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IEEE - CSULB Branch
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Agenda

- Project
- Software setup
  - Arduino IDE
- Arduino Programming Language
  - Functions
  - Values
  - Structures

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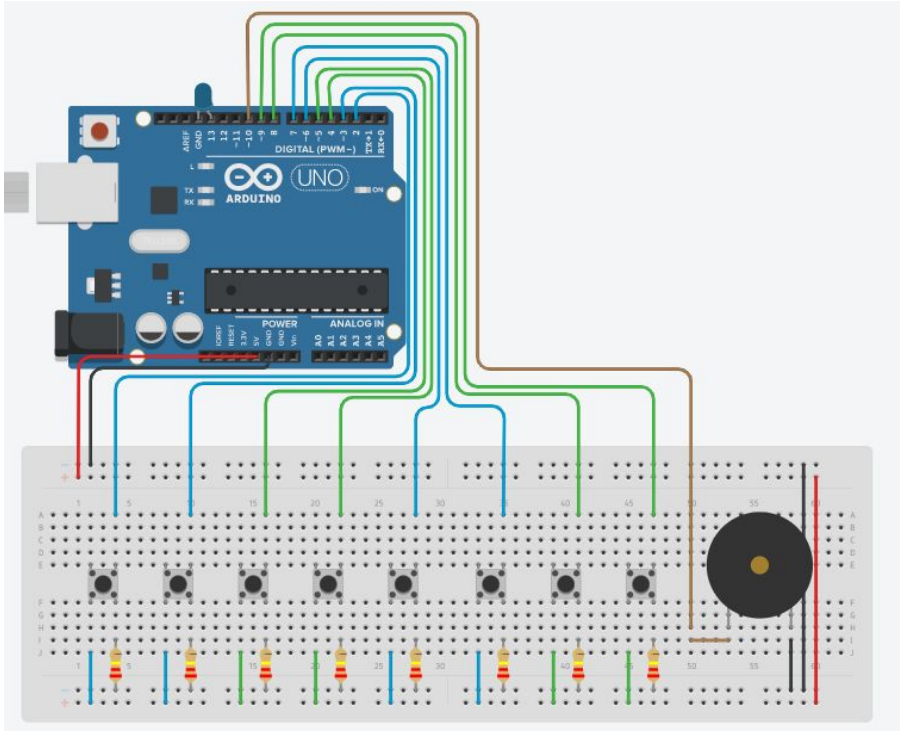
Code Link:

IEEE

Project- Arduino Piano

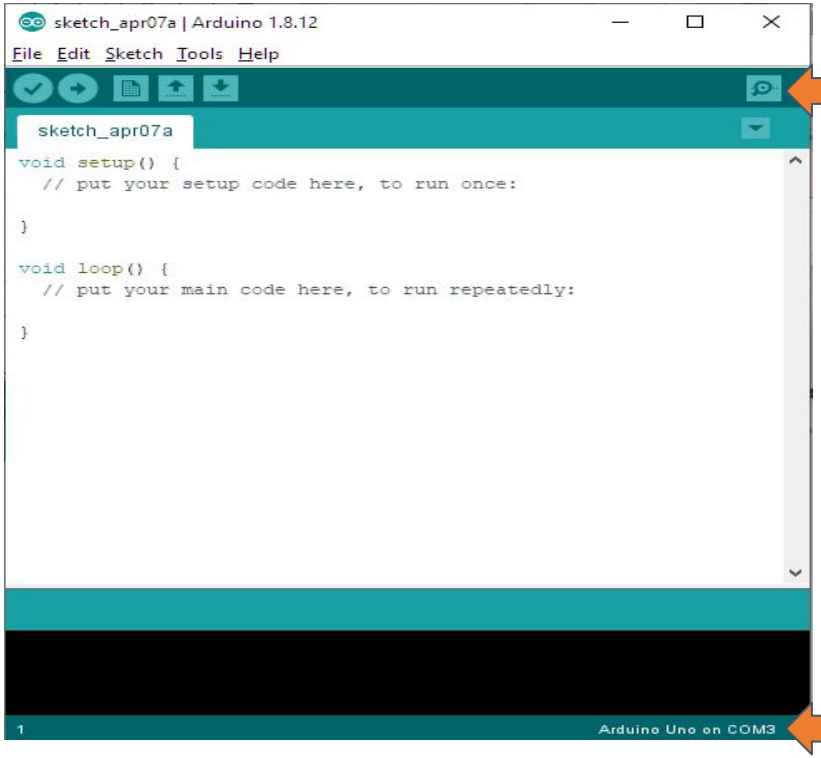
- Sound Reactive Arduino Floor Piano
- Modules used
  - Arduino Uno/nano
- Components
  - Resistors
  - Jumper wires
  - Piezo



