

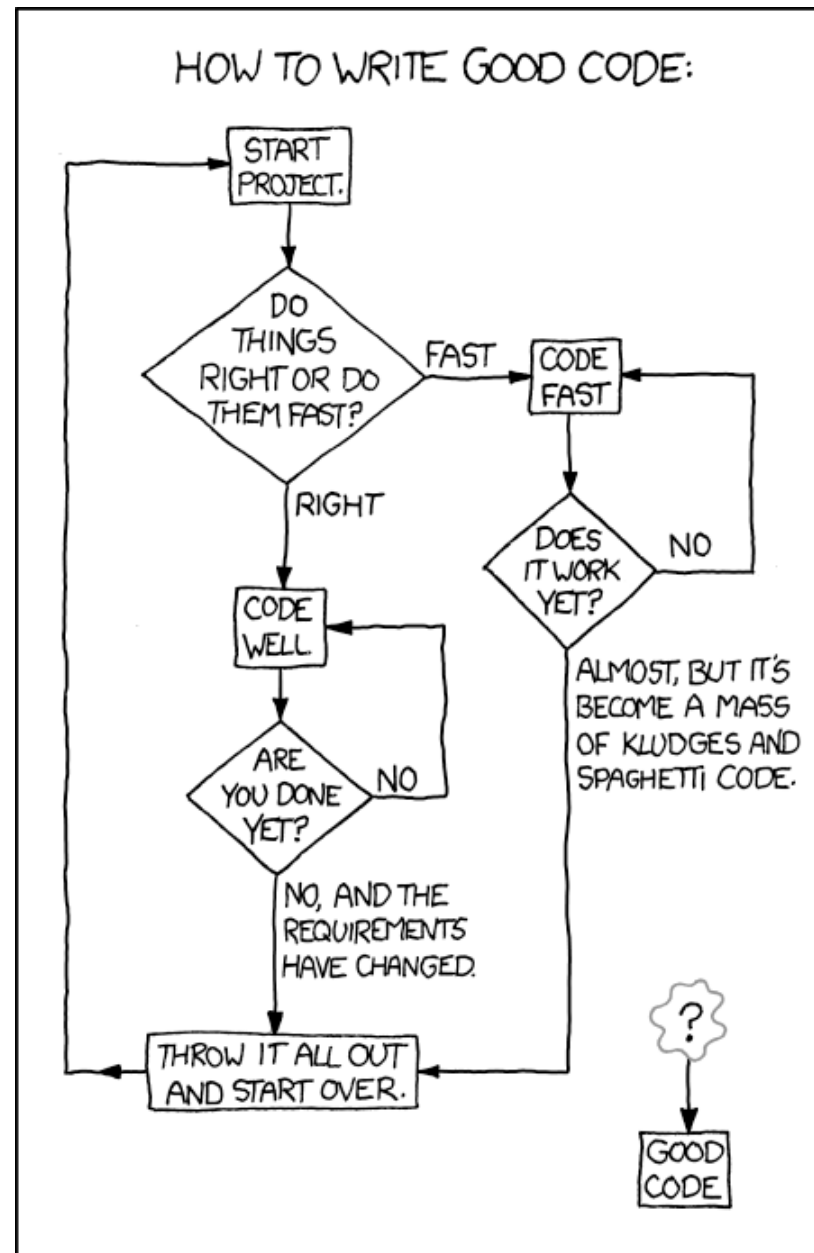
Programming and Flow Diagrams

Course Code: GEEN1064

Course Name: Engineering, Design and Implementation

Credits: 20

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What is programming?

- ▶ ?
- ▶ Why program?

Types of Programming Languages

- High Level / low level – C#, Java, Python, Ruby, C, C++, assembly
- Declarative / imperative/procedural – SQL, Curl, Prolog
- General-purpose/domain specific – HTML, Markdown/up, MATLAB
- Object-orientated/concurrent – C#, Java, Python,
- Command/compiled/script language – batch, bash, Javascript
- Answer set - Prolog

Human Language and Programming Languages

- ▶ Are all programming languages in English?
- ▶ Does it matter when these are compiled down to machine code?

