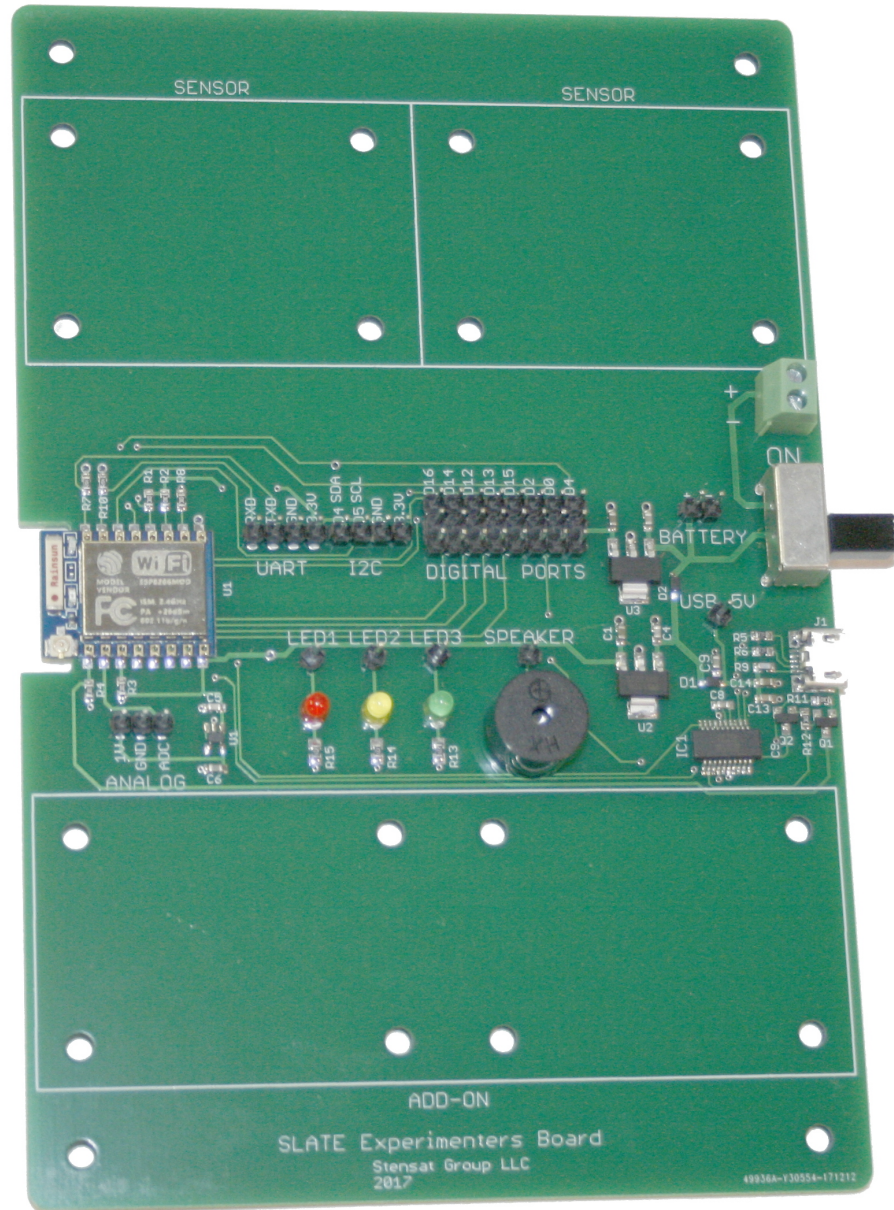


Sten-SLATE ESP Kit

Conditional Programming



Conditional Programming

Conditional Programming

Conditional programming is how programs make decisions. The simplest form is the **if()** statement. The **if()** statement requires an argument. The argument is a comparison that results as true or false. False has a value of zero.

```
if(a == b) {  
    // execute if true  
}  
else {  
    // execute if false  
}
```

The following are valid comparisons

`a == b` true if a equals b

`a > b` true if a greater than b

`a >= b` true if a greater or equal to b

`a < b` true if a less than b

`a <= b` true if a less than or equal to b

Conditional Programming

In this example, the program will monitor the light level and turn on the LED when it gets dark enough.

Reuse the wiring of the light sensor as before. Add a jumper to connect **D14** to **LED1**. Enter the code below and run it. The voltage threshold may need to be adjusted depending on the light level in the room. Adjust it so that the LED is off with the ambient light. Then cover the light sensor. The LED should turn on.

