

# Web Simulation of a Thymio Robot

Degree programme : BSc in Computer Science | Specialisation : Computer Perception and Virtual Reality  
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Thymio is an educational robot that aims at improving early education in science, technology, engineering, mathematics and researching the acknowledgment by kids of robots in their learning environment. One of the main drawbacks is material, be it the space required to make it operate or the hardware capabilities (battery tends to run out fast). In this work, we explore one solution: Simulating the behavior in a web browser.

## Goal:

The goal of this bachelor thesis was to develop a simulation environment that would let users see a 3D representation of the robot and its surrounding, and simulate the behavior of a Thymio robot with a given program from a file with the .aesi extension. Furthermore, it is supposed to allow users to create customized playgrounds that can be loaded in the simulator. And lastly, the application should not require any software installation, thus it comes in the form of a web application, and has to be compatible with modern browsers.

## Our Approach:

We decided to use the three.js library to represent and create graphical elements, it is a library for JavaScript which uses a default WebGL renderer, thus allowing it to display, create and animate 3D computer graphics in a web browser. We chose to implement three basic dissimilar playgrounds directly in the application, to give the user a direct way to use the simulator. The data containing the properties of the different shapes that create the playground

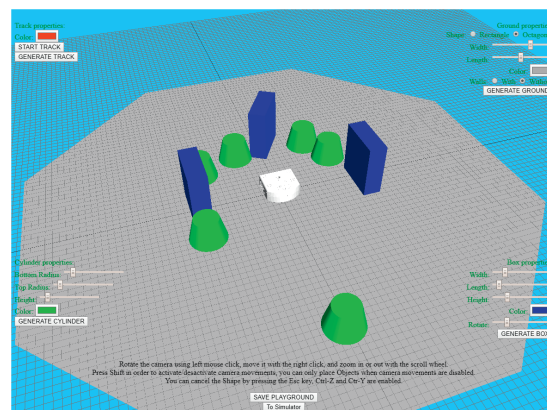
were put into JSON files. We did so because of the coming step that was the implementation of a tool to customize playgrounds and we needed a way to store and read the data from those playgrounds. We gave the ability to the user to choose the type of ground shape he wants between a rectangle and an octagon, two basic shapes, rectangular and cylindrical, and a way to create a track by giving different waypoints. We simulated the movement of a two wheels robot by considering each motor power as a vector and moving accordingly to the resulting vector calculated depending on the cases. Besides we added some proximity sensor to the robot, which shoots raycast and check for intersection if the intersection distance is shorter than the limit given to it, an event is thrown and the action attached to it is run. We decided to use the compiler from Aseba, but we had to translate it from C++ to JavaScript. To compile the behavior file, we first read it and pass the content to a Lexer that will create tokens containing the position and the type, for example, if the file contains the “,” character its token type will be “TOKEN\_COMMA”. Depending on the character we might need to look one, two or more characters ahead to determine its type. Once this operation is done, the file containing the tokens is parsed, thus creating a three. We then expand and control its integrity.



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Thymio II



Playground creator