Some Examples of Non-English Programming Languages

Linotte

It has been a developer for using French keywords, and its “Hello world” program looks like this:

```
BonjourLeMonde:  
  début  
    affiche "Bonjour le monde!"
```

Has a web engine for HTML and PHP and JSP.

SAKO

System Automatycznego Kodowania Operacji (Automatic Operation Encoding System) programming language, which uses polish as for its keywords:

```
K) PROGRAM DRUKUJE NAPIS HELLO WORLD
```

```
    LINIA
```

```
    TEKST:
```

```
    HELLO WORLD
```

```
    KONIEC
```

Really only used in the late 1950s and early 1960s for the XYZ computers.

Rapira

Rapira is another awesome example of non-english programming languages. It uses Russian keywords:

```
ПРОЦ СТАРТ()  
    ВЫВОД: 'Привет, мир!'  
КОН ПРОЦ
```

Translated:

```
proc start()  
    output: 'Hello, world!!!';  
end proc
```


EPL

Chinese engineers developed 易语言 (Easy Programming Language, as known as EPL):

```
公开 类 启动类
{
    公开 静态 启动()
    {
        控制台.输出("你好, 世界!");
    }
}

public class startup class
{
    public static start()
    {
        console.output("Hello, World!");
    }
}
```

Learning to Program

You do not need to know how to program in all languages, you only need to know how to program.

- Conditions
 - if, else if , else
 - switch
- Loops
 - for
 - while
 - do

Pseudo Code

So before programming actual code you should write in pseudocode;

```
BEGIN
  NUMBER a
  NUMBER b

  IF b > a THEN
    OUTPUT "b is greater than a"
  ELSE
    OUTPUT "b is not greater than a"
  ENDIF

END
```

Conditional Checks

C

```
a = 200;  
b = 33;  
if (b > a)  
{  
    print("b is greater than a");  
}  
else  
{  
    print("b is not greater than a");  
}
```

Python

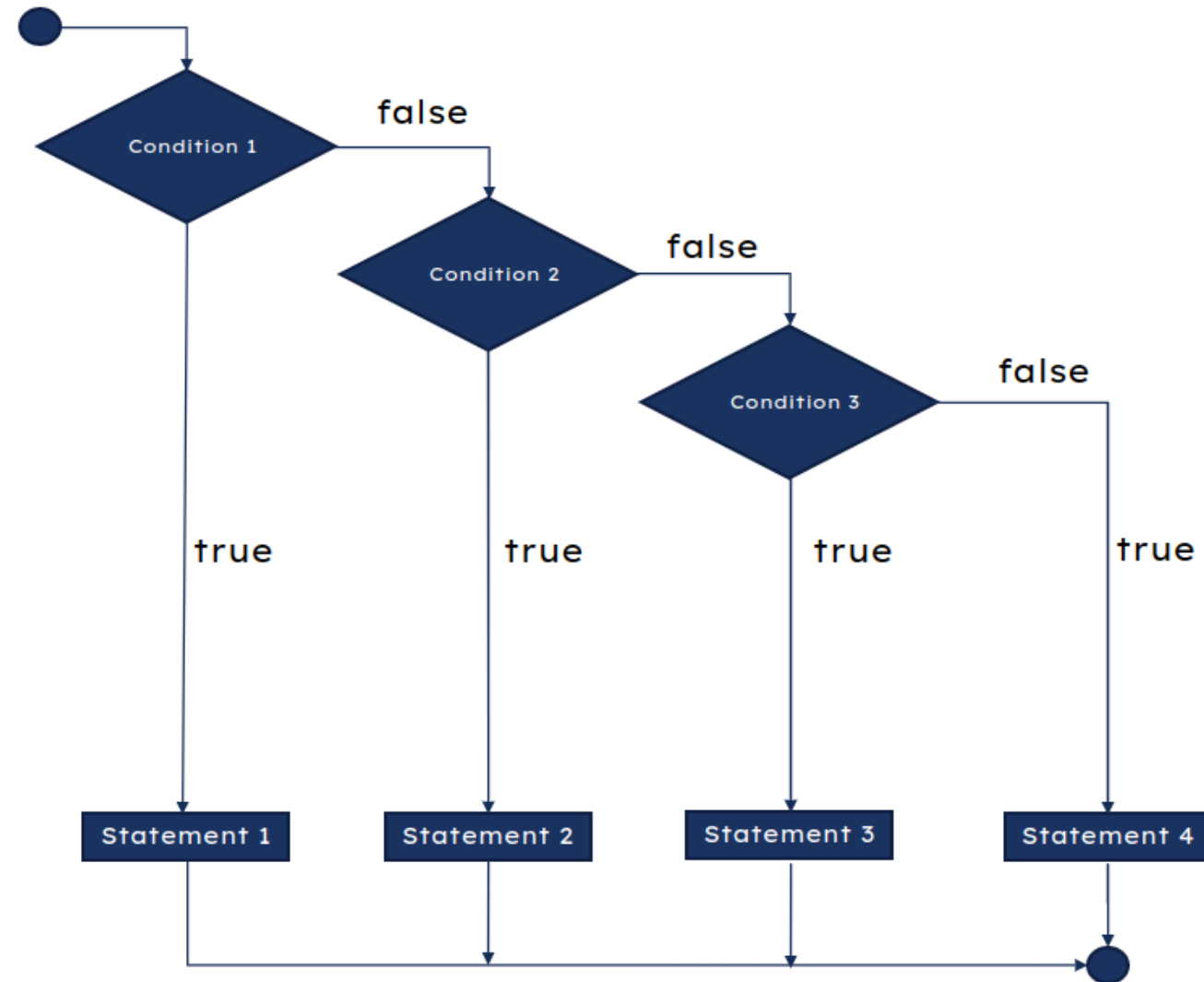
```
a = 200  
b = 33  
if b > a:  
    print("b is greater than a")  
else:  
    print("b is not greater than a")
```

