Exploring Robot Programming with Python
DevFest 2023

This document can be downloaded at https://ailab.space/events/devfest2023.

1 The Challenge

It is time to put together what you have learned so far to program a mobile robot to accomplish given tasks. You will **form two teams**. Each team will comprise of **five robots** and the members that operate these robots.

Your team will program the AlphaBot2 mobile robots, affectionately named as **GumBots** from now on to compete in the following challenges:

1. Candy Rush Adventures (Teleop)
2. Feed the Hungry Pokémon - Magikarp & Snorlax (Autonomous)

These two challenges will take place consecutively. A **30-minute** window will be given to practice teleoperating with the manual robot and programming the autonomous robot. After that, the challenge will start with a time limit of **10 minutes**. **Four GumBots from each team** will start Challenge #1, **while the remaining single GumBot** will compete in Challenge #2. 5 minutes will be given for Challenge #1.

1.1 Environment Specifications

The following items will be strategically placed in the environment (challenge #1 & challenge #2), adding an extra layer of excitement to your Robotic adventures.

Item name	Description
Goblin's Garden	Navigate the environment carefully to avoid collisions with the Goblin's Garden and prevent penalties or deductions from your scores
Taffy Lane	Precision lane designed for seamless GumBot navigation along this delightful trail.
Candy Crate	A specially designed container for storing delightful candies (beads).
Candy Caravan	A charming caravan serves to hold and transport the precious candies (beads).
Walls of Wonder	Not just barriers, but sweet frontiers saving the delicate candies (beads) from falling off the land.

1.2   Challenge 1: Candy Rush Adventures

For **Challenge #1** (Candy Rush Adventures), the following environment
will be used where **four GumBots** will operate manually, i.e., its
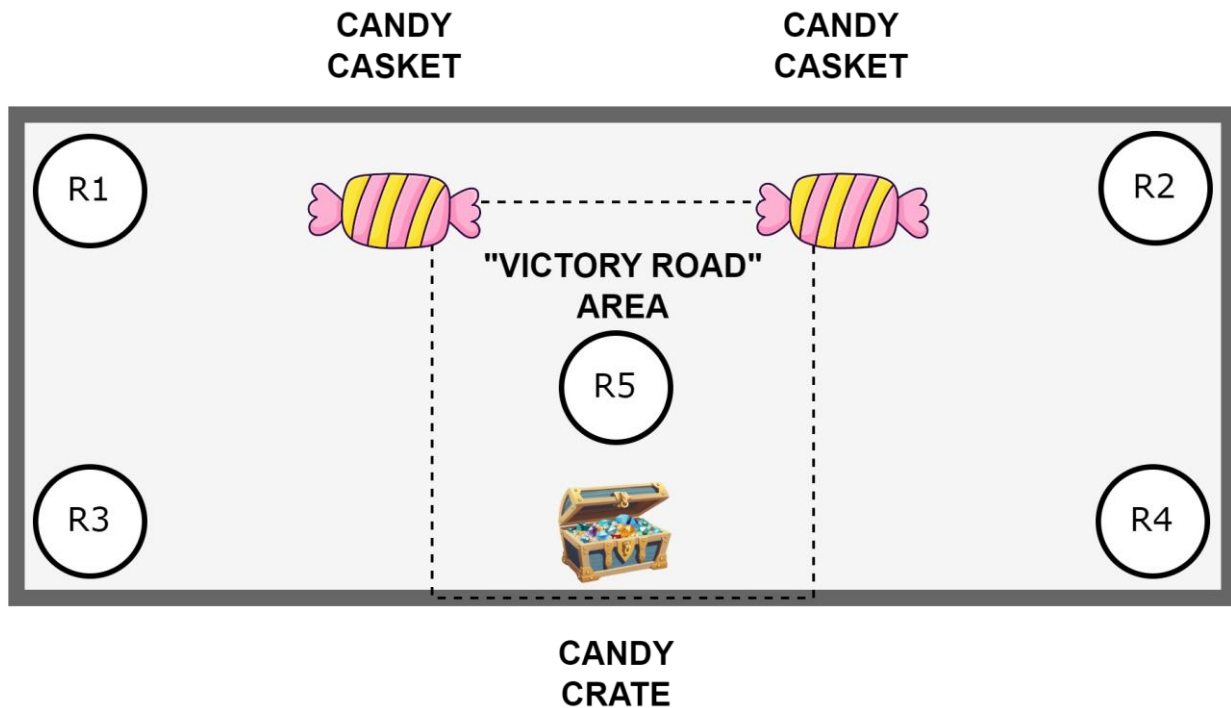**"Candy Cove" world (Figure 1).**

