

EE321 PROJECT PROPOSAL

Object counter Zumo Robot



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Member List

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The Objective

The purpose of this project is programming a Zumo Robot which scans its surroundings and indicates the number of the objects around it. It will be situated in an arena with objects and white borders. It can move and it should remain inside the arena through the process.

Explanation of the Project

Stay in Arena

Zumo robot needs to detect the data from the reflectance sensors below in order to stay within the black arena surrounded by white borders and make decisions accordingly. If one of the sensors detects the white borders, the robot should change direction or move backwards to stay within the arena. In our project, if one of the sensors on the right side of the robot detects the white borders, it should turn left, and if one of the sensors on the left side detects the white borders, it should turn right, thus ensuring that it has not left the arena.

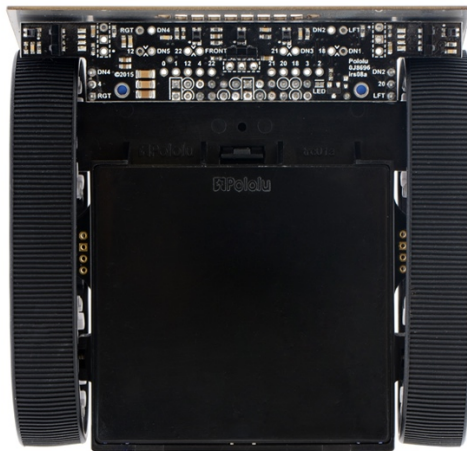


Figure 1. Bottom part of the sumo robot. Reflectance (In the documentation, these sensors are referred to as line and proximity) sensors.

Object Detection

The MZ-80 infrared sensor on top of the robot can detect objects at a certain distance in a single direction. The detection range of the MZ-80 can be adjusted. This sensor provides information about whether there is an object in front of the robot. However, since this sensor only detects objects in front of it, it cannot detect other objects in the arena. To overcome this limitation, the robot must rotate around its own axis. In our project, when the Zumo robot detects an object with the MZ-80 sensor during its rotation around its axis, we will increment a counter in the code. We will also ensure that the robot stops when it returns to the starting point of the rotation.

LED Blinking

As mentioned in the previous section, when the MZ-80 sensor on the robot detects an object during its rotation, the object counter will be incremented. Meanwhile, the LED on the robot will blink the number of times equal to the number of objects detected. A waiting period (delay) will be created between the LED turning on and off to ensure that it is perceptible to humans.

Possible Challenges (Limitations) and Solutions

Objects in a Row

If there are multiple objects arranged in a sequence (one after another) the robot can perceive them as a single large object instead of multiple objects. To prevent this situation, in addition to rotating around its own axis, the robot needs to move within the arena. During this movement, it must ensure that it does not go beyond the boundaries of the arena.

Large Objects

Objects in the arena may be located at different positions and sizes compared to the previous round. A larger object, for instance, could be perceived by the MZ-80 sensor on the robot as multiple objects in some way. To prevent this situation, a solution similar to the previous problem should be implemented. In other words, the robot should move within the arena without crossing its boundaries.

Experiments Should be Done

To address all potential issues that may arise due to the various locations and sizes of objects in the arena, numerous experiments need to be conducted. These experiments should be prepared for every possible scenario that could be encountered. The following image shows some example arenas. In addition to these, several more experiments should be conducted, including scenarios with consecutive objects lined up, consecutive larger objects lined up, and scenarios with multiple objects close to each other.

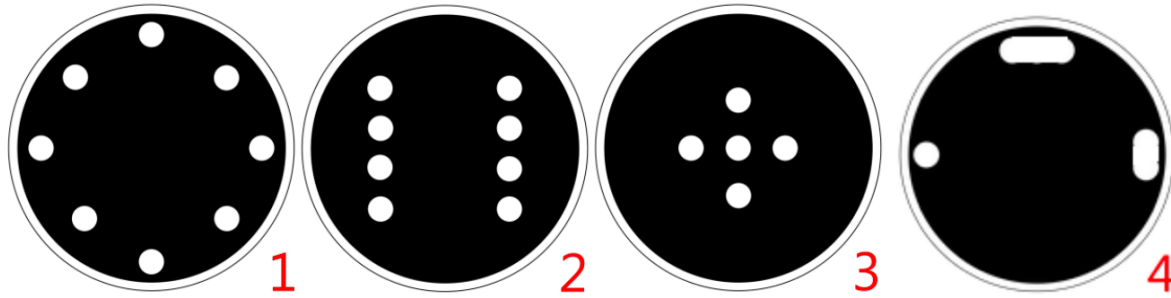


Figure 2. Basic experiments.