Software Setup

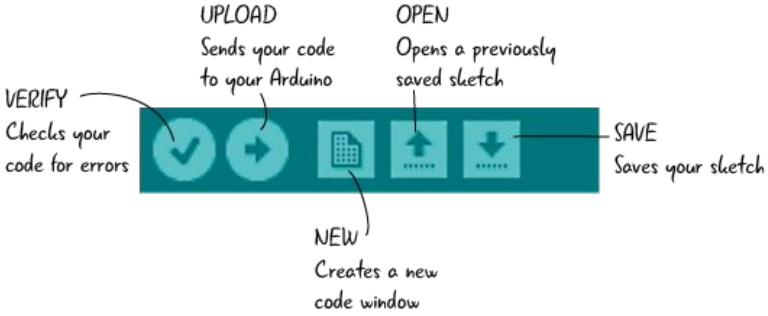
- Google “Arduino IDE”
  - Click on the first link (Software | Arduino)
  - Scroll down and look for “Arduino IDE 1.8.13 “
  - Click on your respective Operating System (i.e. Windows, Apple) to download file.

Software Setup - continued



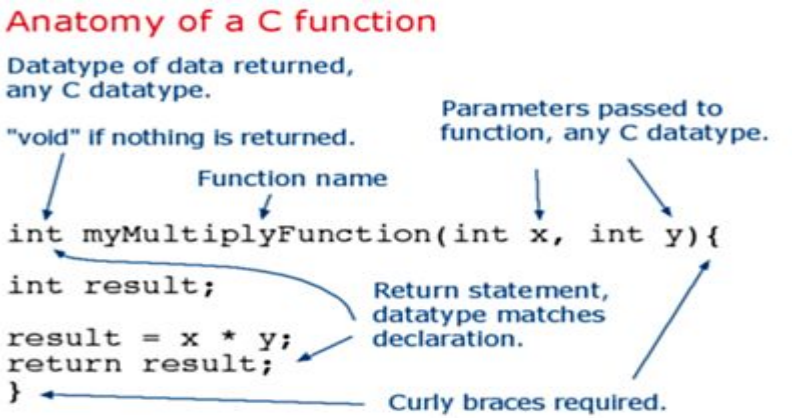
Serial Monitor

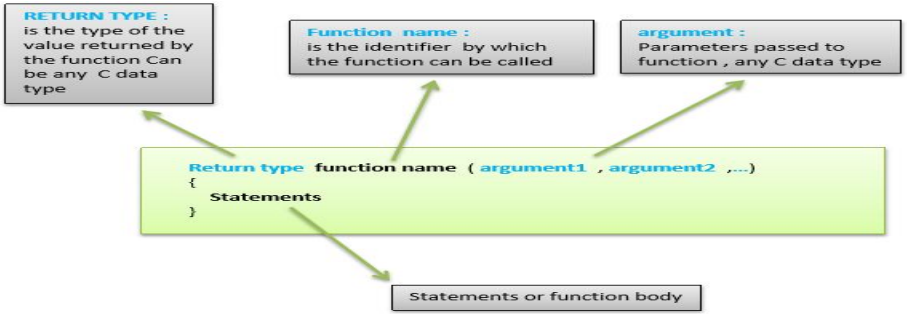
Arduino board



Arduino Programing Language -Functions

