Programming

Fundamentals

Jackie

HOW COMPUTER UNDERSTAND US?

Hey Computer,
display “Hello World”

Arduino language:
Serial.println(“Hello World”);

Arduino IDE:
Compiler / Translator

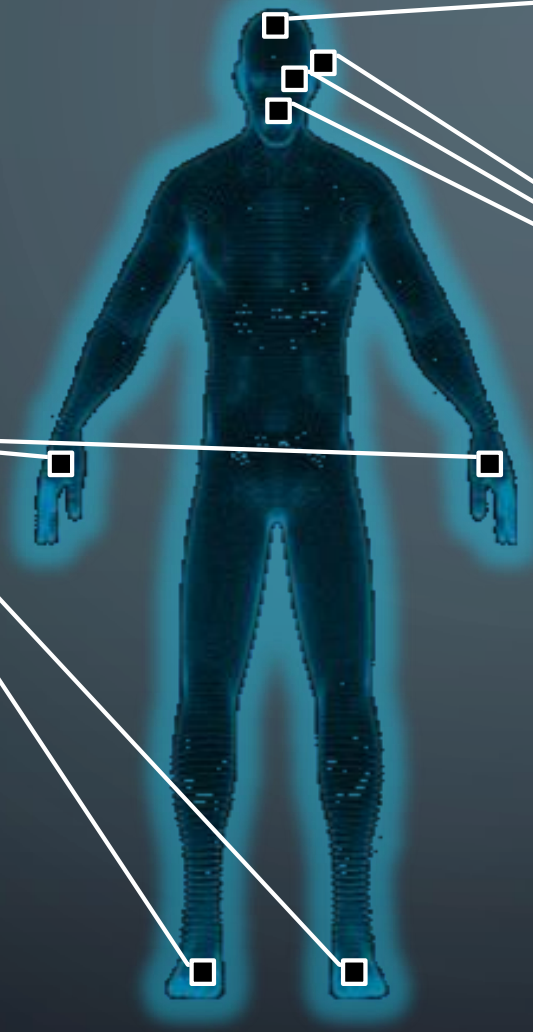
1001 1100
0011 1010
… …

Hello World

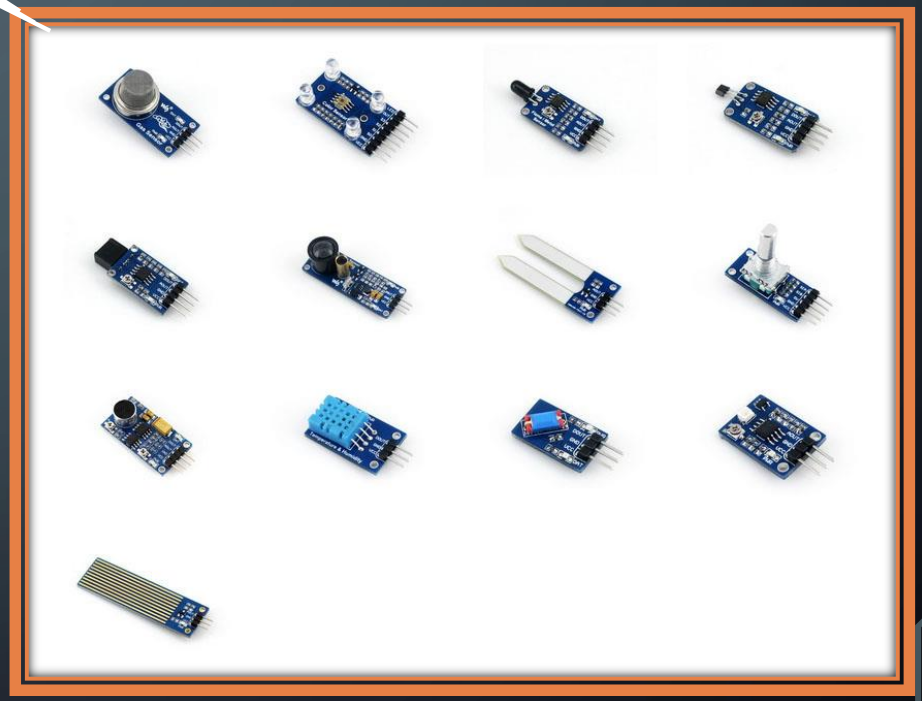
EMBEDDED SYSTEM

Microcontroller
(Brain)

Actuators / Motors
(Limbs)



Sensors
(Sensory Organs)



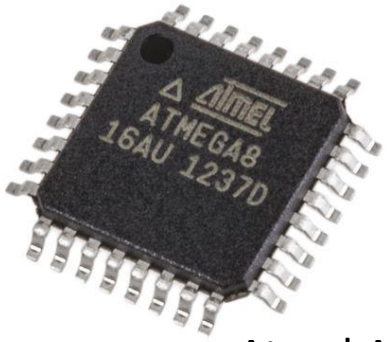
- A computer system
- Firmware (Software) is written to control hardware through input & output

