RoboISM

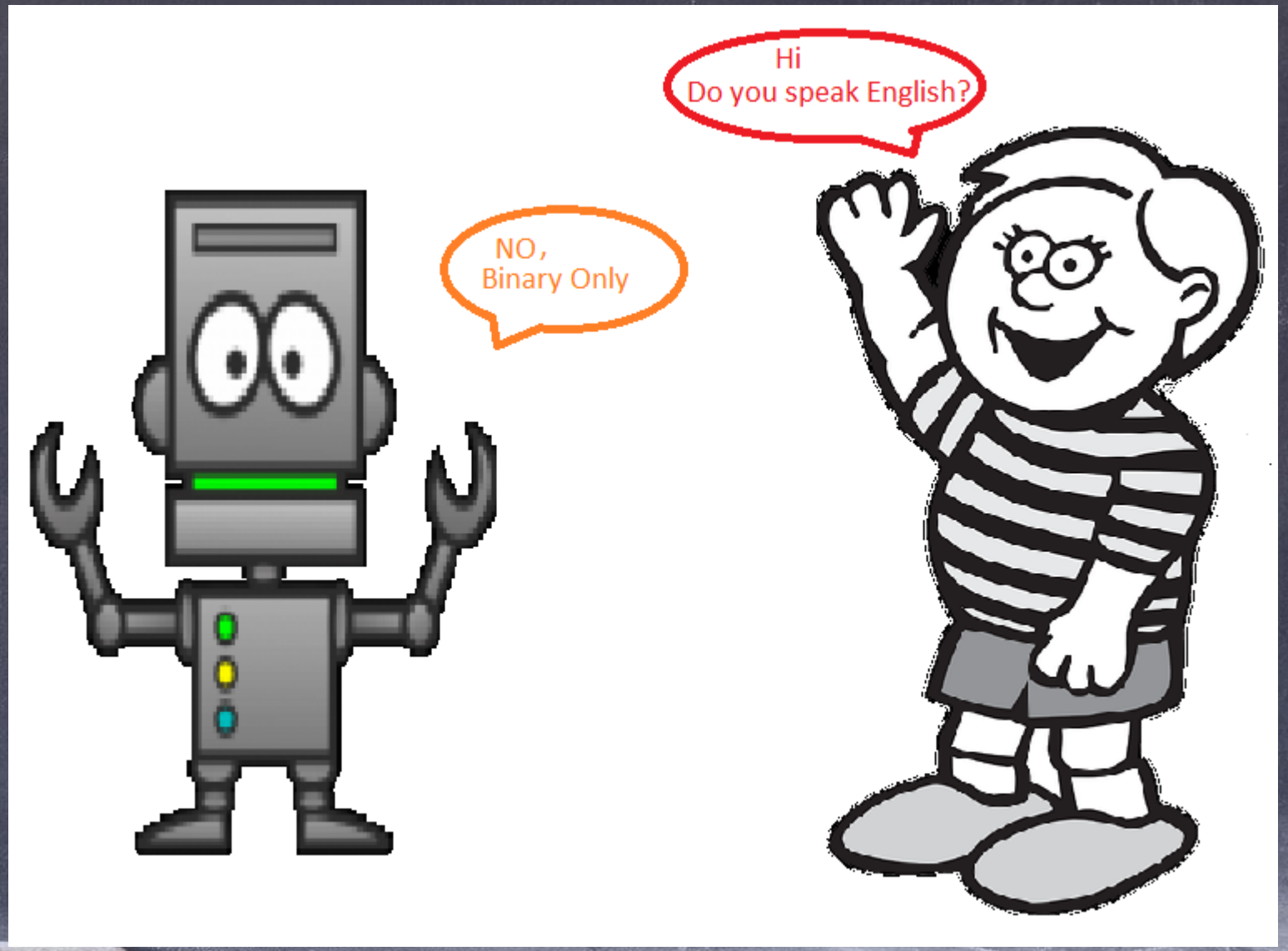
Presents

Workshop on

ARDUINO PROGRAMMING

Follow Us @
fb.com/roboism

The problem with robots...



High Level Languages

C,
Java,
Python,
PHP etc.