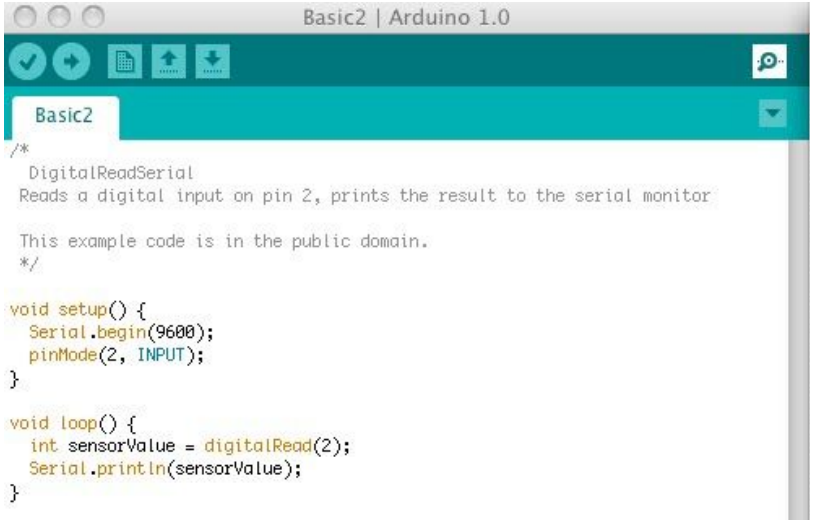
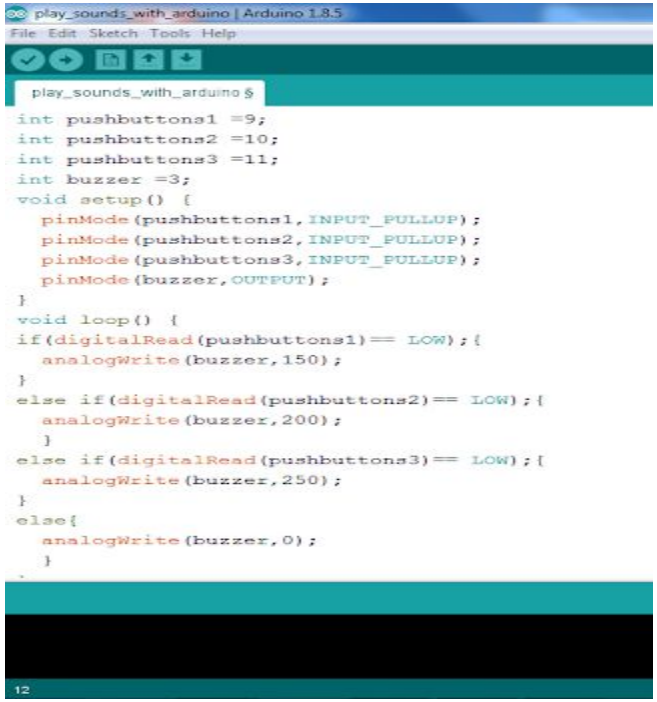
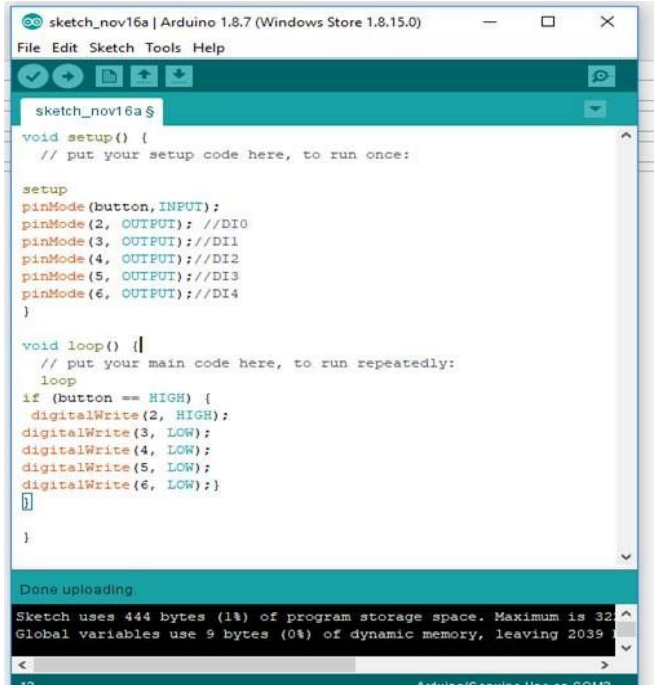
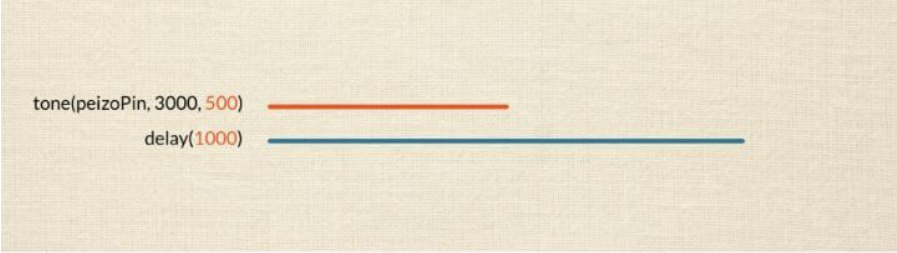
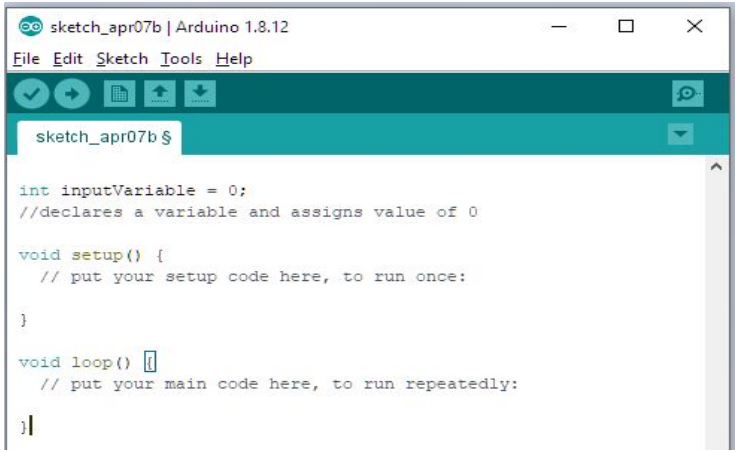
- Functions
  - Controls arduino board and performs multiple computations/tasks
  - Help the programmers stay organized
- Common functions
  - `pinMode()`
  - `digitalRead()`
  - `digitalWrite()`
- Advanced
  - `tone()`





