Programming and Flow Diagrams

```
Course Code: GEEN1064

Course Name: Engineering, Design and Implementation

Credits: 20

Lecturer: Seb Blair BEng(H) PGCAP MIET MIHEEM FHEA
```

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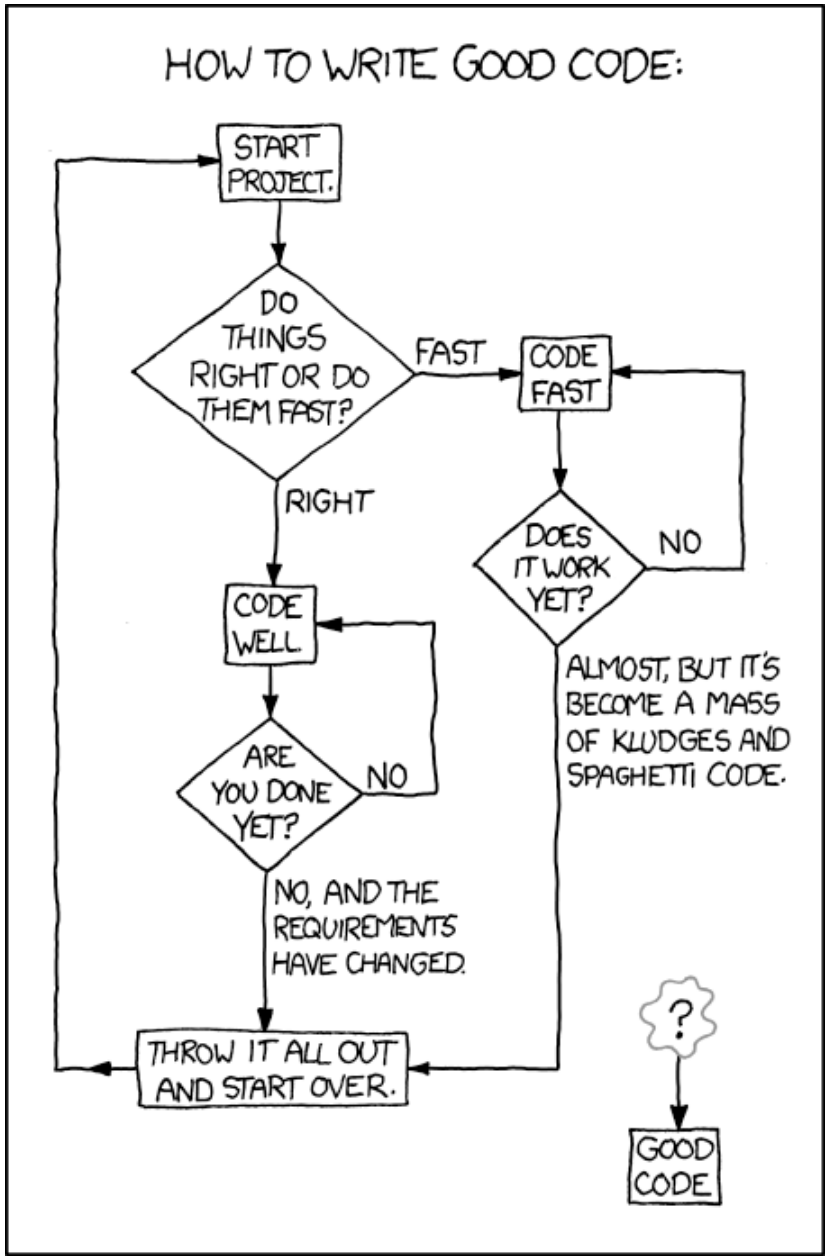

HOW TO WRITE GOOD CODE:
START PROJECT.
DO THINGS RIGHT OR DO THEM FAST?
FAST
CODE FAST
RIGHT
DOES IT WORK YET?
NO
CODE WELL
ARE YOU DONE YET?
NO
ALMOST, BUT IT'S BECOME A MASS OF KLUDGES AND SPAGHETTI CODE.
NO, AND THE REQUIREMENTS HAVE CHANGED.
?
THROW IT ALL OUT AND START OVER.
GOOD CODE

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/complied/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

