PiMaze: Teaching Programming through Tangible Interfaces

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Motivation

- OpenSTEM Challenge 2018
- Improve programming and problem solving skills using a fun exercise that includes a tangible interface.
- Objectives
  - Basic programming constructs, especially conditions and loops
  - Backtracking and related data structures
  - Incrementally build a program by considering different scenarios

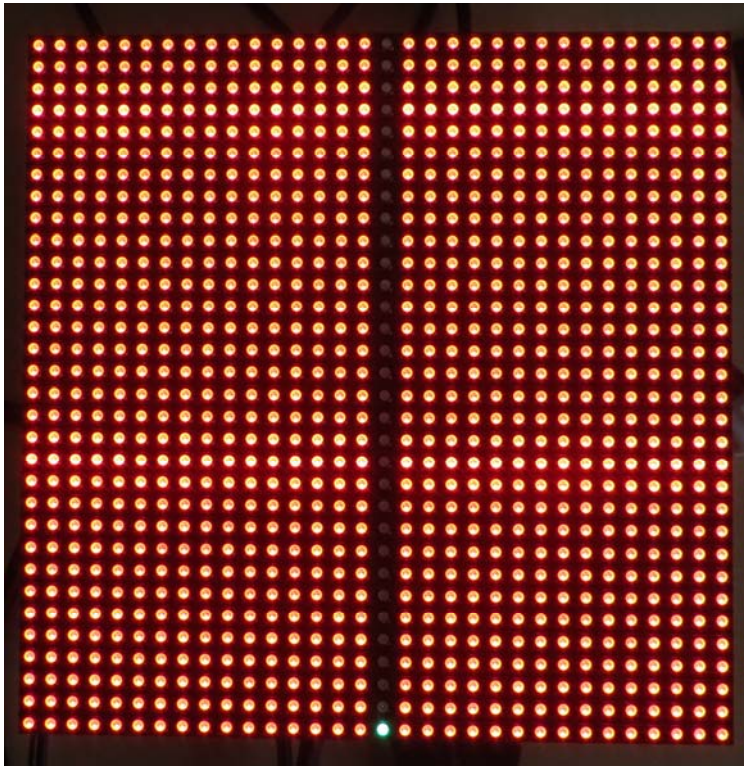
Main Steps of the experiments

This experiment can be associated with Block 1 – Part 2 of TM112 entitled “Problem solving with Python”.

- 5 minutes – familiarise yourself with the interface and read instructions
- 5 minutes – use the forward action and solve the first maze
- 5 minutes – use the turn action and solve the second maze
- 10 minutes – learn about backtracking and solve the third maze
- 5 minutes – reflect about a generic algorithm and test with all mazes

Programming a Maze - Step 1

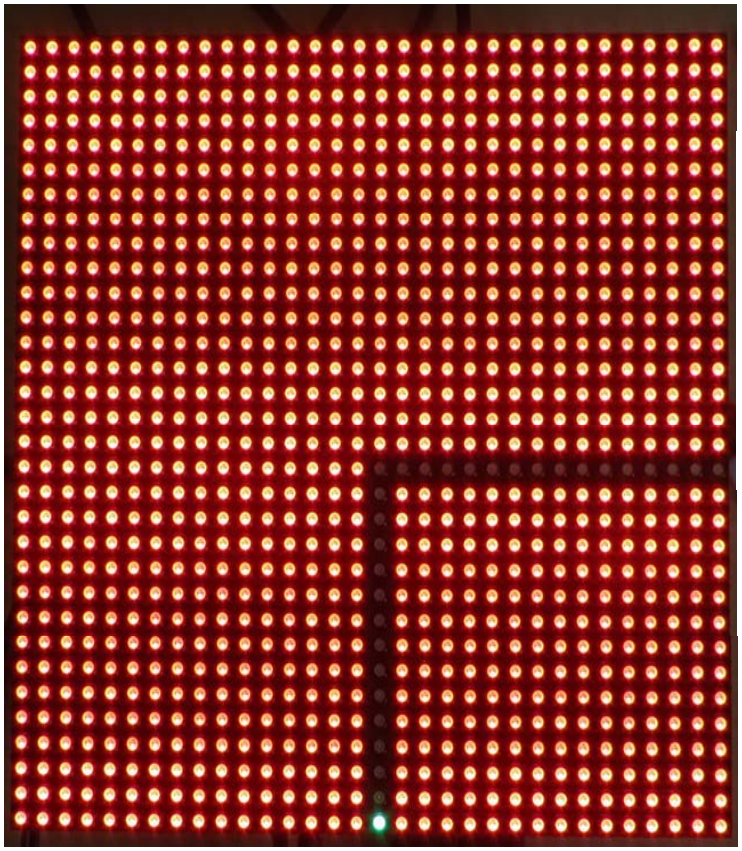
Using the forward function



```
While (current_position != EXIT):
      current_position = move_foward()
```