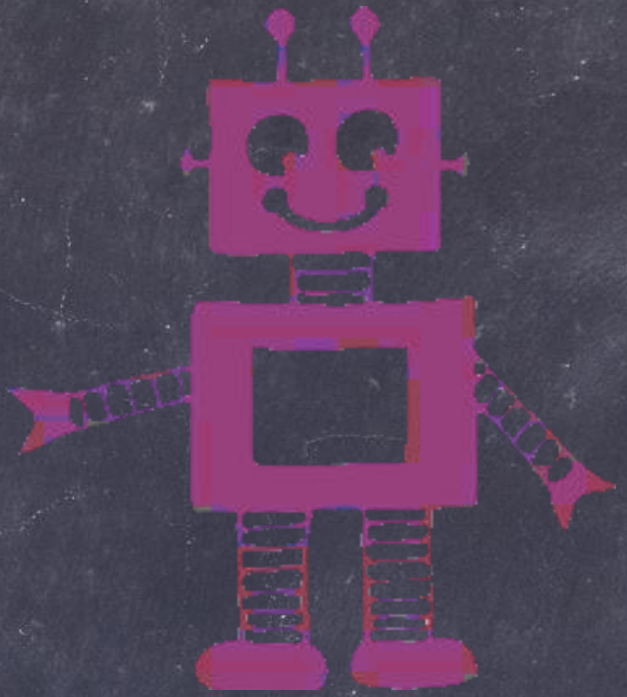
Machine Code,
Assembly Language

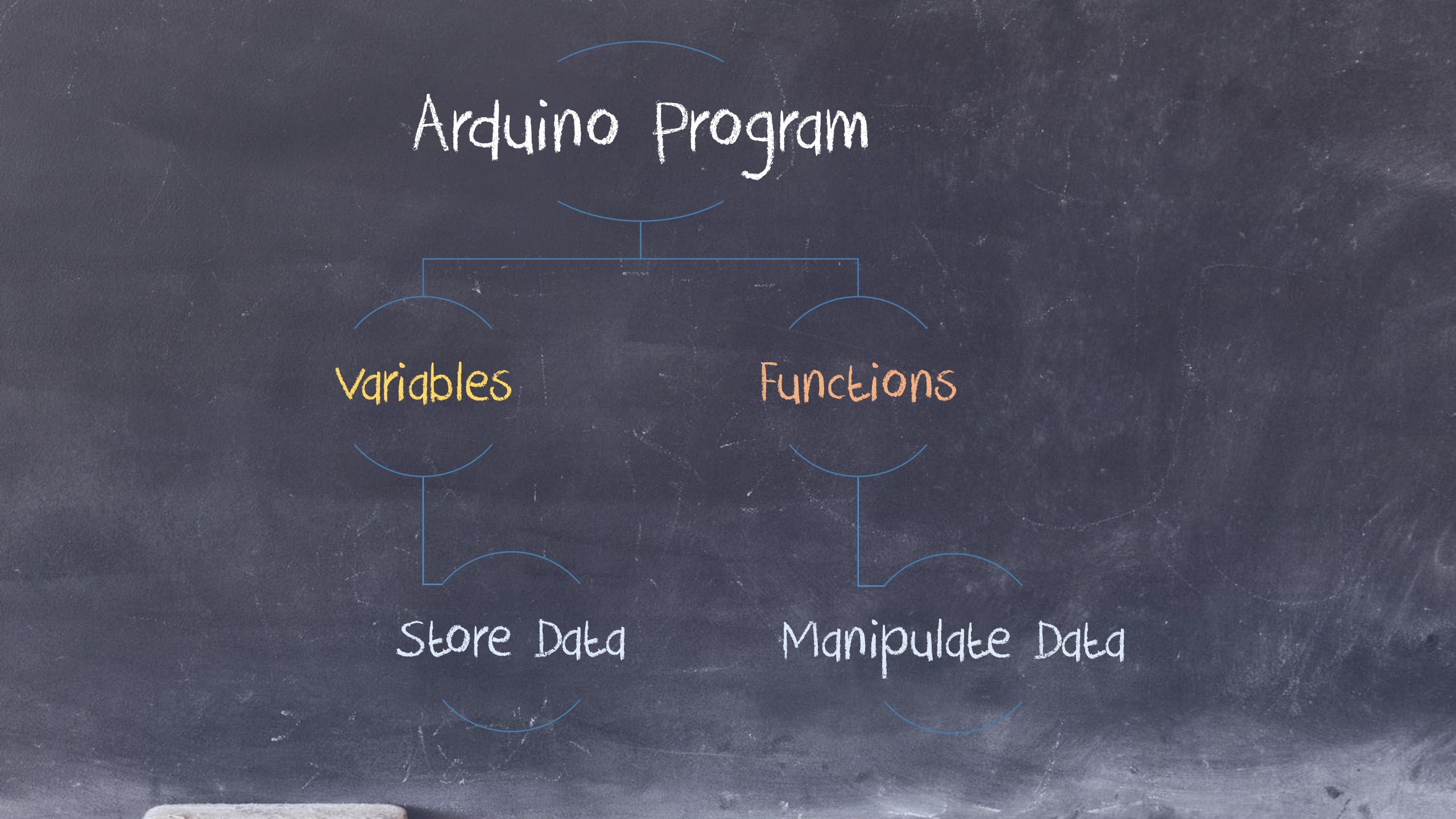
Low Level Languages

Instructions in High Level Language

COMPILER Or INTERPRETER

Instructions in Binary Code




Arduino Program
Variables
Functions
Store Data
Manipulate Data

VARIABLES

Type

- byte
- int
- float
- arrays

Name

- case-sensitive
- contains letters, digits and underscore _
- can't begin with a digit

Value

VARIABLES (CONT.)

Declaration::

[VARIABLE TYPE]<SPACE>[VARIABLE NAME]<SEMI-COLON>

for e.g.,

```
int a ;
float b ;
byte c , d ;
```

Initialization::

[VARIABLE NAME] <EQUALS> [VALUE] <SEMI-COLON>

for e.g.,

```
a = 29 ;
b = 3.14 ;
```

```
int a = 10;
int b = 4, c = 3;
boolean d = true;
boolean e=false;
```

OPERATORS

+	Addition	a + b	14
-	Subtraction	a – b	6
*	Multiplication	a * b	40
/	Division	a / b	2
%	Modulus	a % b	2
^	Exponent	b ^ c	64
( )	Parenthesis	a - (b + c)	3
=	Assignment	a = b - c	a = 1

```
int a = 10;
int b = 4, c = 3;
boolean d = true;
boolean e=false;
```

OPERATORS (CONT.)

++	increment	a ++	11
--	decrement	a --	9
==	is equal to	a == b	FALSE
>	greater than	a > b	TRUE
<	less than	a < b	FALSE
!=	not equal to	a != b	TRUE
