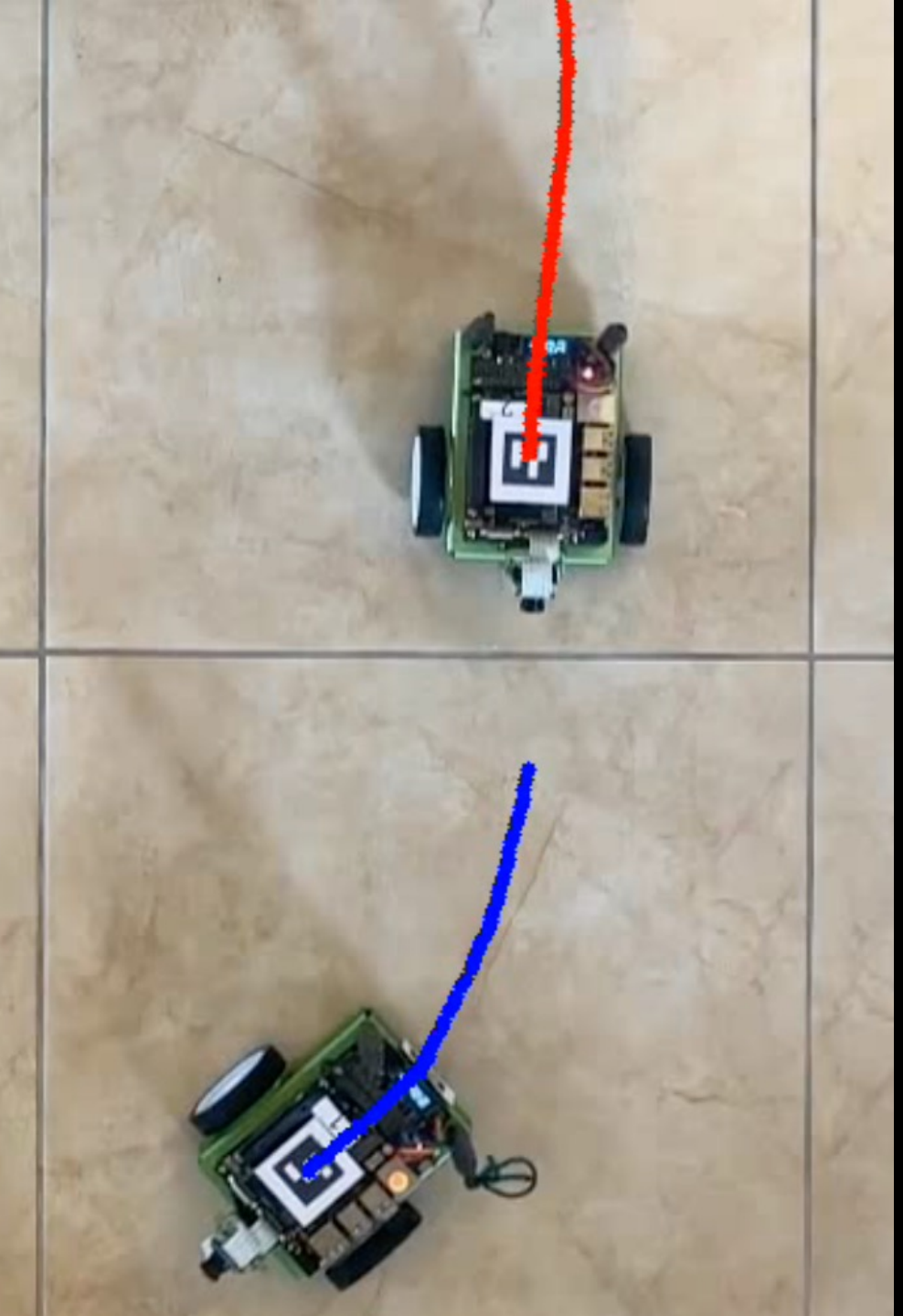


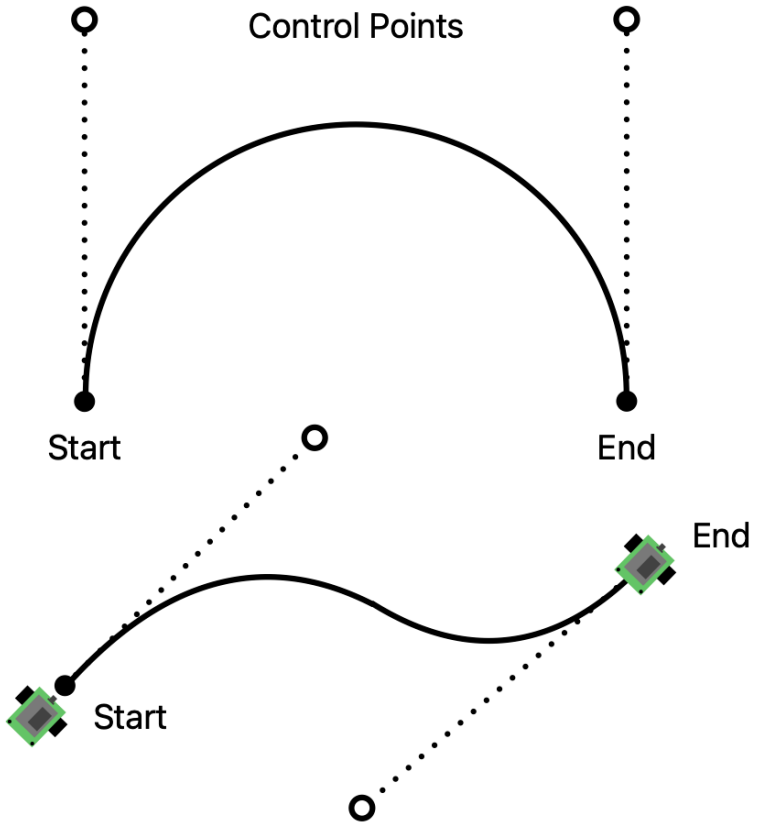
LEADER-FOLLOWER MOVEMENT CONTROL

By Bradley Harris

CONCEPT

BÉZIER CURVES

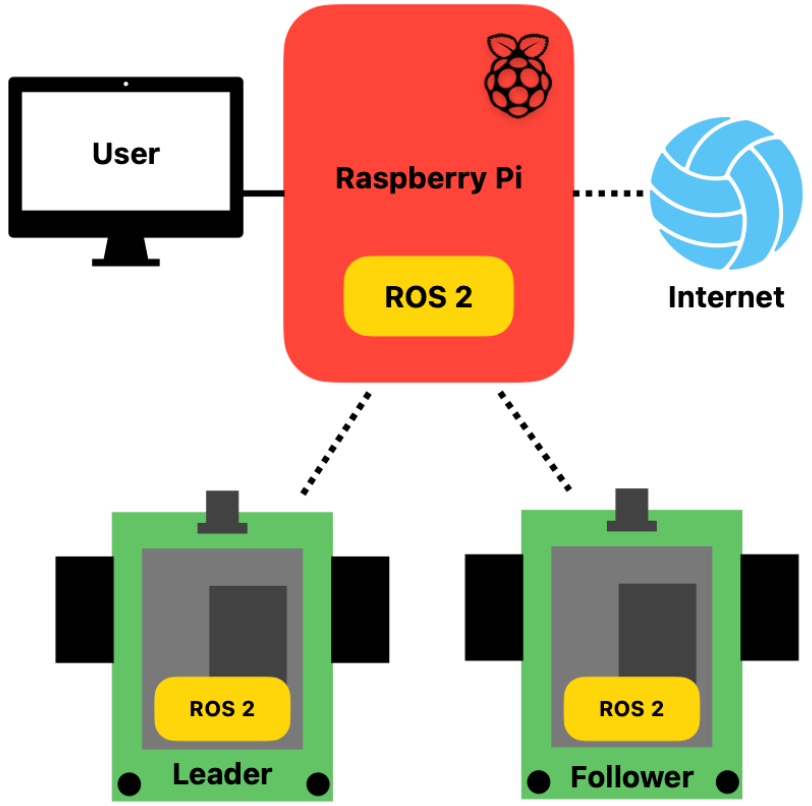
- Track velocity and direction of the Leader
- Attempt to emulate the path
- Utilizing Bézier curves as a method of interpolating the path between two vectors
- These curves can be updated as the position of the leader changes
- Achieve this using no knowledge of the state of the Leader



APPROACH

LEADER - FOLLOWER

- Use a Raspberry Pi as a Gateway
- Utilize ROS for communications and the node based architecture