Microcontroller

Read-Only Memory (ROM) – Permanent memory
- Normally used to store program

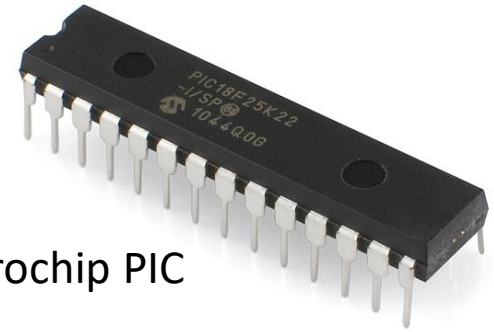
Random Access Memory (RAM) – Temporary memory
- Normally used to store data

Intel



Atmel AVR

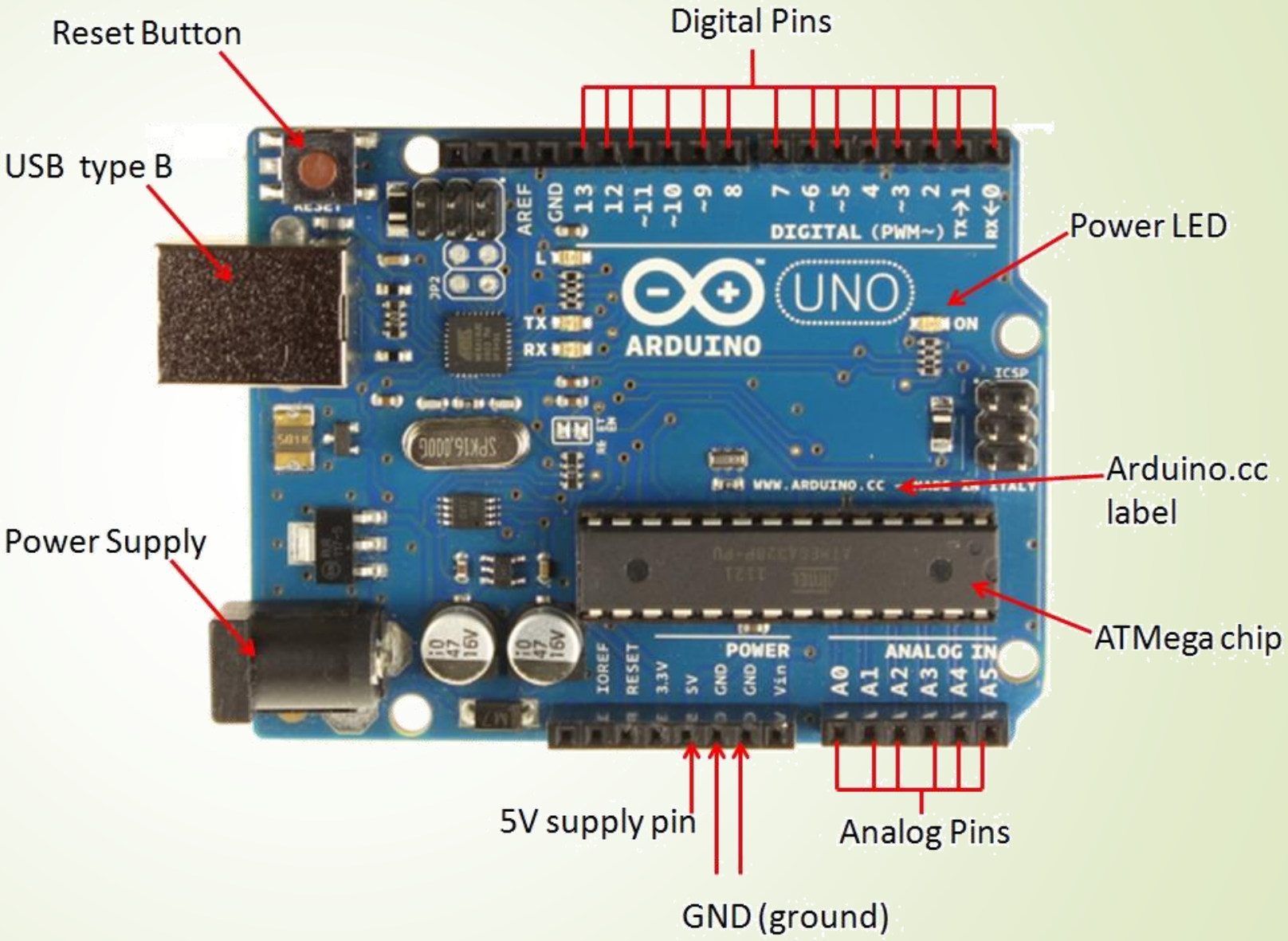
Motorola



Microchip PIC

Arduino

- User-friendly



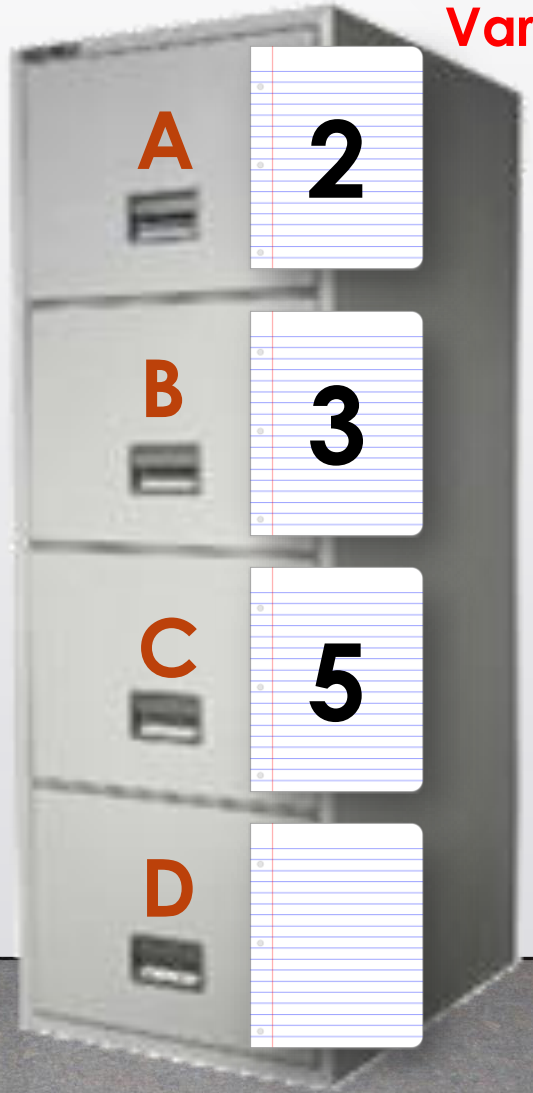
How Computer Carries Out Its Work?

Memory
(Drawer)

Computer
(Employee)

Variable Name
(Label)

Programmer
(Boss)



Data
(Document)

DATA TYPE

Types	In Code	Store	Declaration

Integer	int	(+/-) 0 -> 9
		(no decimal values)
			int a = 10;
			int b = 20;
			int c = -30;

Floating Point	float	(+/-) 0 ~ 9
		(decimal values)
			float f1 = 0.123;
			float f2 = -1.2;
			float f3 = 4.9998;

String	string	a -> z -> !@#$% (allow storing more than 1 character)	string name = “Ash”; string room = “A1” ; string age = “19”;
Character	char	a -> z -> !@#$% (allow storing 1 character only)	Char group1 = ‘A’; Char group2 = ‘b’; (notice string use “ ”, where char use ‘ ’)

Boolean	boolean	1 or 0
		true or false
			boolean isFound = true;
			boolean light = false;
			boolean release = 0;

VARIABLE NAMING CONVENTIONS

1	Be meaningful	working_hour **abc**
2	Start with letter (A, a, B, b, …) or underscore (_)	employee_name _receive
3	Do not start with number	**2ndPlayer**
4	Do not use reserved words	**switch** **return**
5	Aware of case sensitive	**Number ≠ number**

DECISION MAKING (IF-ELSE)

```
if (statement)
{
    //do this when statement is true