!	not	! d	FALSE
&&	Logical AND	d && e	FALSE
||	Logical OR	d || e	TRUE

FUNCTION

a bunch of statements

Library Functions

- Pre-defined in special files called header files
- Ready to use

User defined functions

- need to be defined before use

General function call syntax::

```
function_name(PARAMETERS);
```

for e.g.

```
pinMode( 13, OUTPUT) ;
```

Some Common Library Functions

- pinMode(PIN_NUMBER, MODE)
- digitalWrite(OUTPUT_PIN_NUMBER, VALUE)
- digitalRead(INPUT_PIN_NUMBER)
- delay(MILLISECONDS)
- analogWrite(PWM_OUTPUT_PIN, VALUE)
- analogRead(PWM_INPUT_PIN)
- millis()
- random(MIN, MAX)
- Serial.begin(BAUD_RATE)
- Serial.println(STRING)
- Serial.print(STRING)

Defining your own function

```
Return_type function_name (PARAMETERS) {
        YOUR CODE
        RETURN STATEMENT
}
```

Example:

```
byte plus_pin =13,   minus_pin=12;
void forward(){
        digitalWrite(plus_pin, HIGH);
        digitalWrite(minus_pin, LOW);
        return;
}
```

Another Example:

```
boolean smaller (int a, int b) {
        boolean result= a < b;
        return result;
}
```

Flow Control :: If-Else

```
if(CONDITION) {
        STATEMENTS
}
else {
        STATEMENTS
}
```