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

Python

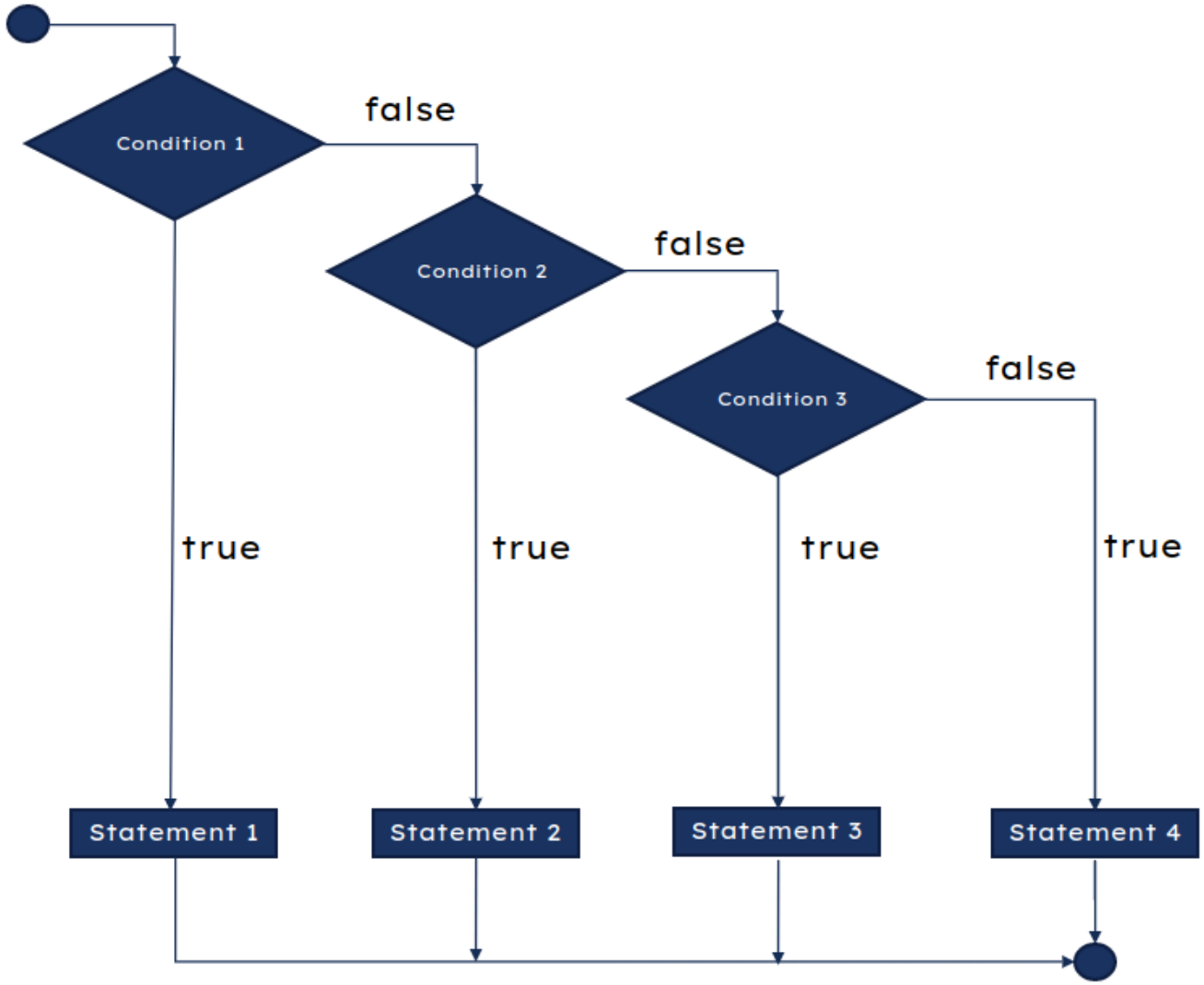
```python
a = 200
b = 33
if b > a:
  print("b is greater than a")
else:
  print("b is not greater than a")
```