Matlab

```
a = 200  
b = 33  
if (b > a)  
    print("b is greater than a")  
else  
    print("b is not greater than a")  
end
```

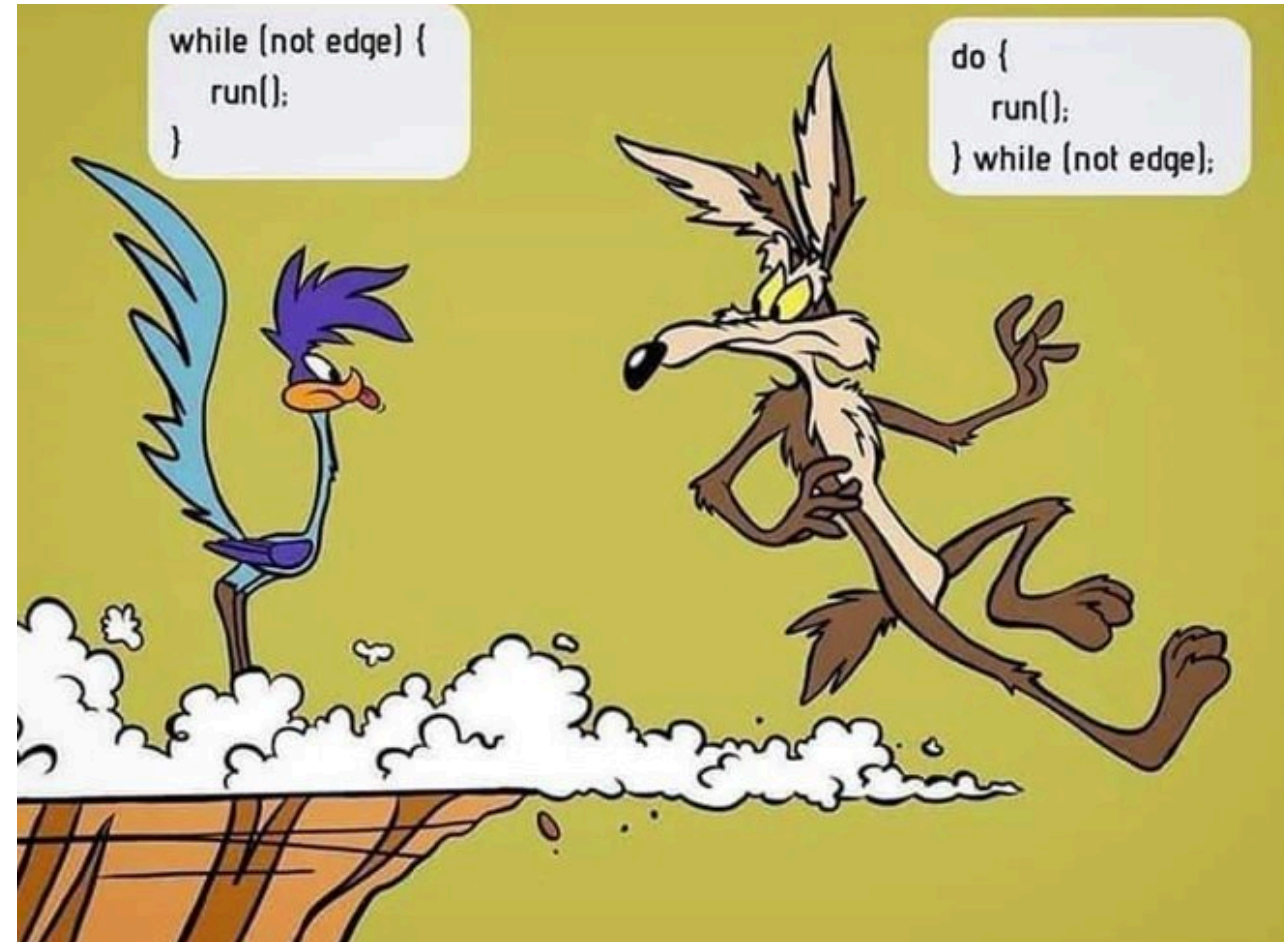
If Flow Diagram

```
if(condition1)
{
    //code for if condition1 is true
}
else if(condition2)
{
    //code for if condition2 is true
}
else if(condition3)
{
    //code for if condition3 is true
}
...
else
{
    //code for all the false conditions
}
```