for e.g.,

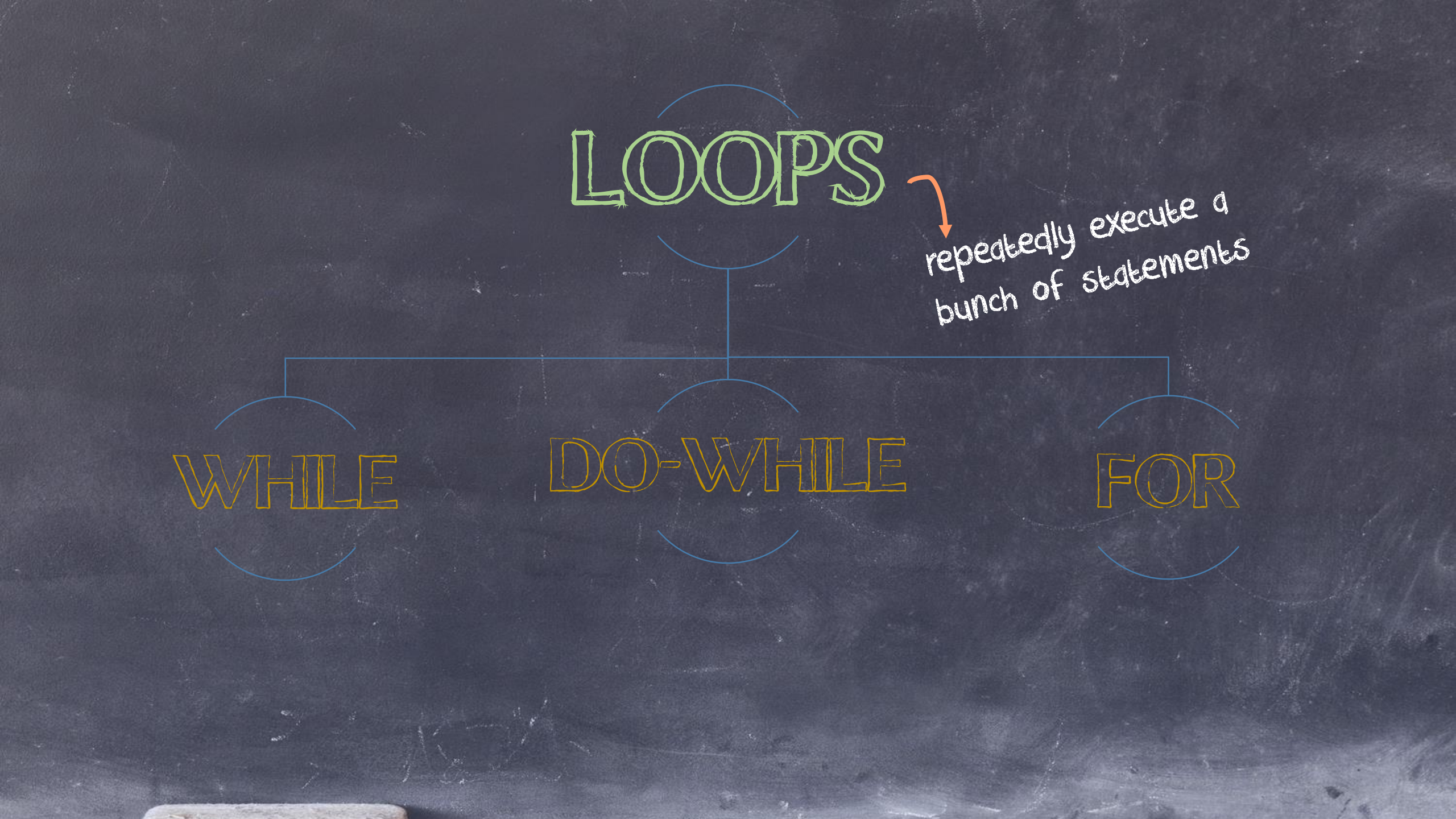
```
        if( digitalRead(3) == HIGH ) {
                digitalWrite(13, HIGH);
        }
        else {
                digitalWrite(13, LOW);
        }
```

Nested If-Else

```
if( digitalRead(3) == HIGH ) {
        if( digitalRead(4) == LOW) {
                digitalWrite(13, HIGH);
        }
        else {
                digitalWrite(13, LOW);
        }
}
else {
        if( digitalRead(4) == LOW) {
                digitalWrite(13, LOW);
        }
        else {
                digitalWrite(13, HIGH);
        }
}
```

If...
Else-If
...Else

```
if( analogRead(3) < 256 )
        analogWrite(11, 63);
else if( analogRead(3) < 512)
        analogWrite(11, 127);
else if(analogRead(3) < 768)
        analogWrite(11, 191);
else
        analogWrite(11, 255);
```


LOOPS
repeatedly execute a bunch of statements
WHILE
DO-WHILE
FOR

WHILE Loop

Syntax ::

```
while( CONDITION ) {
        STATEMENTS
}
```

Example:

```
while( digitalRead(3) == HIGH )
        digitalWrite( 13, HIGH);
```

Another example:

```
int i = 0;
while( i < 255){
        analogWrite( 11, i);
        i++;
}
```