Matlab

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

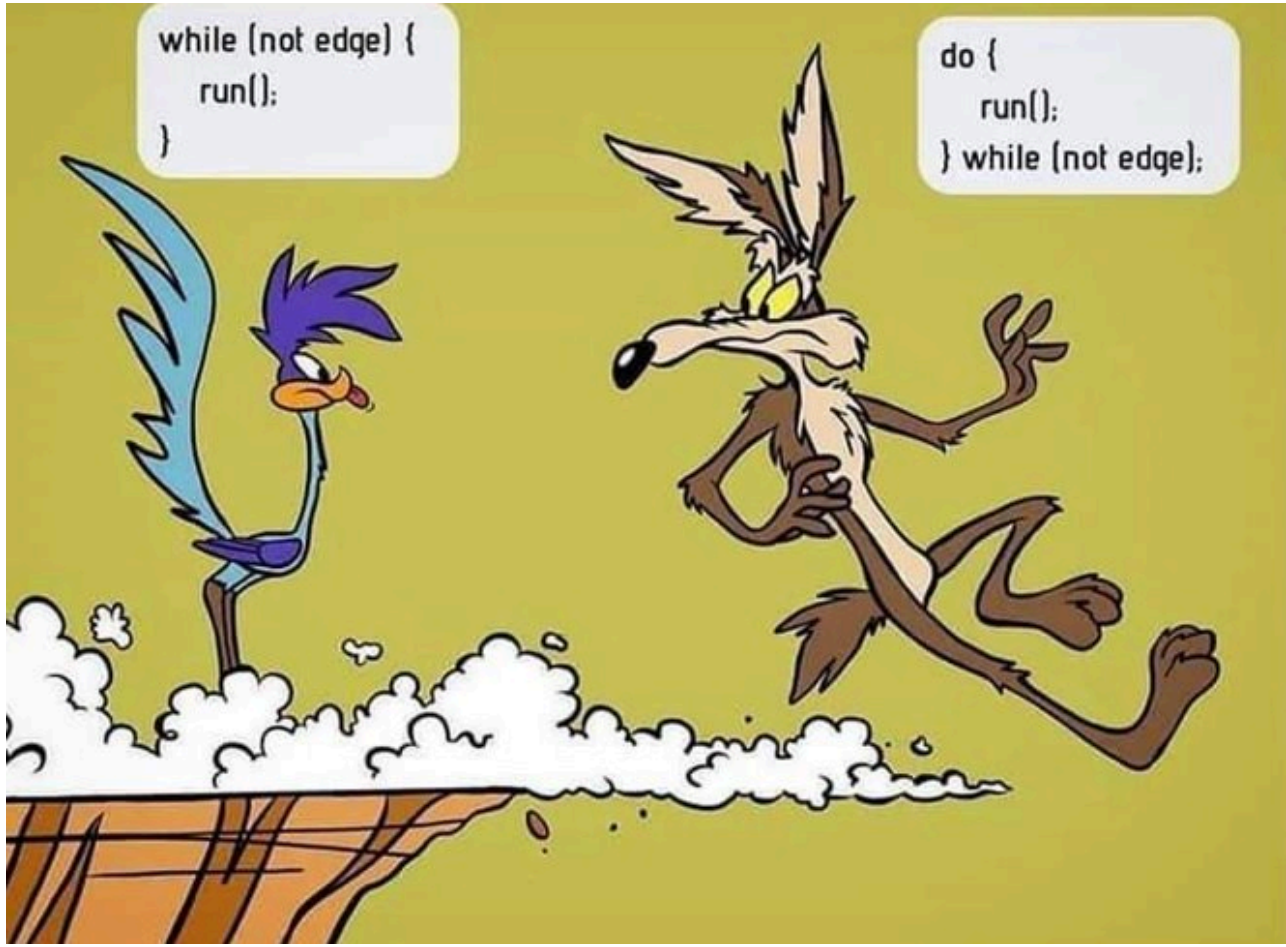
`If` Flow Diagram