- Implement following of an apriltag on the back of the Leader
- Get pose of an apriltag to obtain the directional vector of the leader
- Implement Béizier following



PLATFORM

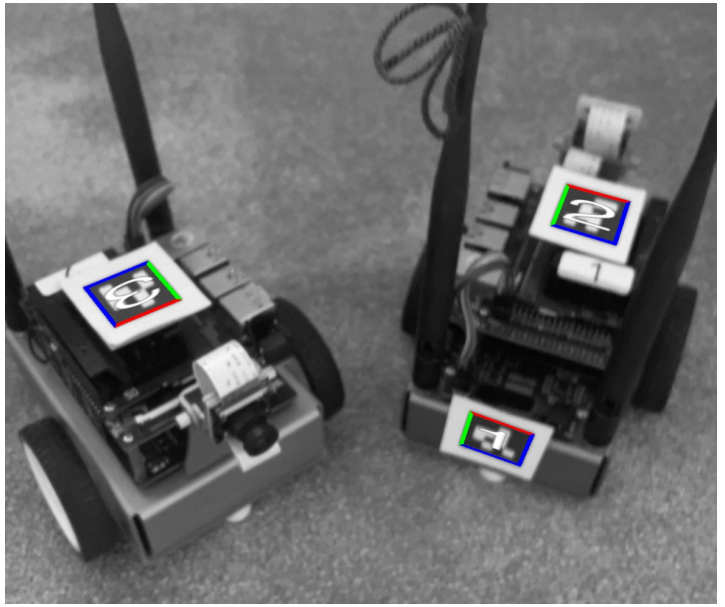
WAVESHARE JETBOT

- Based on NVIDIA’s open source specification
- Differential Drive Robotics platform
- Comprised of two TT motors, a lithium-ion battery pack, The Jetson Nano and a CSI camera on front
- Waveshare provides libraries for interfacing with the I2C motor driver
- Example Jupyter notebooks Provide an into to Neural networks and Machine vision