DO-WHILE Loop

Syntax ::

```
do {
        STATEMENTS
}
while( CONDITION );
```

Example:

```
int i = 0;
do{
        i +=5;
        Serial.println(i);
}
while( i < 20 );
```

FOR Loop

Example:

```
for(int i=0; i < 20; i += 20)
        Serial.println( i ) ;
```

Another example ::

```
for(int i =255; i >= 0; i--)
        analogWrite( 11, i ) ;
```

Syntax ::

```
for(INITIALISATION, CONDITION, EXPRESSION) {
        STATEMENTS
}
```

THE MIGHTY COMMENTS

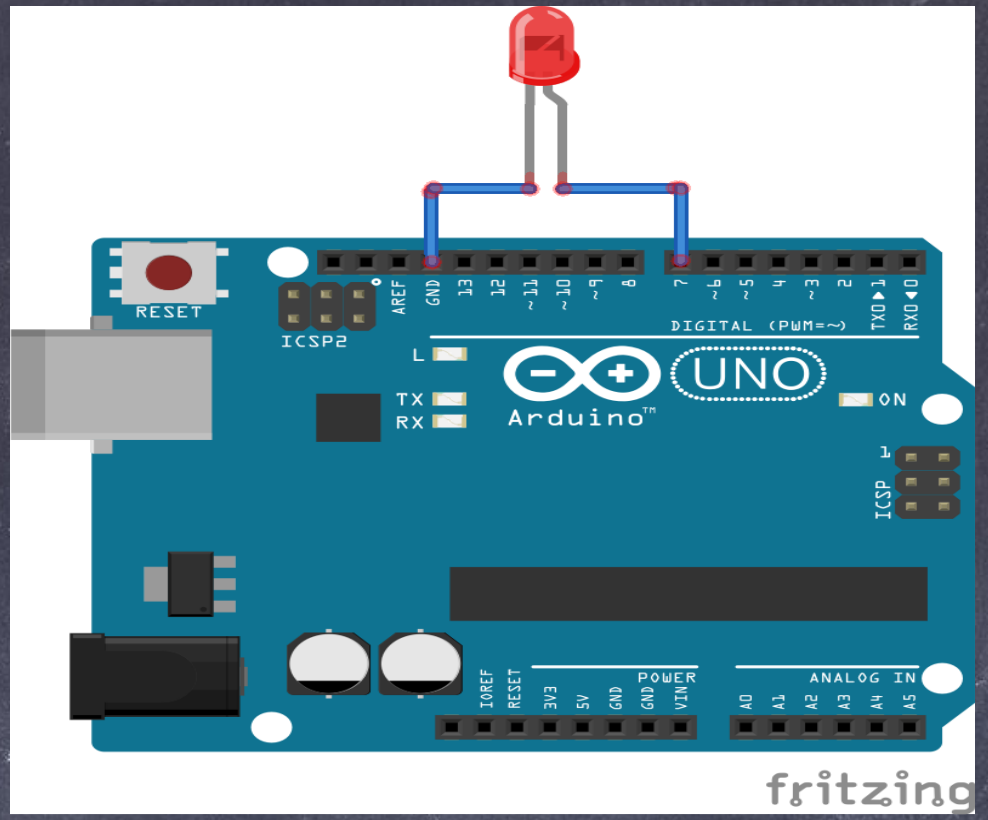
```
$NOT executed
$Contents can be anything
$Single-line comment ::
      //HERE GOES YOUR COMMENT...
$Multi-line comment ::
      /* This is also a comment,
         but runs in more than
         one line */
$VERY Useful
```

General Structure of an Arduino Program

```
VARIABLE_DECLARATIONS
void setup(){
        PIN_SETUP
        INITIALISATION_CODE
}
void loop() {
        SOME_MORE_CODE
}
CODE_WHICH_YOU_DONT_WANT_TO_RUN :P
```