While Do & Do While Loops

While loops run forever until a condition is met, like our iconic duo on the left are demonstrating.



An Example Looping

Infinite Loop

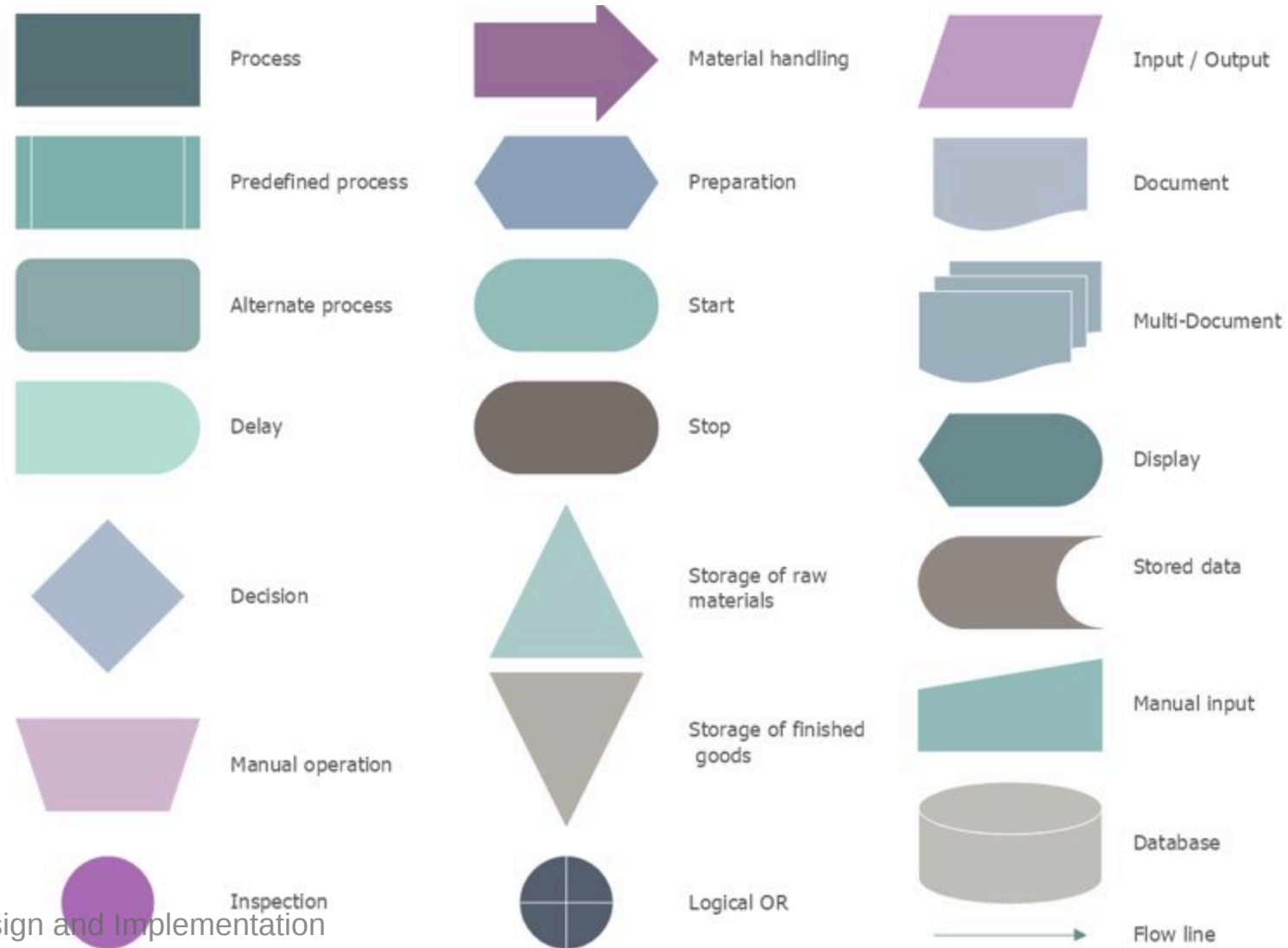