```
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

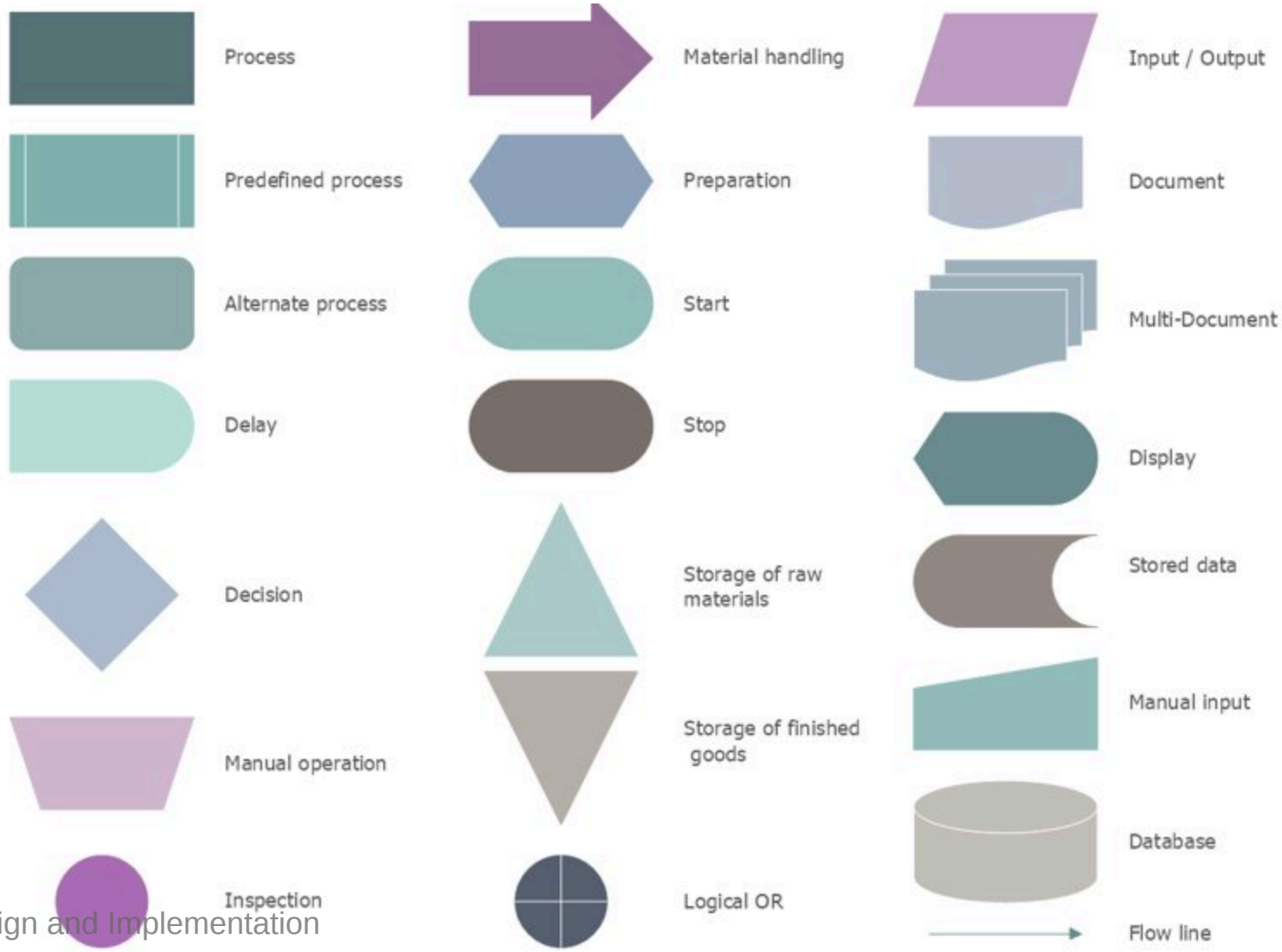
Infinite Loop