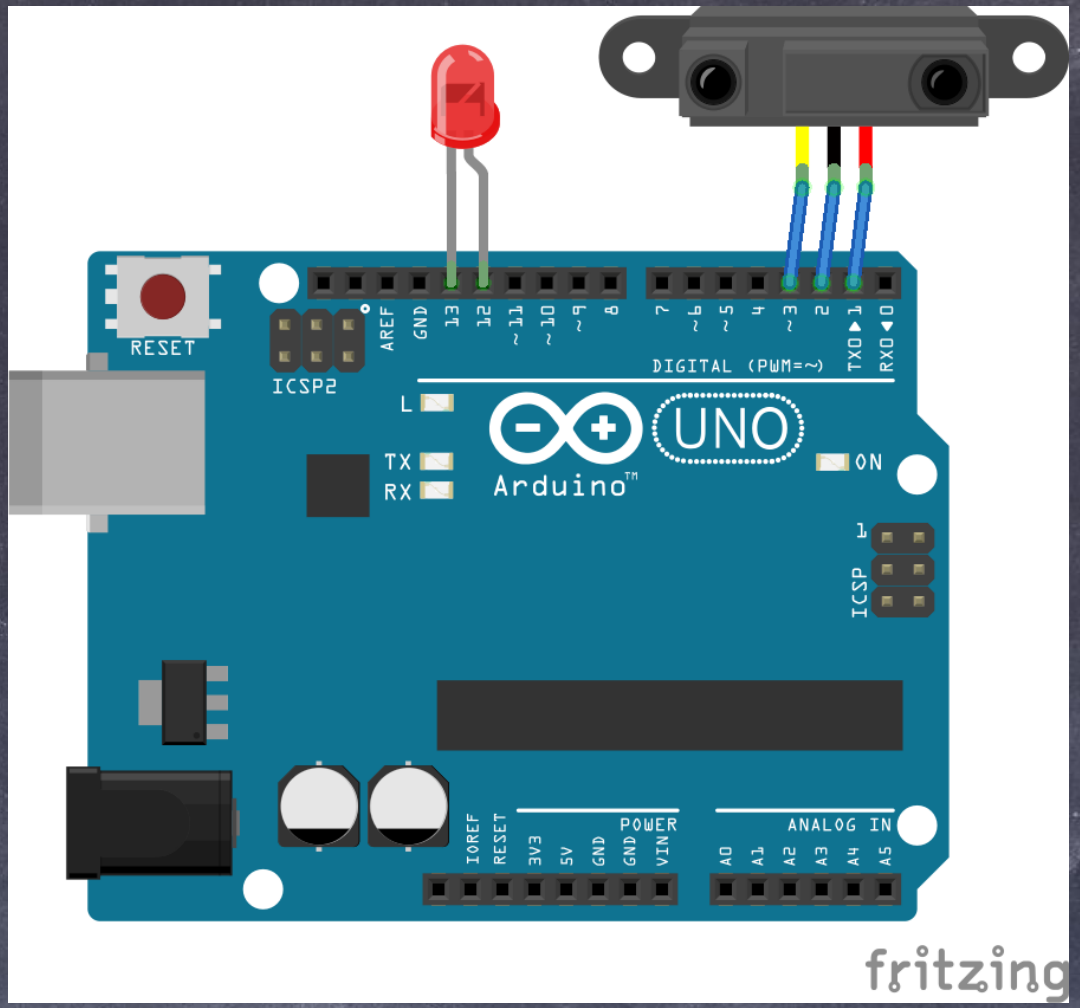
TEST - 1

```
//Code to blink an LED at
// intervals of half second
void setup() {
        pinMode(<A>, <B>);
}
void loop(){
        delay(<C>);
        digitalWrite(<D>, <E>);
        delay( <F>);
        digitalWrite(<D>, <G>);
}
```



Using an IR Sensor

```
boolean a;
void setup(){
        pinMode(1, OUTPUT);      //+ve pin of IR Sensor
        pinMode(2, OUTPUT);      //-ve pin of IR Sensor
        pinMode(3, INPUT);       //Data pin of Sensor
        pinMode(12, OUTPUT);     //+ve pin of LED
        pinMode(13,OUTPUT);      //-ve pin of LED
        digitalWrite(1, HIGH);
        digitalWrite(2, LOW);
        digitalWrite(13, LOW);
}
void loop(){
        a = digitalRead(3);
        if( a == HIGH)
                digitalWrite(12, HIGH);
}
```



Using Ultrasound sensor
Using L293D motor driver shield
Using servo motor

TEST - 2

* Size of a float variable ?
* Invalid variable names are: motor1 , IR, my servo, _LED1, 1stSwitch, pot4left ?
* return statement is not mandatory in which function type?
* Error in following code:

```
If( 10 != 9) Serial. print("Mathematics, dude!");
```

* Pin mode of data pin of a servo is?
* 8/9-(4+1) = ?

THANK YOU

Follow Us @
fb.com/roboism