APRILTAGS

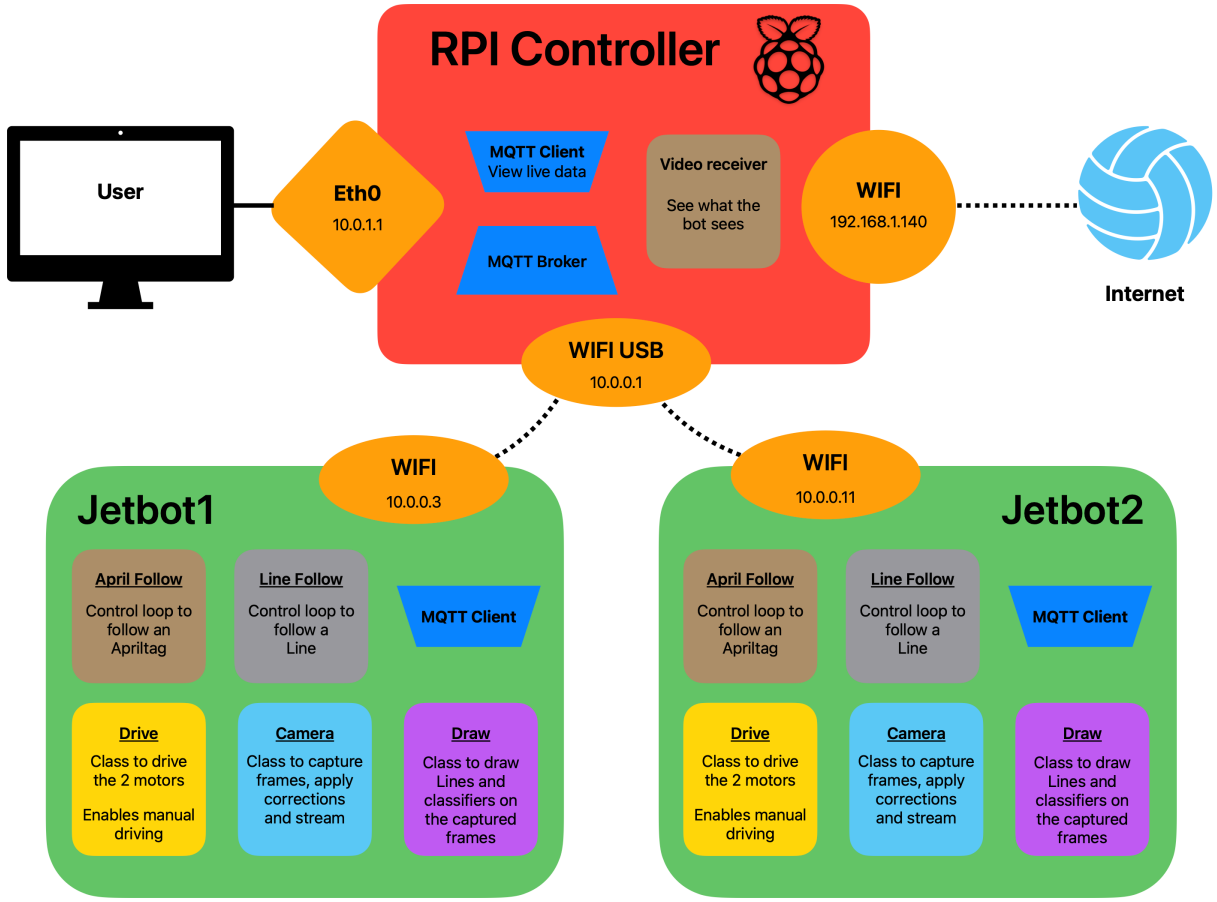
QR CODES

- QR code like markers used as targets in machine vision applications
- A variety of family types in different shapes and sizes
- Developed at the University of Michigan in 2010
- Can be used to obtain the position and pose of a plane
- Easy to track with lightweight algorithm



Tag16h5 - id 1

Tag36h11 - id 1

ACHIEVED

- ROS did not work as expected
- Pivoted to Object Orientated approach
- Used a Python Apriltag Library to facilitate the detections
- Utilizes MQTT for debug and live data feed
- Video optionally streamed to the Raspberry Pi