```
while (0 < 1)
{
    print("Hello World!");
}
```

Finite Loop

```
int i = 0;

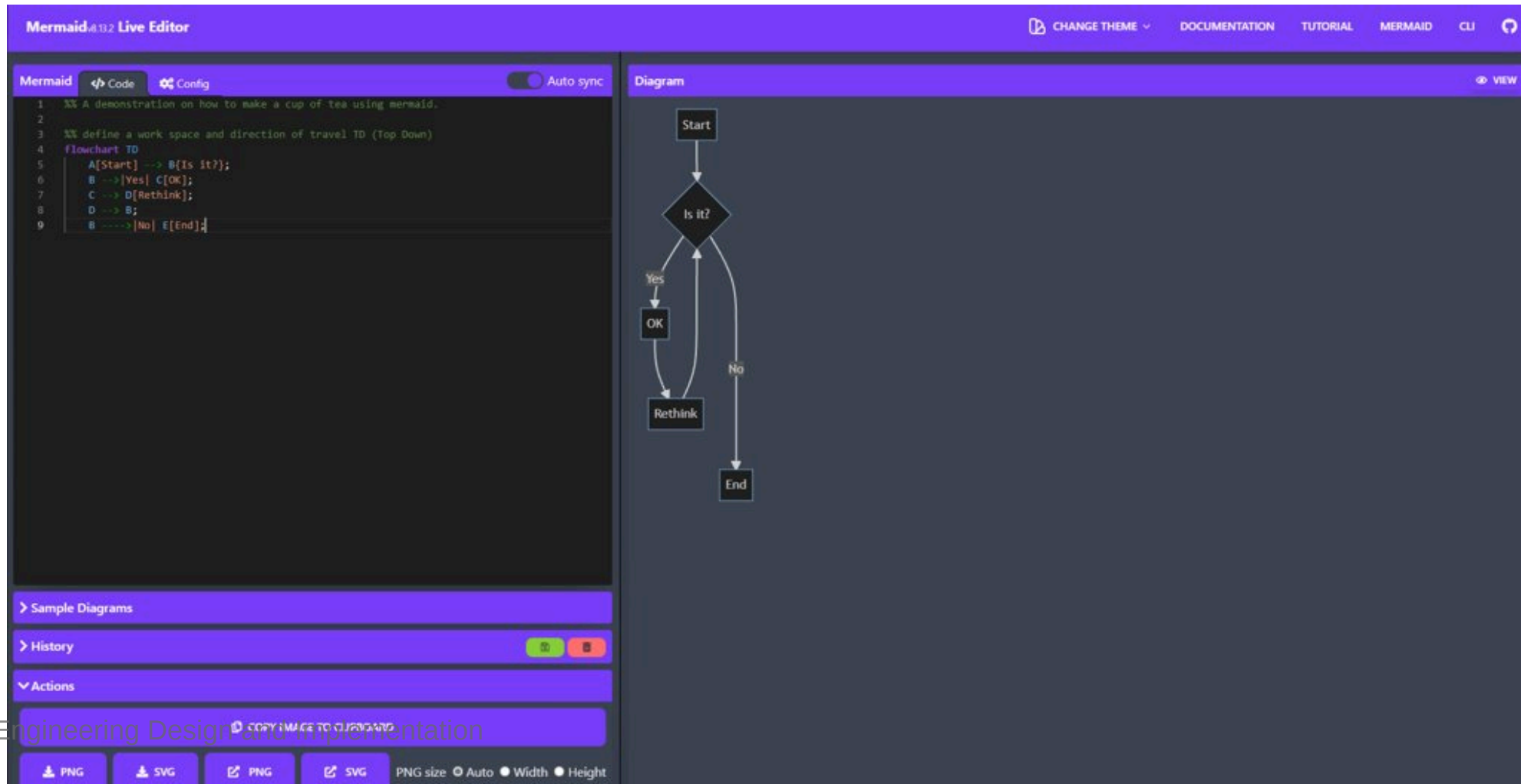
while (i < 10)
{
    print("Hello World!");
    i = i + 1;
}
```