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

Finite Loop

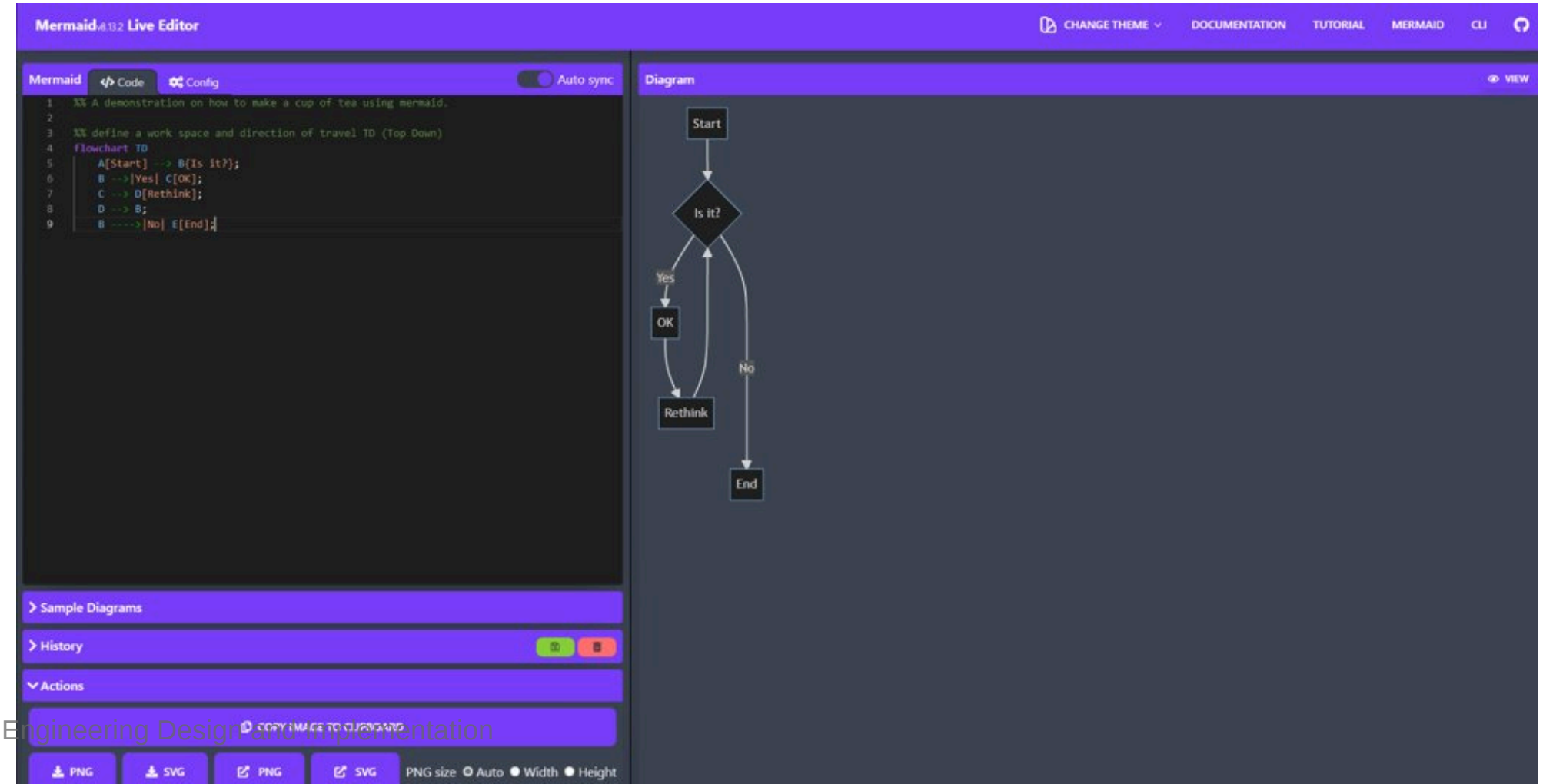
```
int i = 0;

