Progress Presentation-I

e-Yantra Summer Intership-2016

Formation Control of Multiple Swarm Robots

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Overview of Project

Project Name: Formation Control of Multiple Swarm Robots

Objectives:

1. Implement formation control over a group of Spark V robot using overhead camera and aruco markers for localization of the robot
2. Implement swarm behaviors like disperse, follow the leader etc

Deliverables:

- Robots capable of making any desired formation
- Robots capable of implementing Swarm behaviors

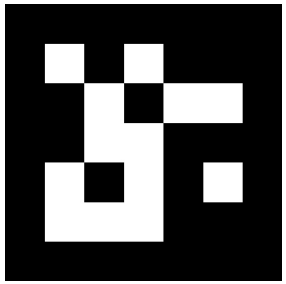
Overview of Task

No.	Task	Deadline
1.	Python,Spark V ,OpenCV introduction interface Xbee	2days
2.	Position and orientation calculation of multiple Spark V robots	3 Days
3.	Go-to-goal for a single Spark V	4 Days
4.	Formation testing for 2-3 robots	2 Days
5.	Algorithm for formation control of multiple robots	3 Days
6.	Avoid obstacle controller	3 Days
7.	Algorithm testing and fine tuning Scaling up the number of robots	3 Days
8.	Local Swarm behaviors	8 Days

Task Accomplished

Task Completed

- Cropping and transforming the arena area inside the black border
- The position and orientation (x, y,Φ) of multiple robots can be found using aruco markers placed on the robot



Opencv-Contrib-python (aruco library)
https://github.com/opencv/opencv_contrib

Task Accomplished

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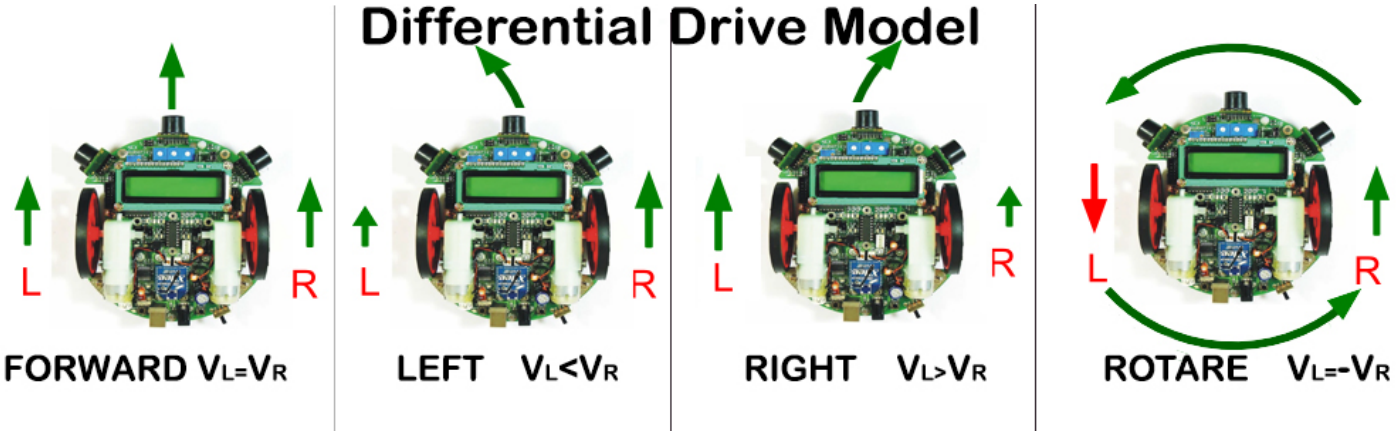
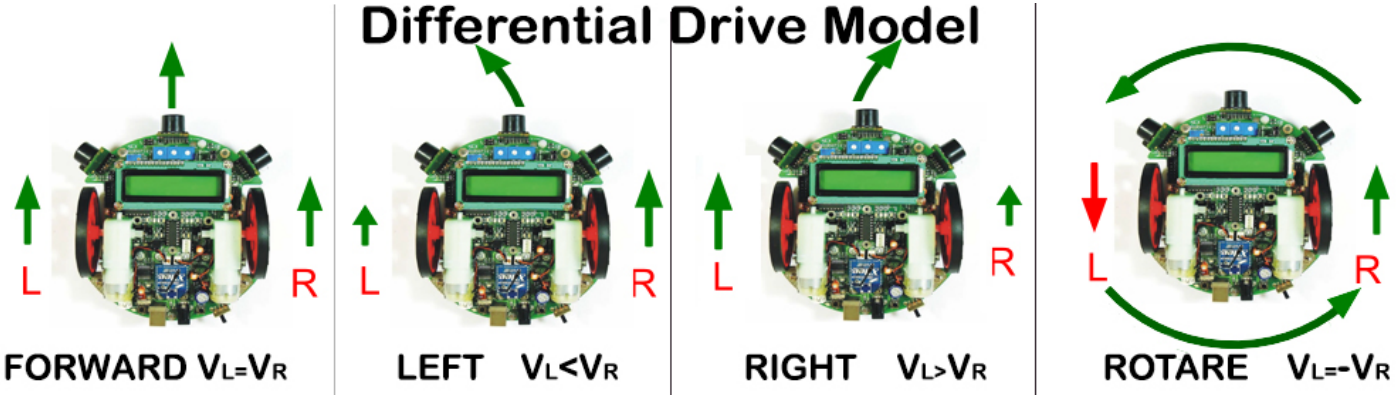
- Selected suitable equations for the differential drive robot



- (x, y, θ) of each robot is transmitted via XBee to the robot. The desired location (xg,yg,ϕ) is also transmitted. The XBees are configured in a star configuration
- Suitable Equation for the differential drive robot.



Task Accomplished

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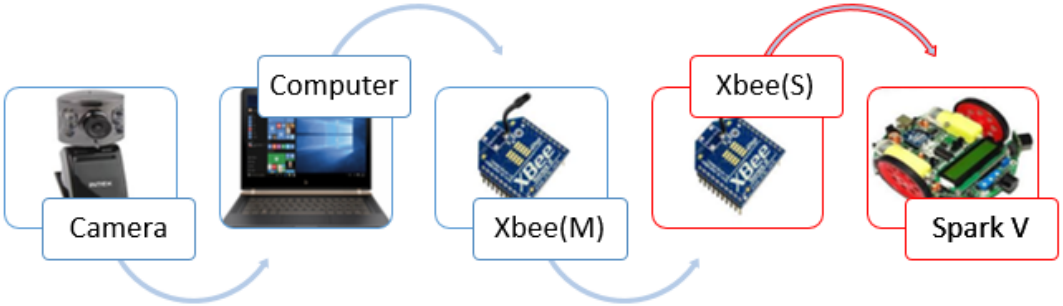

- The robot can turn and move towards the required location using a P controller for differential drive

Next Tasks

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- Implementing a PID controller on the robot to increase the precision of Go-To-Goal
- Go-to-Goal for multiple robots

Challenges Faced

- Communication between computer(Master) and robot(Slave) to transmit the robots initial state and desired state
  (x, y, Φ)(Serial Communication Protocol)
- Developing an effective differential drive robot model for the Spark V
- Conversion from unicycle model to differential drive model
- Implementing Go-to-goal controller using P controller algorithm on the Spark V

Future Plans

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- Communication of Master(PC) to Multiple slaves(Spark V)
- Multiple robots capable of moving to a point selected manually
- Multiple robots making pre-defined formation
- Swarm behaviors like "follow the leader"

Thank You

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THANK YOU !!!