Flow Diagrams Symbols



Mermaid Editor

<https://mermaid-js.github.io/mermaid-live-editor/edit/>



Mermaid Exercise

<https://mermaid-js.github.io/mermaid-live-editor/edit/ w:800>

So now that we have seen mermaid, write out the flow for a robot to make a hot beverage such as tea.

Remember

Computers are not good or bad at a job, it is how well the human programs it.

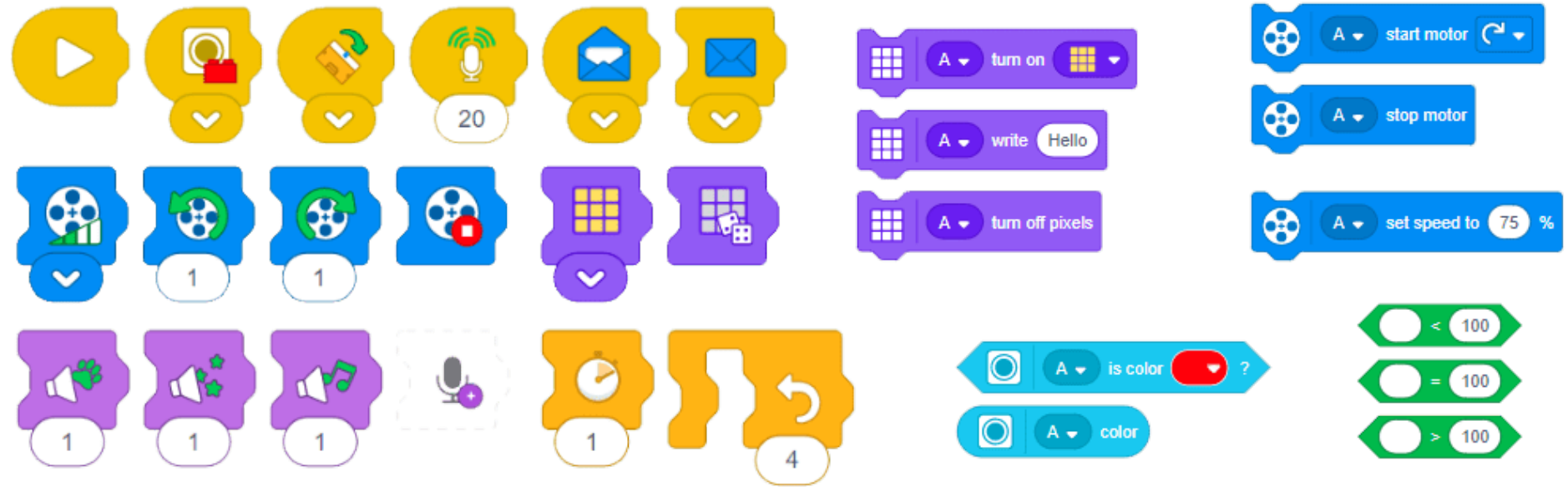
Blocky

<https://blockly.games/?lang=en>



Ev3 Spike

- Icon
- Block
- Python

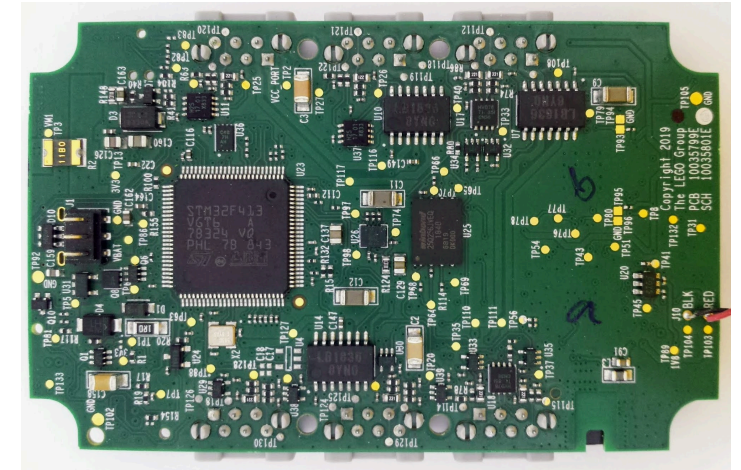