Programming a Maze - Step 2

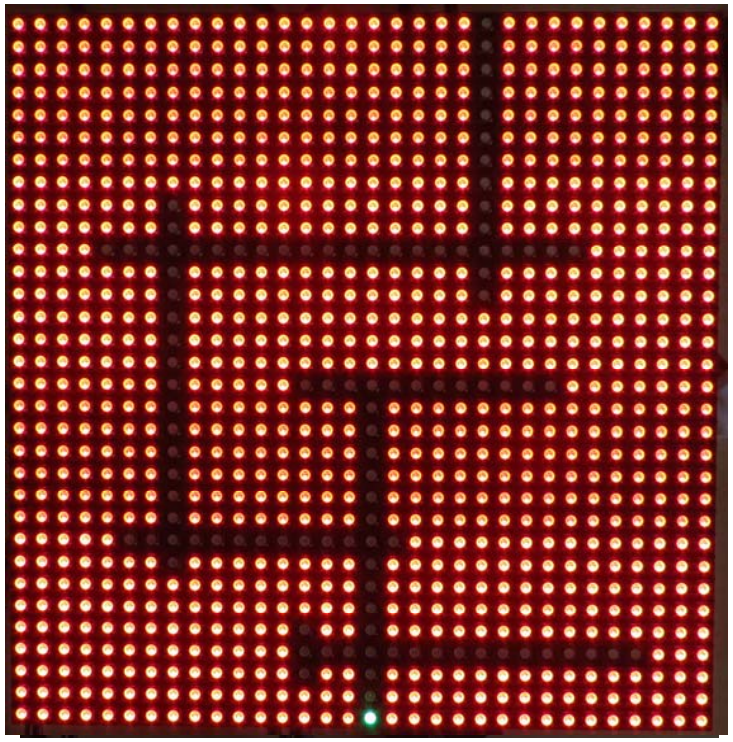
Using the turn function



```
While (current_position != EXIT):
      current_position = move_foward()
      If (current_position == old_position):
            # there must be a wall in front
            current_position = turn_right()
```

Programming a Maze - Step 3

Backtracking



```
markedChoice[] = false
While (current_position != EXIT):
      current_position = move_foward()
      If (current_position == old_position):
            # there must be a wall in front
            if (!markedChoice[current_position]):
                  current_position = turn_right()
                  markedChoice[current_position]= true
            elif:
                  current_position = turn_left()
```

ABC - Python

Comments

```
"""
Single or multiple line comments
can be between quotation marks
"""
# Single line comments can be written after a hash (#)
```

ABC - Python

Variable assignment

```
# assign the value 5 to the variable x
x = 5
```

ABC - Python

Print

ABC - Python

Invoking a Function

ABC - Python

Let’s Code

Possible Extensions

- Optimisation and complexity
  - Including keys and finding the shortest path → M269
  - Moving walls to convey notions of software adaptation and resilience
- Different programming languages
  - Java Programming in M250
- Robot programming
  - Using iRobot Create (Programmable Vacuum Cleaner)
  - Highlights the connection between computing and engineering modules such as T212 (Electronics: sensing, logic and actuation)

Thank you

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