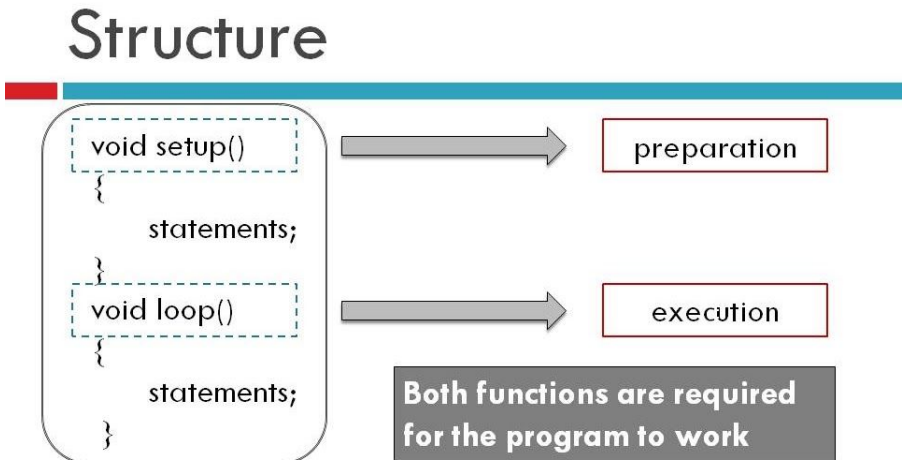
Functions > Digital I/O > pinMode()