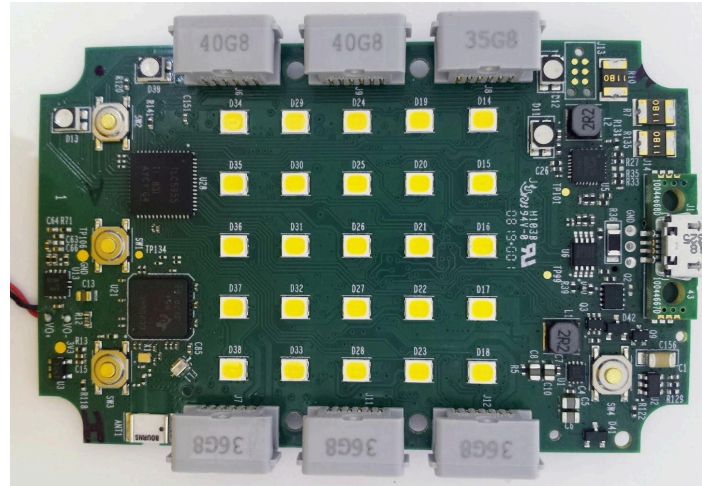
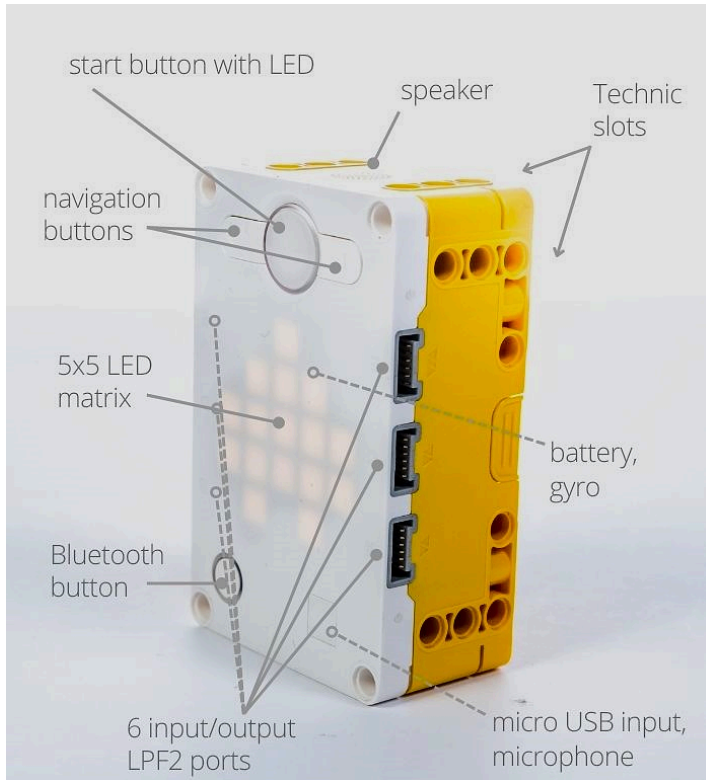


```

23 motor_pair = MotorPair('B','D')
24 Kp = 0.04
25 Turn = 0
26 Error = 0
27 threshold_value = 60
28 distance_value = 0
29 while True:
30     distance_value = distance_sensor.get_distance_cm(False)
31     if distance_value != None:
32         if distance_value > 14:
33             Error = color_sensor_c.get_reflected_light() - threshold_value
34             Turn = int(Error * Kp)
35             motor_pair.start_tank(15-Turn, 15+Turn)
