IEEE SoutheastCon 2019 Hardware Competition
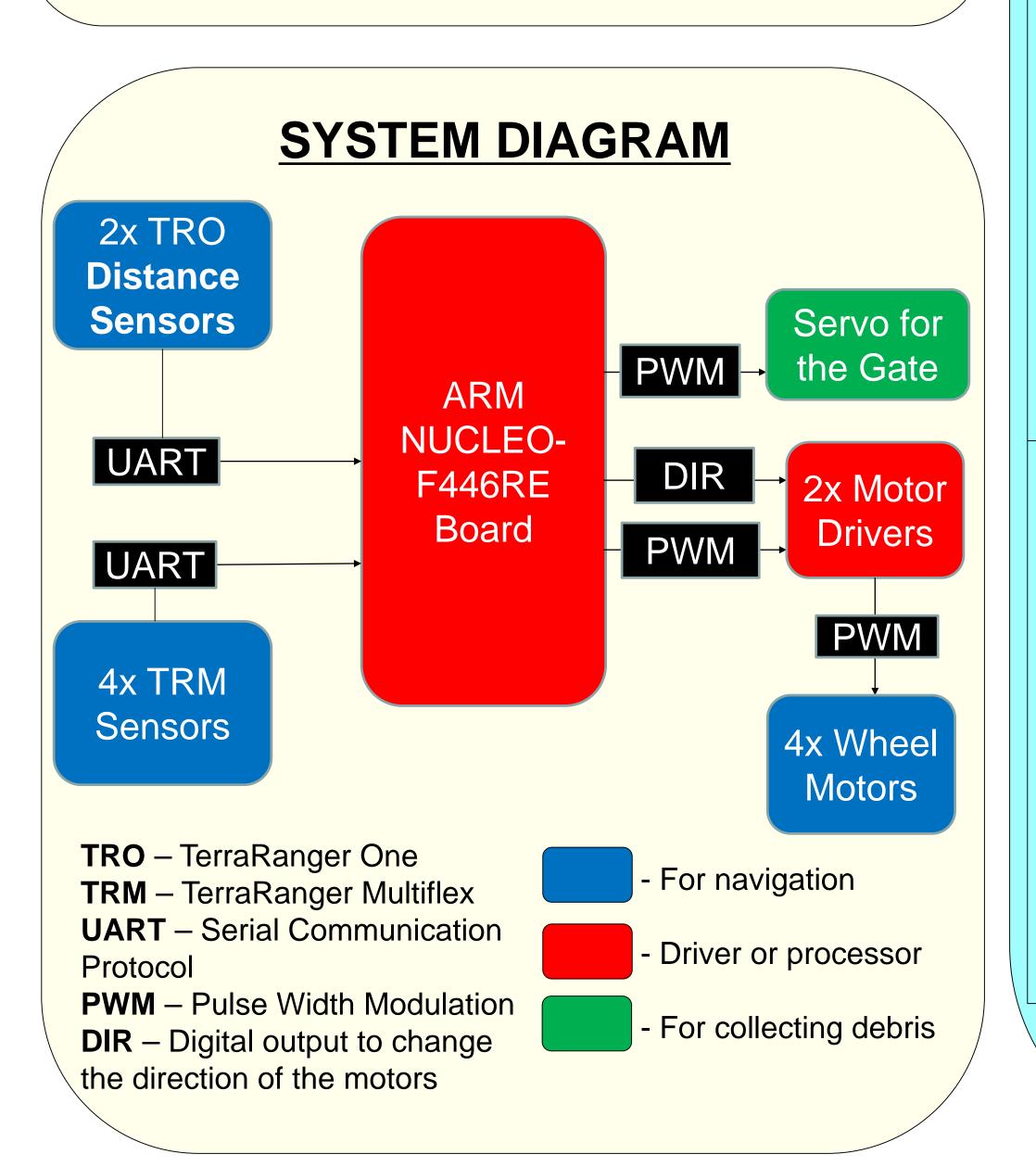## First 50 … Next 50
Jacob Hopp and Naser Alangery
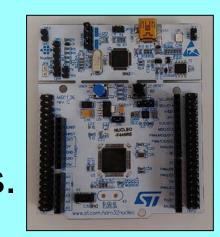## Computer Engineering

UNIVERSITY OF EVANSVILLE
EST 1854

PROBLEM DESCRIPTION

The goal of the project was to design a robot that navigates counterclockwise around the track. The robot had to collect pit balls and wooden blocks while moving them to the outer squares based on their color. In addition, the robot had to avoid all of the blinking LED's located on the edges of the circle. The robot had to be autonomous and not exceed 9"x9"x11".

