HACKING WEBOTS PROJECTS

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1. **Synopsis**

   Micromouse is a robot that can move freely in a labyrinth area (maze) without touching the objects around it. In the end, the robot knows which way to move, how many degrees to turn, and what if it encounters a dead end in the labyrinth area.

2. **Installation**

   • Webots

   O Robot Simulation Software

   O Visual 3D environment = World

   O Robot Programming = Controller

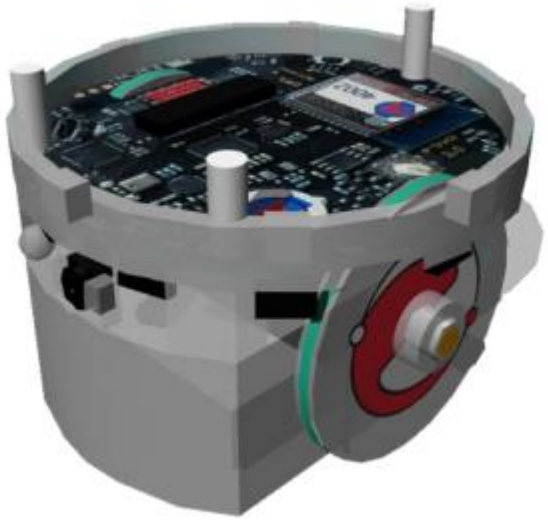
   • Micromouse

   O **Maze Solving:** Moving/searching around for the best path to reach the center. Use of searching algorithms to compute shortest path.

   O **Performance:** The shortest path is not always the fastest. Straight lines enable the mouse to accelerate.

3. **Construction**

   • E-puck



The e-puck is a small differential wheeled mobile robot. It was originally designed for micro-engineering education by Michael Bonani and Francesco Mondada at the ASL laboratory of Prof. Roland Siegwart at EPFL

• Maze

• Controller

Robot

The controller (in Java) is the “brains” of the Autonomous Agent and is responsible guide the robot to the centre of the maze

Odometry → Localization & Mapping → Searching Algorithm

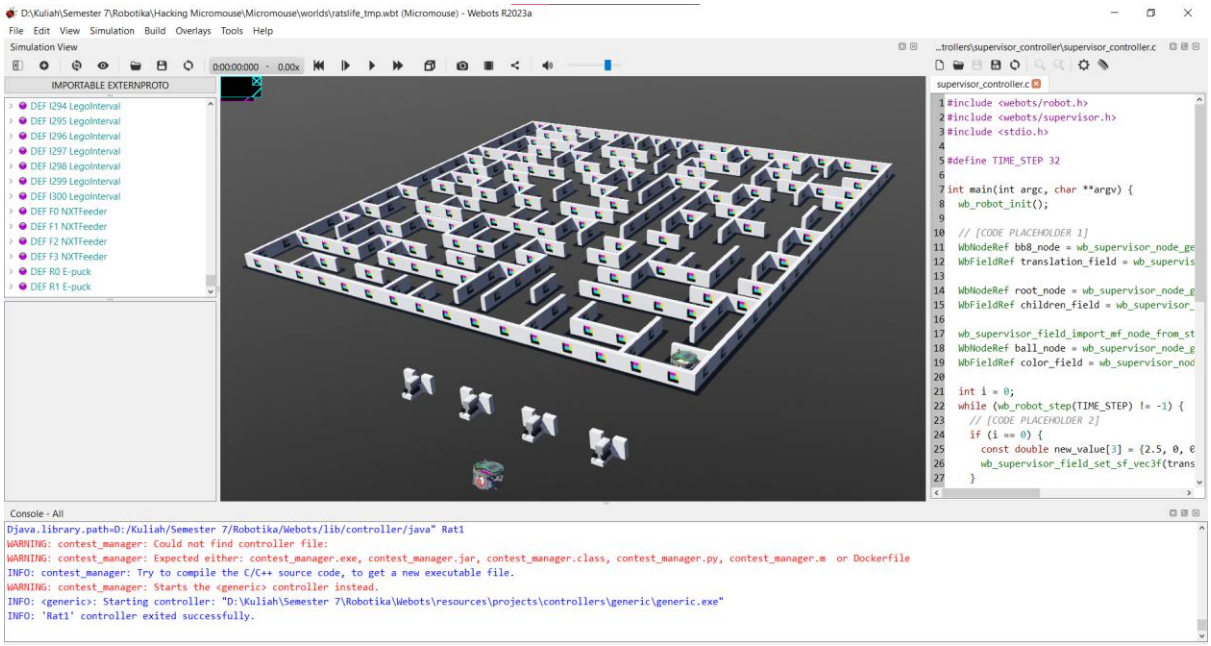
• Odometry

The use of data from motion sensors to estimate change in position over time.