36         else:
37             break
38     motor_pair.stop()

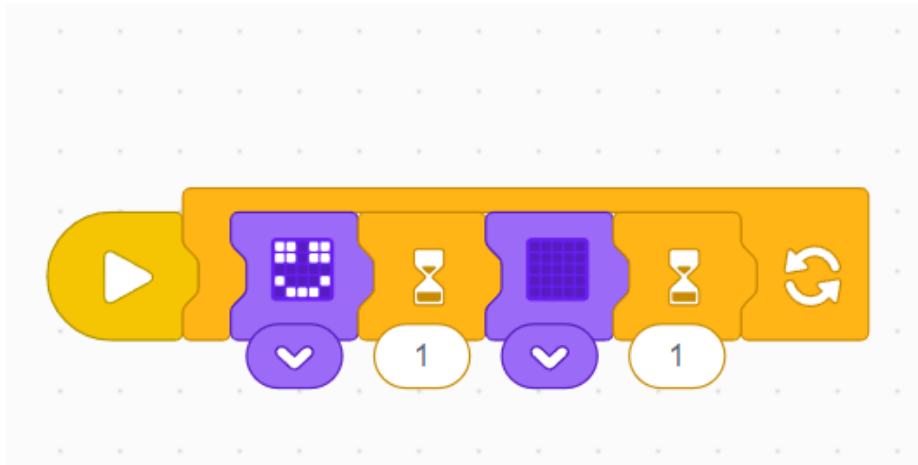
```

Eve Spike block

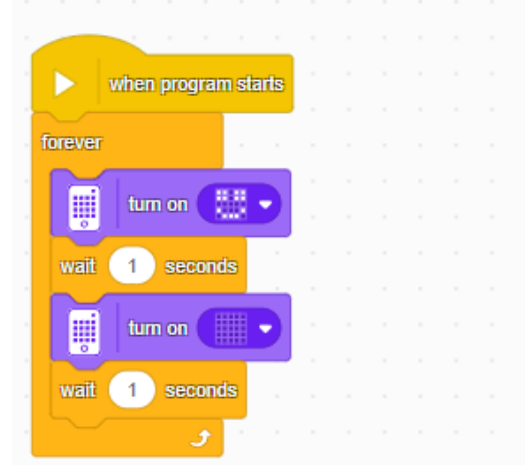


Spike Software

Icon blocks



Word Blocks



Python

```
from hub import light_matrix
import runloop

async def main():
    # write your code here
    light_matrix.show_image(3) # HAPPY
    await runloop.sleep_ms(1000) # 1 sec
    # Eyes
    light_matrix.clear
    await runloop.sleep_ms(1000) # 1 sec

runloop.run(main())
```