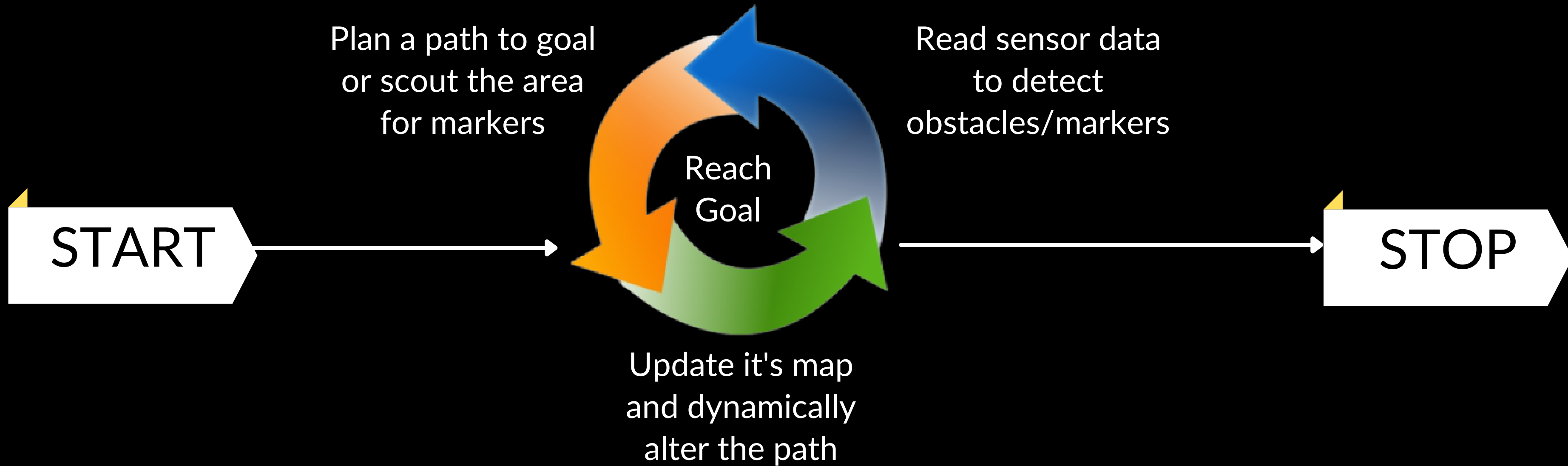# THE AUTONOMOUS SUBSYSTEM

Our Objective

Our team's task is simple, to enable the rover to autonomously traverse a terrain that is filled with obstacles and use markers and information about its surroundings to intelligently and dynamically plan its actions.

Achieving automation of the rover requires venturing into the fields of Motion Planning and Computer Vision.

Through this course, we hope to give you a taste of the implementation of various algorithms that we often encounter in this field including:

- Basics of some common path planning algorithms
- Writing scripts for a bot and running it in a simulation environment.
- Building Object Recognition models.
- Using latest state of the art models for specific problems.

So how do we actually do it ?

Plan a path to goal or scout the area for markers

Read sensor data to detect obstacles/markers

Reach Goal

Update it's map and dynamically alter the path

START

STOP

Path Planning

- Implementing path-planning algorithms based on data taken in from camera and GPS
- Path Planning algorithms:
  - A*, RRT*, Informed RRT*, Dijkstra
- Localization and Mapping:
  - SLAM, kalman filter etc.
- Simulators
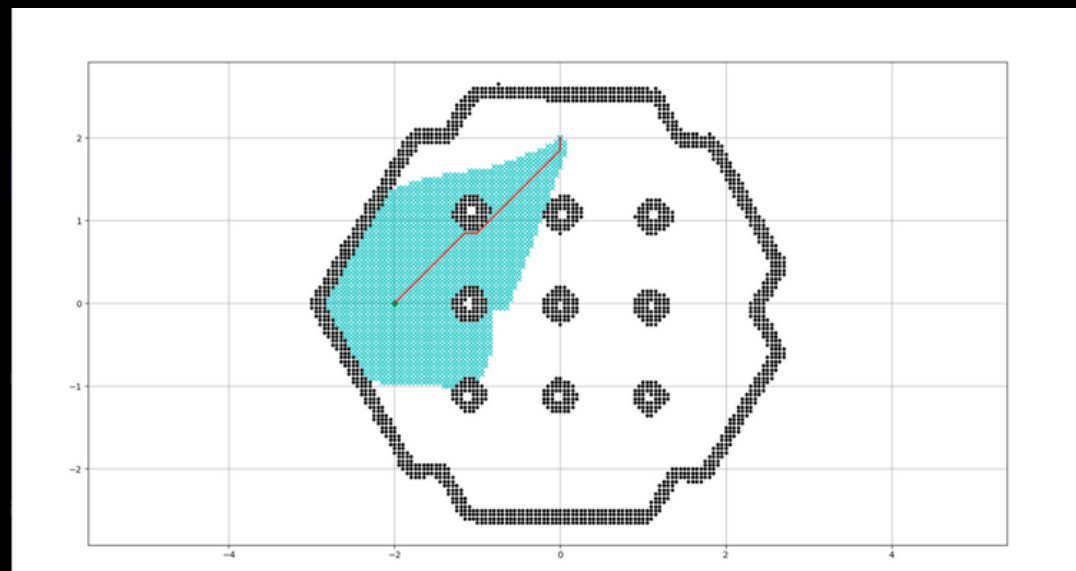
Object Detection

- Detecting and following any object in its field of view
- Computer Vision for recognition of objects
  - AR Tags
  - Arrows
  - Tennis balls, traffic cones
- Obstacle detection

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[20, 0] [7, 0] [4, 5] [0, 4]
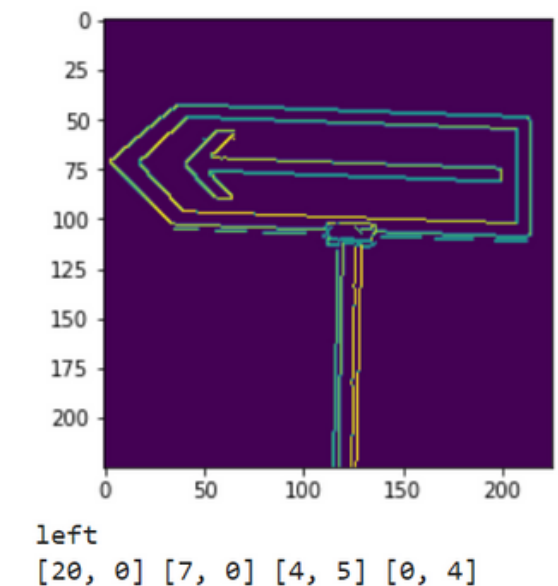
Tools Used

1. Operating Systems:
   a. Windows
   b. Linux

2. Programming Languages:
   a. Python and C++ (for Path Planning)
   b. Python (for Object Detection)

3. Working Platforms:
   a. ROS (Robot Operating System)
   b. Gazebo
   c. Turtlebot3
   d. Unity (not part of QSTP)

4. Frameworks:
   a. OpenCV
   b. Neural Networks
   c. Pytorch
   d. Matplotlib

Why Autonomous?

Coz it's cool

Takeaways:
1. ROS (robot operating system)
2. Planning Algorithms
3. OpenCV
4. Deep Learning

Automation, Autonomous Traversal
Research
You will write Neural Networks for real-life problems
We can teach you to make a roomba robot, or atleast simulate it :D

THANK YOU!

You can contact anyone of us if you have any queries or doubts regarding the Autonomous Subsystem

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