- What is “`pinMode()`“
  - Configure the pins to act as an input or an output
  - Inside of the “void setup()”
- Syntax
  - pinMode(pin,mode)
  - Pin
- Parameters
  - pin:arduino pin number
- Example
  - ```
    void setup() {
      pinMode(cNote,INPUT);    //
    sets the digital pin 2 = cNote as
    input
    }
    ```


    ```

Functions > Digital I/O > digitalRead()

- What is “`digitalRead()`”
  - Reads the value from a specified digital pin
    - HIGH or LOW
  - Inside of the loop
- Syntax
  - digitalRead(pin)
- Parameter
  - pin : pin number you want to read
- Example
  -
```
void loop() {
  val = digitalRead(inPin);   // read the input pin
  digitalWrite(ledPin, val);  // sets the LED to the button's value
}
```



Function > digital I/O > digitalWrite()

- What is “`digitalWrite()`”
  - Used to write a HIGH or a LOW value
  - If OUTPUT with pinMode()
    - Voltage will be set to 5V/3.3V for HIGH and 0V for LOW
- Syntax
  - `digitalWrite(pin,value)` //value HIGH/LOW
- Parameter
  -
- Example
  -
```
void loop() {
  val = digitalRead(inPin);   // read the input pin
  digitalWrite(ledPin, val);  // sets the LED to the button's value
}
```



Example 2

Function > Advance I/O > tone()

- What is tone()
  - Generates a square wave of the specified frequency on a pin
- Syntax
  - `tone(pin, frequency, duration)`
- Parameters
  - frequency of the tone in hertz
  - pin: to generate the tone
- Example
  - `tone(Piezo, c, 250);  // plays note c`

    `digitalWrite(LED,HIGH);`




```
16
17  tone(peizoPin, 3000, 500);
18
19  delay(1000);
20
21 }
```

Arduino Programing Language - Variables(values & const)

- Variables (values & constants)
  - Way of naming and storing numerical values
  - A variable needs to be declared Data types and constants

ArithmaticOperator | Arduino 1.8.1

File Edit Sketch Tools Help

ArithmaticOperator

```
int Num1 = 15;
int Num2 = 3;
int Addition = Num1 + Num2;
int Subtraction = Num1 - Num2;
int Multiplication = Num1 * Num2;
int Division = Num1 / Num2;
int Remainder = Num1 % Num2;
```

Variable > Data type > int

- What is “`int`”
  - Integers are primary datatype for storing numbers
  - Whole numbers
- Syntax
  - `Int var = val`
- `Parameters`
  - `Var: variable name`
  - `Val: value assigned to the var`
- Example code
  - `int cNote = 264; //frequency of key notes`
    `//declaring the value of the keynote`



Example 2

Variable > Data types > char

- What is char
  - Used to store character
    - Stored as numbers
  - Written in single quotes
    - ‘A’
- Syntax
  - `Char var = val;`
- Parameter
  - `Var:variable name`
  - `Val:value to assign variable`
- Example
  - ```
    char myChar = 'A';
    char myChar = 65; // both are equivalent
    ```
    ```