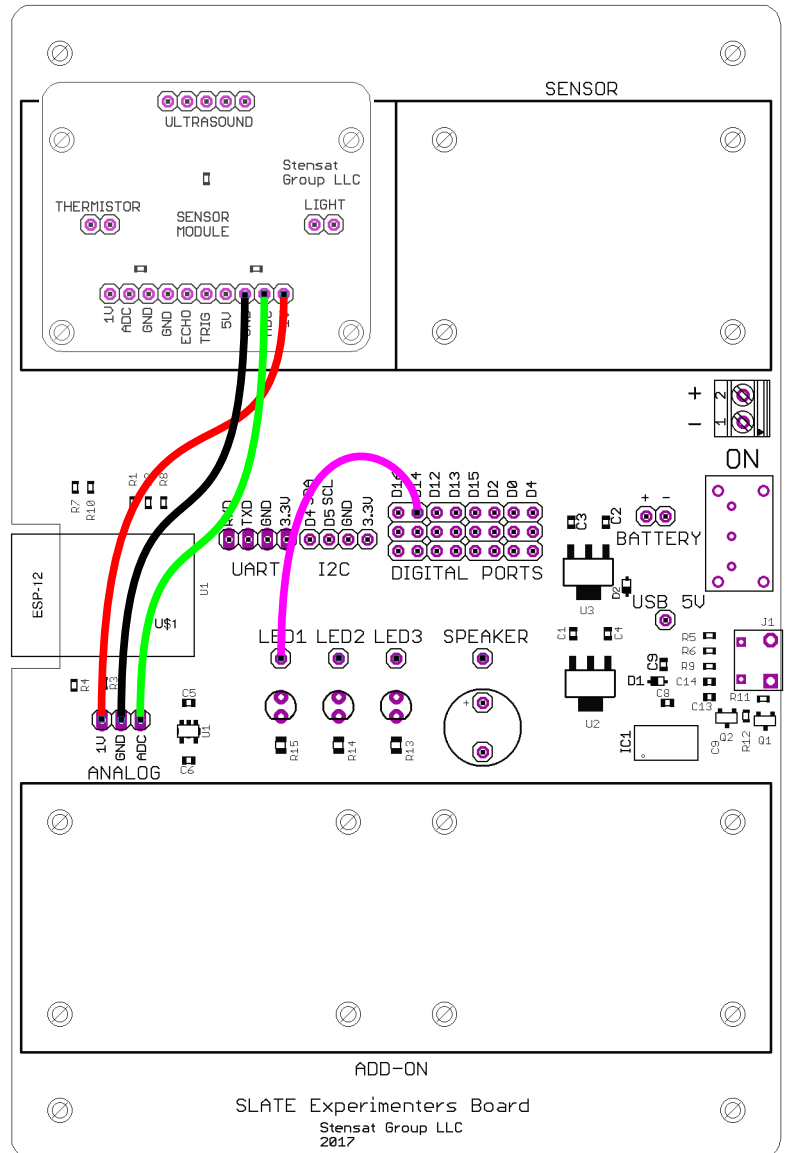
At the top of the code is a **#define** statement. This assigns a constant to a name. This is useful if the constant is used in multiple places. It allows easier changes by only changing the constant in one location. It also helps to use a name that has meaning for its use.

Adjust the **THRESHOLD** constant until the program operates properly.

```
#define THRESHOLD 500

void setup()
{
  Serial.begin(115200);
  pinMode(14, OUTPUT);
}

void loop()
{
  int a;
  a = analogRead(0);
  Serial.println(a);
  if(a < THRESHOLD) {
    digitalWrite(14, HIGH);
  } else {
    digitalWrite(14, LOW);
  }
  delay(200);
}
```



Conditional Test

Reconnect the thermistor to the ADC. Connect all three LEDs to digital pins. Create a program to do the following:

Turn on the green LED when at room temperature

Turn on the yellow LED when it is a bit warmer. Select the threshold.

Turn on the red LED when it is hot. Select the threshold.

Turn off the red LED when it is below the hot threshold.

Turn off the yellow LED when it is below the warm threshold.

Multiple Conditions

Multiple conditions can be tested simultaneously with an `if()` statement. The first example shows two comparisons with an **AND** comparison which is represented by `&&`. The `if` statement reads as follows: if **a** equals **45** and **b** equals **c** execute the following. Both variable comparisons have to be true for the `if()` statement result to be true.

The second example shows an **OR** comparison. The `if()` statement result is true if either comparisons are true or both comparisons are true. The `if` statement reads as follows: If **a** equals **45** or **b** is greater than **c** then execute the following. At least one of the comparisons have to be true for the `if()` statement result to be true.

More than two comparisons can be included in the `if()` statement. A statement can have several comparisons and all have to be true for the `if()` statement result to be true using the **AND** comparison. An `if()` statement with several comparisons can have at least one comparison to be true using the **OR** comparison. A combination of **AND** and **OR** comparisons can be performed. Care has to be taken on how the comparisons are grouped. The last example shows a combination. Notice the **OR** comparison has an extra pair of parentheses around it. This tells the compiler to first perform if **b** is greater than **c** or **b** equals **32**. The result of that comparison is then compared with if **a** equals **45**. If the results of both are true, the `if()` statement is true.

```
void setup() {
  Serial.begin(115200);
  int a = 45;
  int b = 32;
  int c = 32;
}

void loop() {
  if((a == 45) && (b == c) {
    Serial.println("All equal");
  }
}
```

AND Comparison Example

```
void setup() {
  Serial.begin(115200);
  int a = 45;
  int b = 32;
  int c = 32;
}

void loop() {
  if((a == 45) || (b > c) {
    Serial.println("some true");
  }
}
```

OR Comparison Example

```
void loop() {
  if((a == 45) && ((b > c) || (b == 32)) {
    Serial.println("mostly true");
  }
}
```

AND and OR Comparison Example

Multiple Conditions

The code to the right works the same as the third example in the previous page. It shows the **if()** statement broken down into multiple **if()** statements. This code may be easier to understand.

For an exercise, write a program that requires testing two sensors, the light sensor and ultrasonic sensor. Write a program that turns on the red LED when the room is dark and the ultrasonic sensor is within 20 cm of an object otherwise turn off the red LED. Turn the green LED on when the room is not dark and the ultrasonic sensor is within 20 cm of an object otherwise turn the green LED off.

```
void setup() {
  Serial.begin(115200);
  int a = 45;
  int b = 32;
  int c = 32;
}

void loop() {
  if((b > c) || (b == 32) {
    if(a == 45) {
      Serial.println("mostly true");
    }
  }
}
```

AND and OR Comparison Example