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

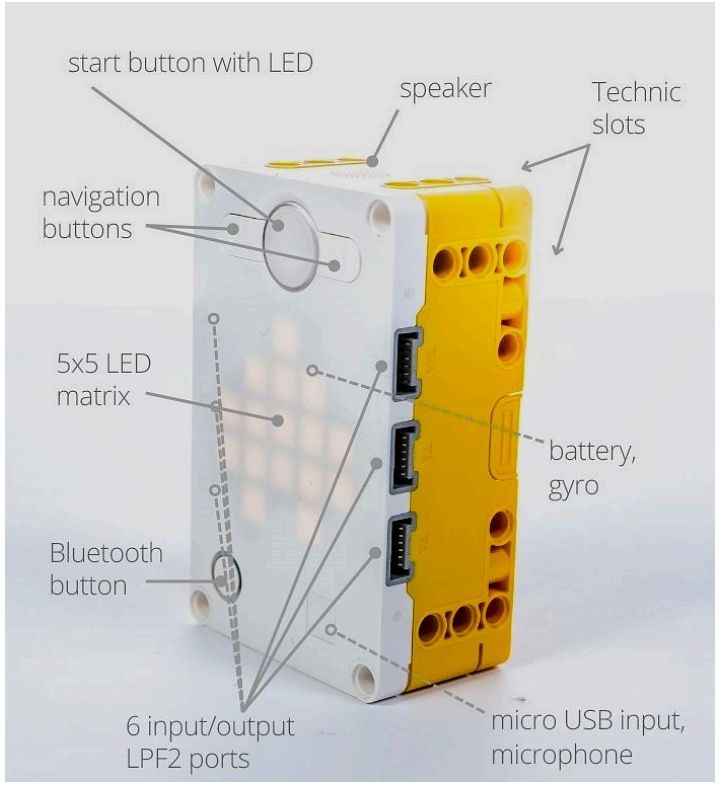
https://blockly.games/?lang=en

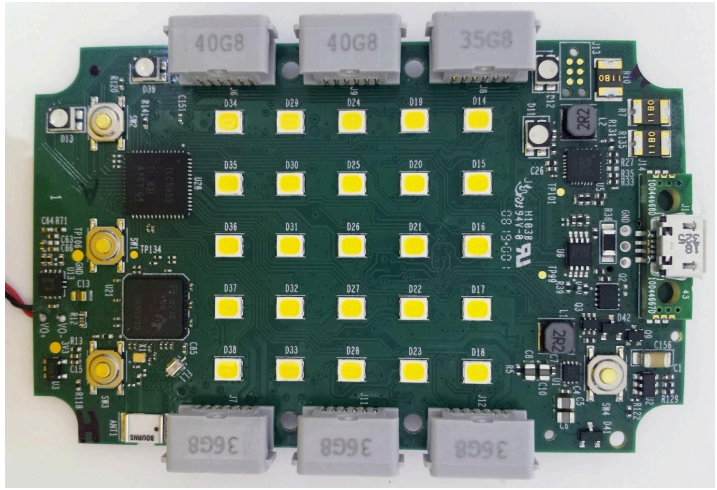
Ev3 Spike

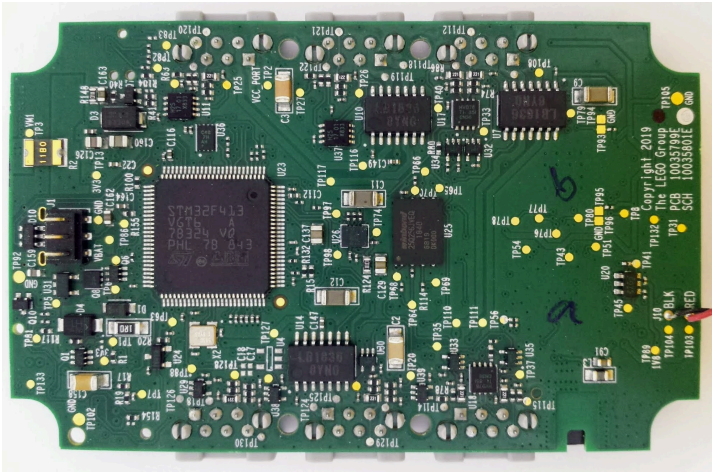
- Icon
- Block
- Python


```
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

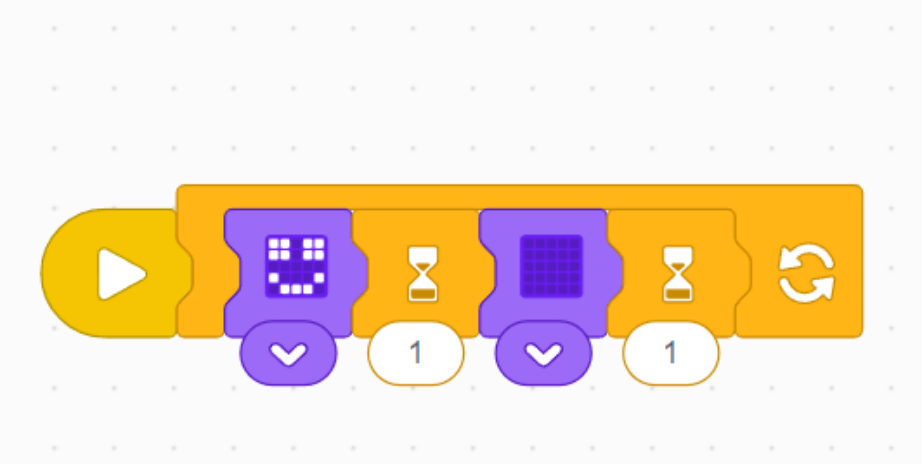




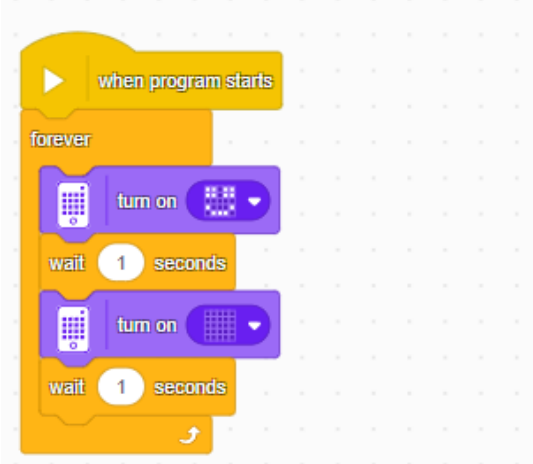


Spike Software

Icon blocks



Word Blocks



Python

```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())
```