SYSTEM DIAGRAM

- 2x TRO **Distance Sensors**
- UART
- UART
- 4x TRM Sensors
- ARM NUCLEO-F446RE Board
- PWM → Servo for the Gate
- DIR
- PWM → 2x Motor Drivers
- PWM → 4x Wheel Motors

TRO – TerraRanger One
TRM – TerraRanger Multiflex
UART – Serial Communication Protocol
PWM – Pulse Width Modulation
DIR – Digital output to change the direction of the motors

- (blue) - For navigation
- (red) - Driver or processor
- (green) - For collecting debris

DESIGN

- STM32F446 Nucleo ARM board was used.
- The project was coded in Keil µVision 5.
- Mecanum wheels were used for navigation purposes.

Entering Zone 2 (The Circle)
Problem: Leave the starting square and enter zone one, then leave zone one and enter zone 2.

Solution: Use the mecanum wheels and startup algorithm to move forward, then turn right and enter zone 2.

Navigating Zone 2
Problem: Navigate counterclockwise around zone two while avoiding LED's.

Solution: Use two TeraRanger One sensors on the front and right side to know when the robot is too close to a wall, then readjust.
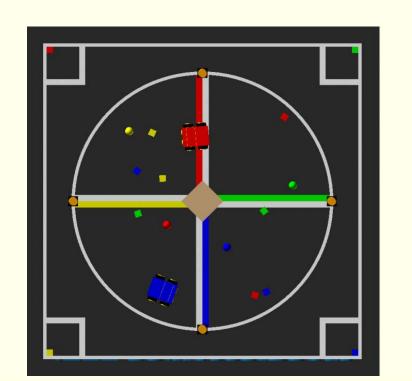
Collecting the Debris
Problem: Locate and collect a block or ball in order to remove it from zone 2.

Solution: Use the TeraRanger Multiflex sensors to locate the debris then use a rotating servo to lift the gate and capture the debris.

Dropping off Debris
Problem: Move the debris out of zone 2 to be dropped off in one of the corner squares.

Solution: Use both types of sensors to find the corner box and the servo to open the gate and return to zone 2.
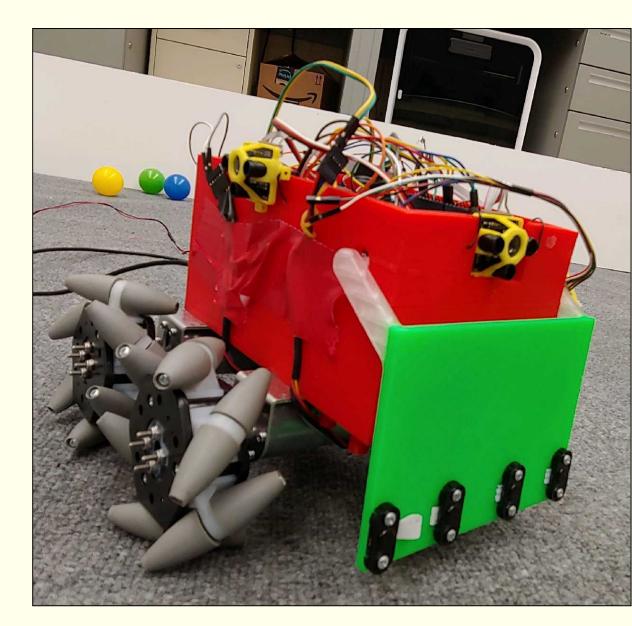
COURSE TRACK

RESULTS

The robot navigates around the track, avoids LED's and removes debris from the circle.