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

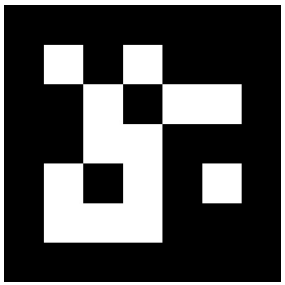
Overview of Task

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

Task Accomplished

Task Completed

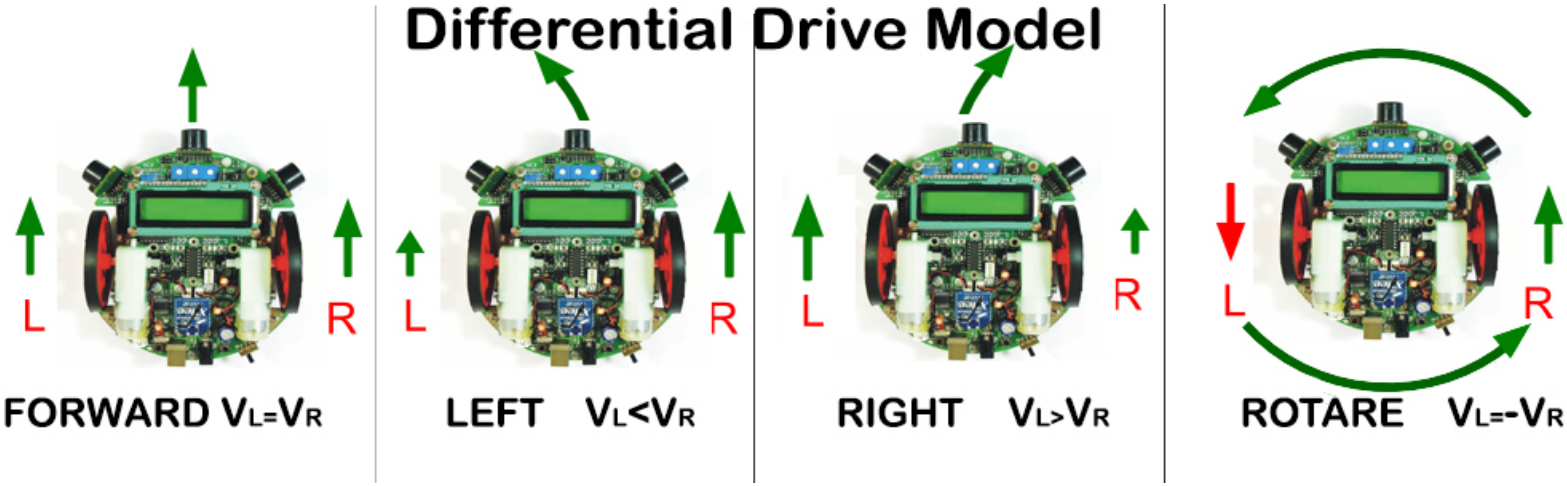
- Cropping and transforming the Arena area under black border.
- The position and orientation (x, y,Φ) of Multiple robots can be found using aruco markers placed on the robot



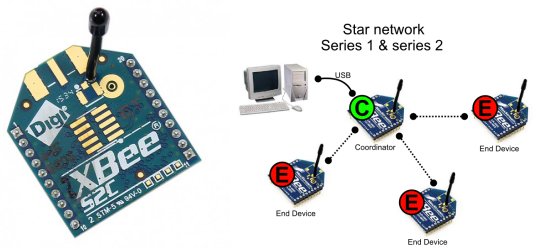
Opencv-Contrib-python (aruco library)
https://github.com/opencv/opencv_contrib