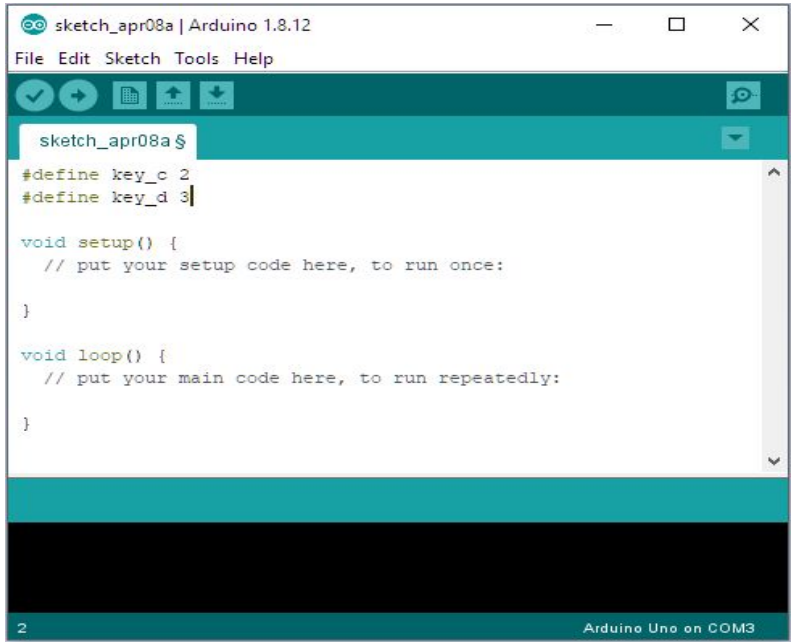
Arduino Programing Language - Structure

- Structure
  - Elements of Arduino(C++) code
  - Allows us to combine data of different types together
  - Helps to construct a complex data type
  - Can store any type of data



Structure > Syntax > #define

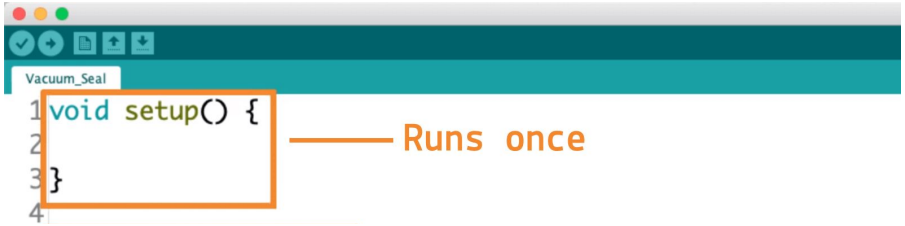
- `#define`
  - Allows the programmer to give a name to a constant value
- Syntax
  - `#define constantName  value`
- Parameter
  - constantName:name of the macro to define
  - Value: value of the macro
- Example
  - `#define cNote 2`
    `// The compiler will replace any mention of cNote with the value 2 at compile time.`



Example

Structure > Sketch > setup()

- What is “`setup()`”
  - Used for initializing
    - Variables
    - pinModes
    - libraries
  - Only run once
- Example
  -
```
void setup() {  //initializing values
  Serial.begin(9600);
  pinMode(buttonPin, INPUT);
}
```



Example 2

Structure > Sketch > loop()

- What is "`loop()`"
  - A programming structure
    - Repeats a sequence of instruction until a specific condition is met
    - Allow your program to change and respond
    - Controls arduino board
- Example code (continued from "setup()")
  -
```
void loop() {
  if (digitalRead(buttonPin) == HIGH)
{
    Serial.write('H');
  }
  else {
    Serial.write('L');
  }
  delay(1000); //milliseconds
}
```

```
5 void loop() {
6
7   //Do first...
8   //Do this next...
9   //Do this too...
10
11 }
```

Runs over and over and over...

Vacuum_Seal §

```
1 void setup() {
2
3   /* Start Serial Communication*/
4   Serial.begin(9600);
5
6 }
7
8 void loop() {
9
10  Serial.println("Ice Ice Baby");
11
12 }
```

```
Ice Ice Baby
Ice Ice Baby
Ice Ice Baby
Ice Ice Baby
Ice Ice Baby
Ice Ice Baby
Ice Ice Baby
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Ice Ice Baby
```

Example 2

Structure > comparison operators > equalto

- What is ==
  - Comparison of one variable or constant against another (left and right)
- Syntax
  - `if x == y; // is true if x is equal to y and it is false if x is not equal to y`
- Parameter
  - `X:variable(int,float,double,byte,short,long)`
  - `y:variable or constant`
- Example
  -
```
if (x == y) { // tests if x is equal to y
  // do something only if the comparison
result is true
}
```

```
int a=1;

int b=1,count=0;

if(a==b) //true

count++; //count increases
```