• Localization & Mapping

Since the robot now can detect if it has travelled to the next cell, It can calculate the relative orientation by monitoring its rotation from the input of the rotary encoders given its known direction at the starting cell.

4. Micromouse World



5. Flood Fill Algorithm

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o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o
|014 013 012 011 010 009 008 007 007 008 009 010 011 012 013 014|
o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o
|013 012 011 010 009 008 007 006 006 007 008 009 010 011 012 013|
o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o
|012 011 010 009 008 007 006 005 005 006 007 008 009 010 011 012|
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|011 010 009 008 007 006 005 004 004 005 006 007 008 009 010 011|
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|010 009 008 007 006 005 004 003 003 004 005 006 007 008 009 010|
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|009 008 007 006 005 004 003 002 002 003 004 005 006 007 008 009|
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|010 009 008 007 006 005 004 003 003 004 005 006 007 008 009 010|
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|011 010 009 008 007 006 005 004 004 005 006 007 008 009 010 011|
o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o
|012 011 010 009 008 007 006 005 005 006 007 008 009 010 011 012|
o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o   o
|013|012 011 010 009 008 007 006 006 007 008 009 010 011 012 013|
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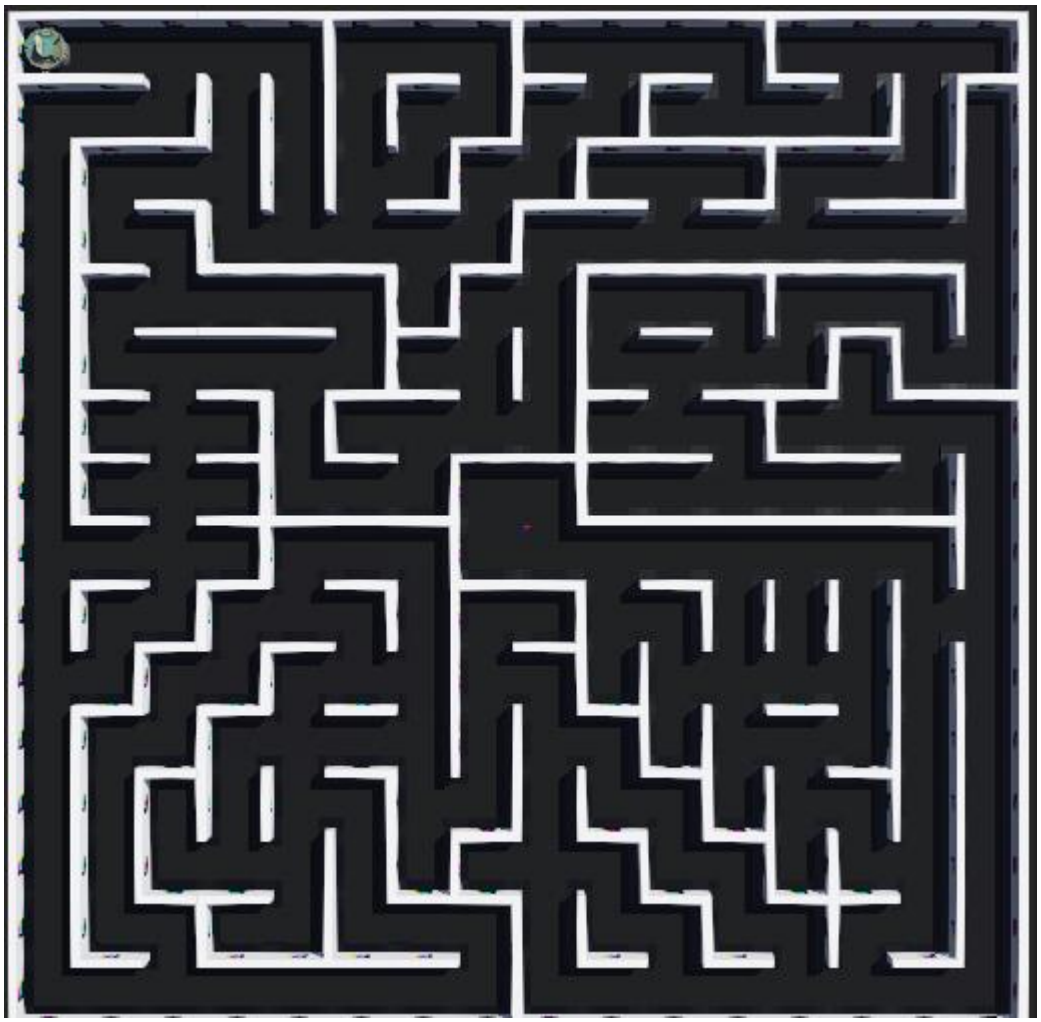
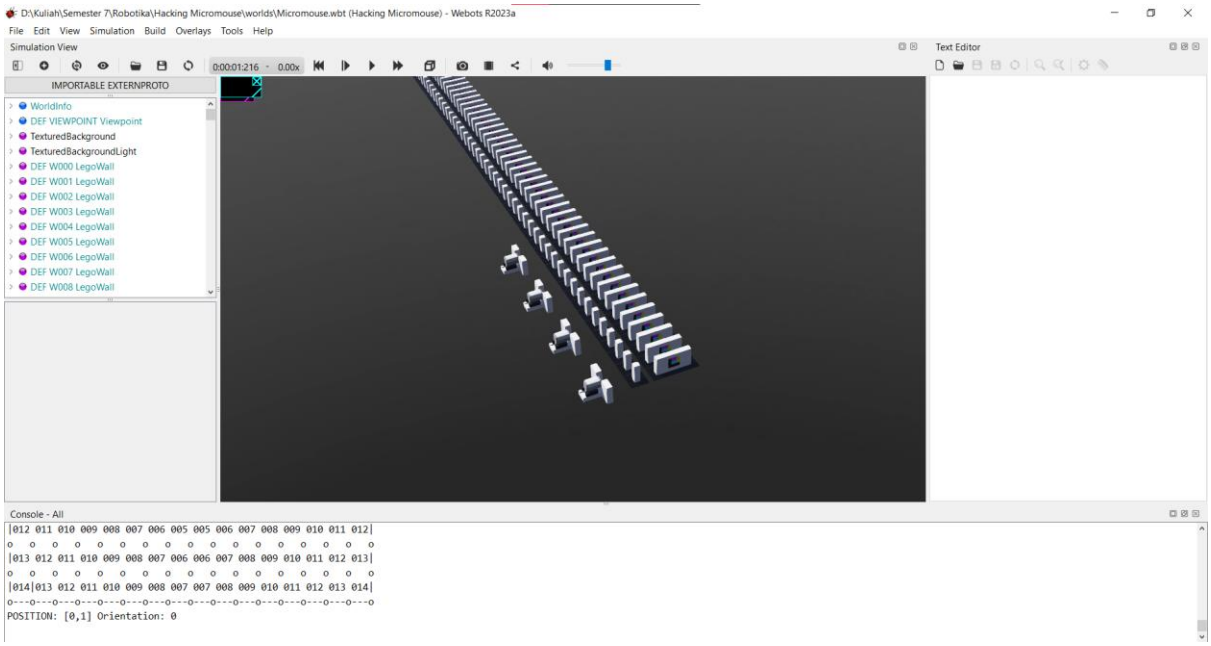
|014|013 012 011 010 009 008 007 007 008 009 010 011 012 013 014|
o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o
```

6. Result




D:\Kuliah\Semester 7\Robotika\Hacking Micromouse\worlds\Micromouse.wbt (Hacking Micromouse) - Webots R2023a
File Edit View Simulation Build Overlays Tools Help
Simulation View
Text Editor
IMPORTABLE EXTERNPROTO
WorldInfo
DEF VIEWPOINT Viewpoint
TexturedBackground
TexturedBackgroundLight
DEF W000 LegoWall
DEF W001 LegoWall
DEF W002 LegoWall
DEF W003 LegoWall
DEF W004 LegoWall
DEF W005 LegoWall
DEF W006 LegoWall
DEF W007 LegoWall
DEF W008 LegoWall
Console - All
|012 011 010 009 008 007 006 005 005 006 007 008 009 010 011 012|
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|013 012 011 010 009 008 007 006 006 007 008 009 010 011 012 013|
o o o o o o o o o o o o o o o o
|014|013 012 011 010 009 008 007 007 008 009 010 011 012 013 014|
o---o---o---o---o---o---o---o---o---o---o---o---o---o---o---o
POSITION: [0,1] Orientation: 0