Figure 1. "Candy Cove" world

- ▪ In this boxed environment, two teams will compete to secure as
  many points as possible by snatching the candies (beads) from the
  two Candy crates to their Candy box at the center.
- ▪ Each team consists of **four GumBots** that will work together to
  collect as much candies as possible. Points will be awarded
  according to the number of candies collected.
- ▪ The robots are manually controlled through teleoperation.
- ▪ You will have **30 minutes** to practice and modify your GumBots'
  scripts.
- ▪ This challenge will have a time limit of **10 minutes**. The team
  with the most points will win the challenge.
- ▪ You will have 30 minutes to practice teleoperating your robots.
- ▪ There are no rules; we'll leave the creative direction to you

1.3 Challenge 2: Feed the Hungry Pokémon

For **Challenge #2** (Feed the Hungry Pokémon), here's the environment where the GumBot will operate, i.e., its **"Victory Road" world (Figure 2)**.
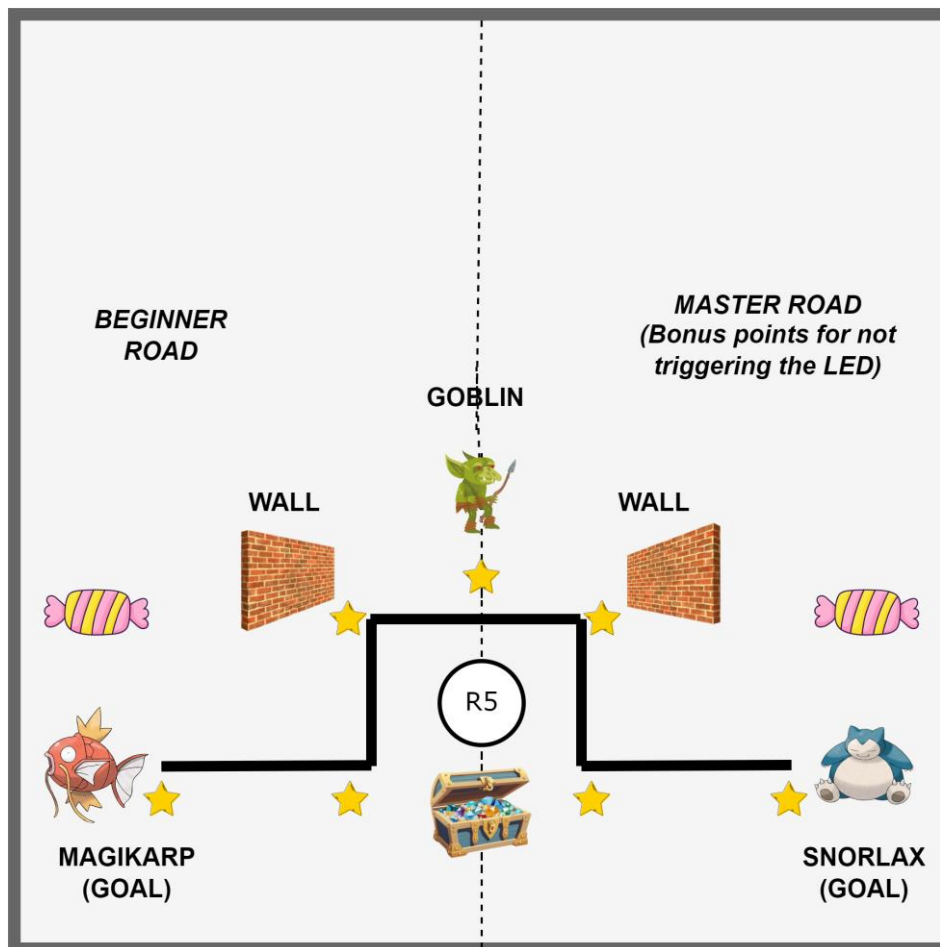

Figure 2. "Victory Road" world of the robot

- In this environment, the GumBot will be tasked to autonomously carry the Candy caravan to feed either the tranquil Magikarp or the feisty Snorlax.
- Unlike the previous challenge, **one GumBot** will be representing each team to compete in this challenge.
- You may work in groups for this challenge to create an algorithm to solve this environment.
- Each GumBot should start from its start zone and maneuver autonomously towards the end goal. At the end of the maze, the robot should sound a beep and stop.
- You will have **30 minutes** to program and test the GumBots.