}
else
{
    //do this when statement is false
}
```

EXAMPLE

```
if (height > 180)
{
    println("You are tall");
}
else
{
    println("You are short");
}
```

DECISION MAKING (SWITCH-CASE)

```
switch (argument)
{
    case condition1:
        //do when argument == condition1; break;
    case condition2:
        //do when argument == condition2; break;
    default:
        //otherwise, do this; break;
}
```

EXAMPLE

```
switch (grade)
{
    case ‘A’:
        println(“Good!”); break;
    case ‘B’:
        println(“OK lah~”); break;
    default:
        println(“Got pass then OK lah…”); break;
}
```

LOOP (WHILE & DO-WHILE)

```
while (statement)
{
    //do something
}
```

Pre-Conditional Loop
Check then do

```
do
{
    //do something
} while (condition);
```

Post Conditional Loop
Do then check

LOOP (FOR)

```
for (initialization; statement; increment)
{
    //do something
}
```

Pre-Conditional Loop
Check then do

Usually for things that you know **how many times** will you **repeat**.

EXAMPLE

```
while (not_enough_to_pass)
{
    study( );
}

do
{
    study( );
} while (not_understand);
```

“Pass enough liao lah~”

PRO!!!

EXAMPLE

```
for (time = 0; time < 3; time ++)
{
    study( );
}
```

“Aiya~ I studied 3 times already. Enough de la~”

Exercise

- Bluetooth – receive **character** from Android app

- ‘F’ – forward
- ‘B’ – backward
- ‘L’ – left
- ‘R’ – right
- ‘Z’ – stop

- **Serial.begin(9600)**
- **Serial.available() > 0**
- **Serial.read()**