Task Accomplished

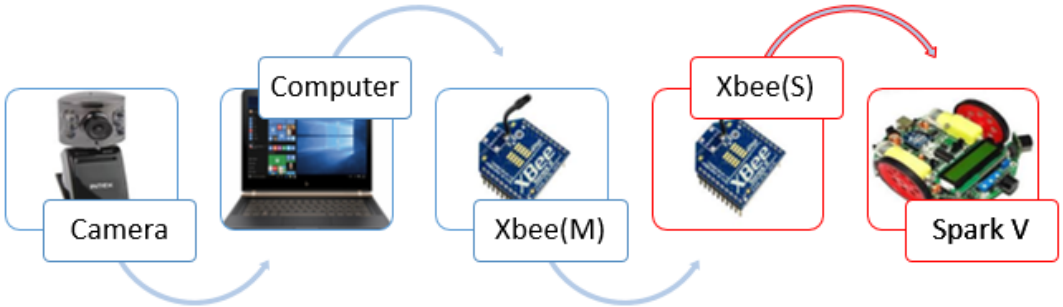
- Suitable Equation for the differential drive robot.



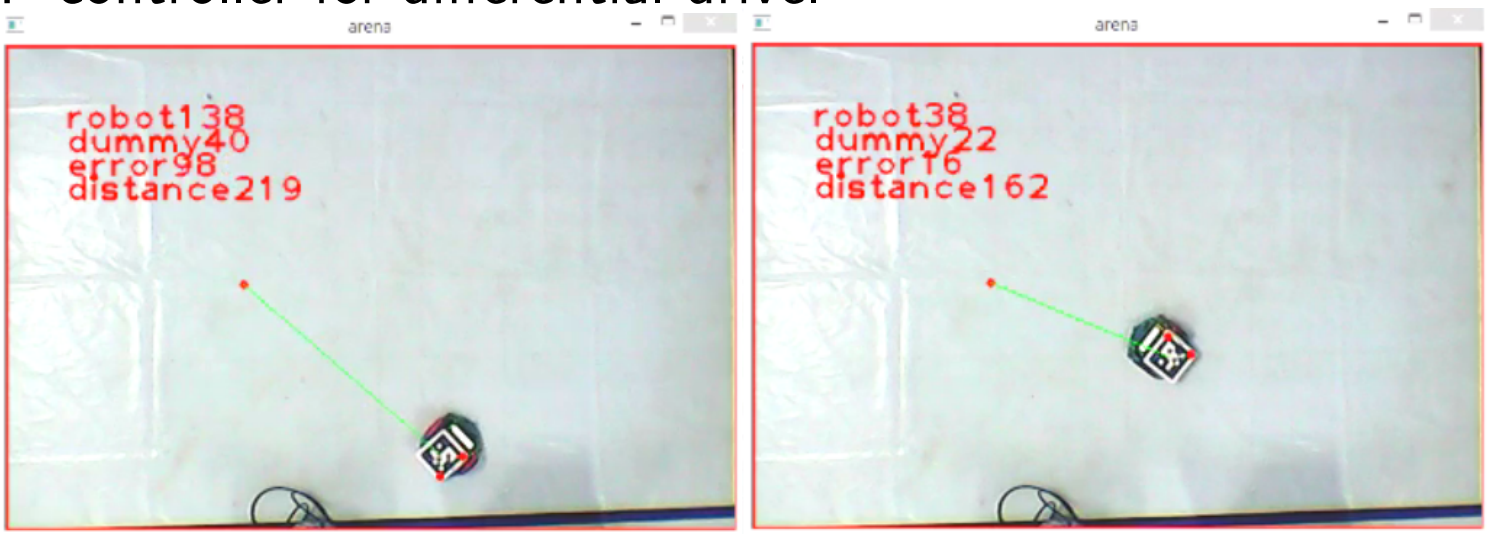
- (x, y, θ) of each robot is transmitted via XBee to the robot. The desired location (xg,yg,ϕ) is also transmitted. The XBees are configured in a star configuration.



Task Accomplished



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



Next Tasks

- Implementing a PID controller on the robot to increase 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 a 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

- 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

THANK YOU !!!