- This challenge will have a time limit of **10 minutes**. The robot that can complete the circuit will be awarded **8 points**. You may choose one road (either the **"BEGINNER ROAD"** or the **"MASTER ROAD"**).
  - **For both roads,** 2 points are awarded for each checkpoint passed (marked by the star symbol). There are 3 checkpoints before the goal, so a total of **6 points** can be earned here.
  - **2 points** awarded if the robot can stop before crashing into the Pokémon (Snorlax or Magikarp).
  - **For MASTER ROAD, 4 points will be awarded if your robot can go to the goal (Snorlax) without triggering the Red LED on the GumBot (going out of bound).**
- The GumBot should be fully autonomous. Teleoperation (manually controlling the robot) will not be allowed in this part of the game field.
- Choose the path for your GumBot wisely!

2   Preparation

This is what you should do:

Challenge #1 (Teleop)

1. Choose four GumBots and the members to compete in this challenge.
2. Familiarize yourself with running the teleoperation scripts and practice controlling the robot.
3. If you wish, you may modify the teleoperation script to make it easier to control the robot. For e.g., changing the key inputs, and duty cycles of the motor to increase or decrease the travel speed of the robot.
4. You will have 30 minutes to practice controlling your robots and/or modifying your robot script before the challenge starts.
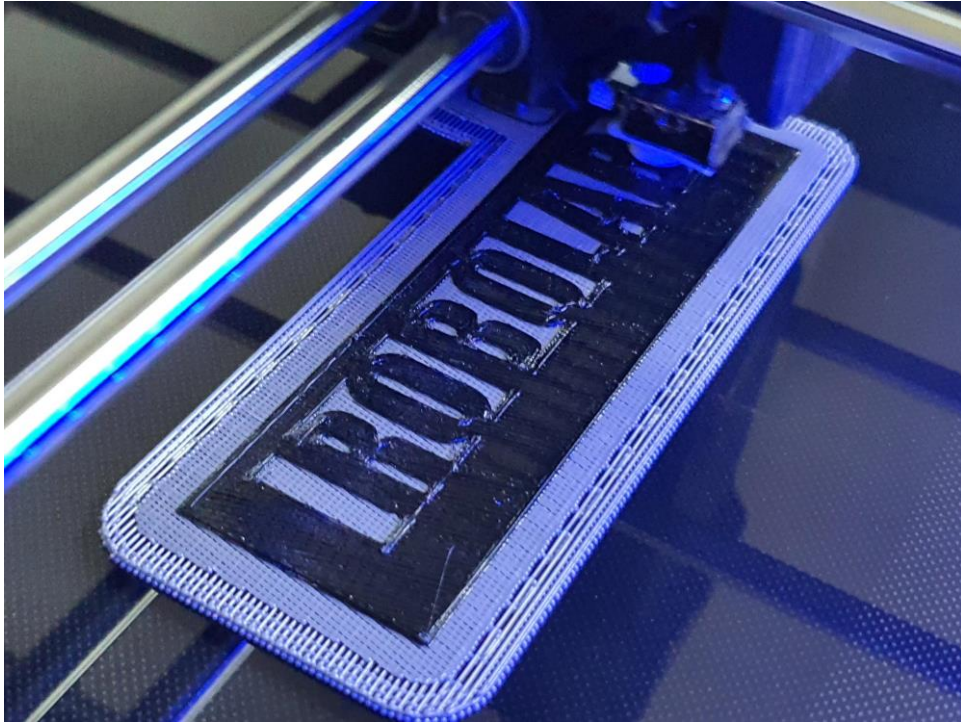5. You may want to have a strategy.

Challenge #2 (Autonomous)

1. Choose one GumBot to represent the team in the maze challenge.
2. Discuss and work together to design and implement GumBot behavior that can successfully complete the circuit while avoiding the walls.
3. You will be using the functions learned from the workshop to give intelligence to the GumBot.
4. You will have 30 minutes to program your GumBots' autonomous navigation behavior to complete the task.

In summary, you have 30 minutes of robot development and practicing time. Since the autonomous challenge will require more work, you may allocate some of your team members to familiarize themselves with the controlling the robot for Challenge #1 and some to design and implement

intelligent behavior for Challenge #2. May the sweetest team claim victory! 🍭

P.S: Fantastic Prizes await the top-performing team.

- The End -