

A photograph of three smooth, rounded stones stacked vertically on a sandy surface. The bottom stone is reddish-brown with white veining. The middle stone is a lighter, mottled brown. The top stone is dark, almost black. The background is a bright, hazy landscape.

MAP TRACER

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What is MAP-TRACER

- A device which will navigate in a unknown territory.
- Provides a map upto considerable accuracy.

Requirement Specification

- To get the sensor values and and convert them to actual distance.
- Making the bot move in the unknown arena with minimal collisions.
- Localisation of the bot.
- Plotting the map with the information we have got from sensors and image processing.

Project Plan

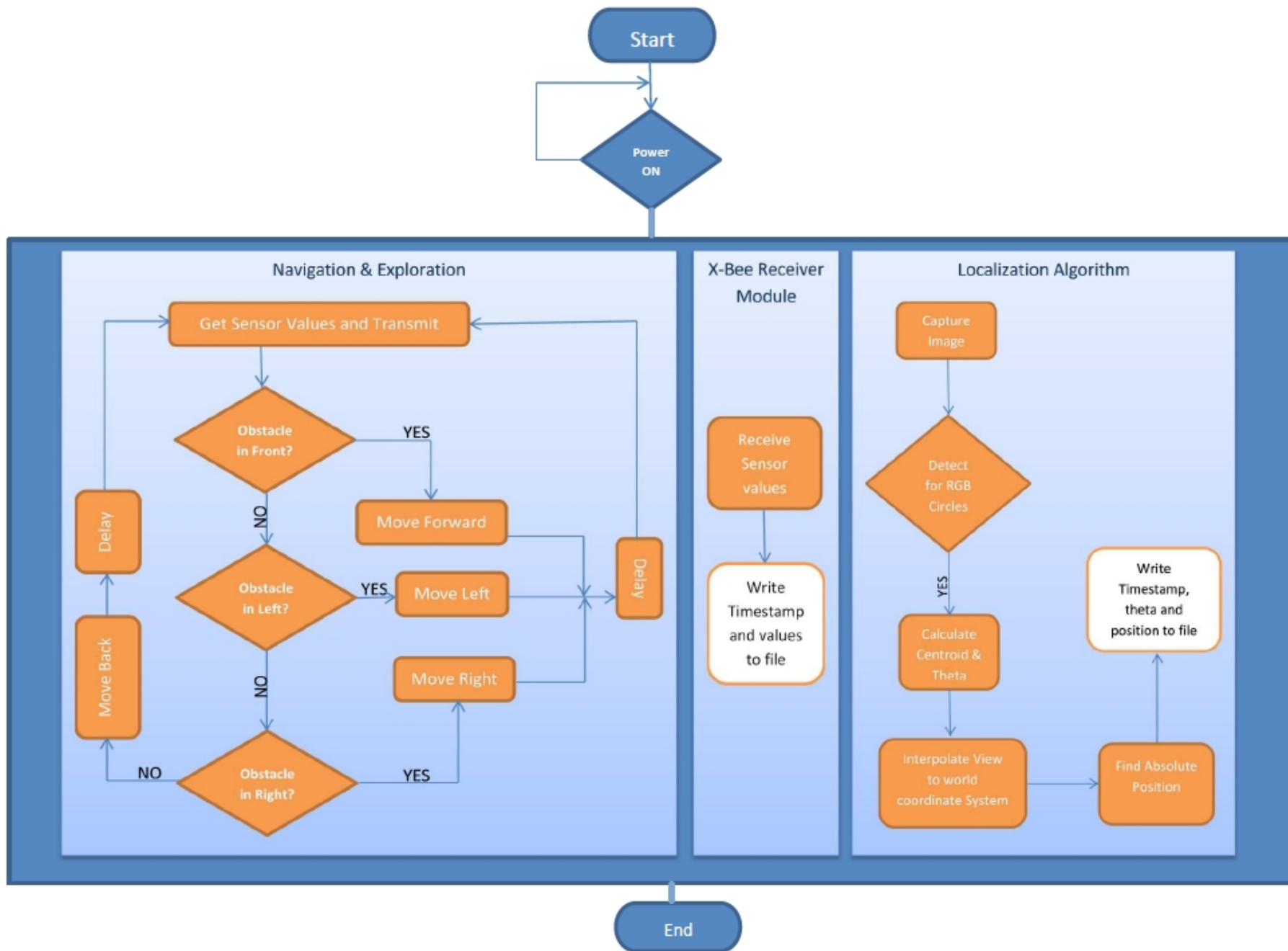
- Plan Followed:-
 - First we converted sensor values to actual distances.
 - We determined the location of bot using a local GPS.
 - Generated two files with timestamps and sensor values in one file and angle values in other file.
 - We applied an algorithm to generate a map file to draw the map

- Work Division
 - Navigation And Xbee Transfer
 - Rahul Nihalani
 - Vivek V Velankar
 - Localization And Map drawing
 - Arpit Malani
 - Hermesh Gupta

- Critical Task and their completion dates
 - Navigation Of Bot
 - Version 1: 22-oct-2010
 - Version 2: 28-oct-2010
 - Final Version: 2-nov-2010
 - Zigbee Transfer
 - Version 1: 15-oct-2010
 - Version 2: 21-oct-2010
 - Localisation
 - Version 1: 23-oct-2010
 - Version 2: 27-oct-2010

- Final Version: 3-nov-2010
- Map Drawing
 - Version 1: 20-oct-2010
 - Version 2: 28-oct-2010
 - Final Version: 3-nov-2010

State Chart Diagram



Innovation And Challenges

- Proximity sensors don't transmit distances, we plotted graph for its reading to get the distance.
- For localisation, we used three different colored(RGB) balls.

- To synchronise the data sent by Xbee and image frames captured by camera we used text files to store the values and then apply synchronisation algorithm.
- One big problem is the accuracy of sensors. Also they are color dependent. (best with white color)
- Xbee data transmission breaks the order of sending. We applied delay in transmission after each sensor value.

Test Cases

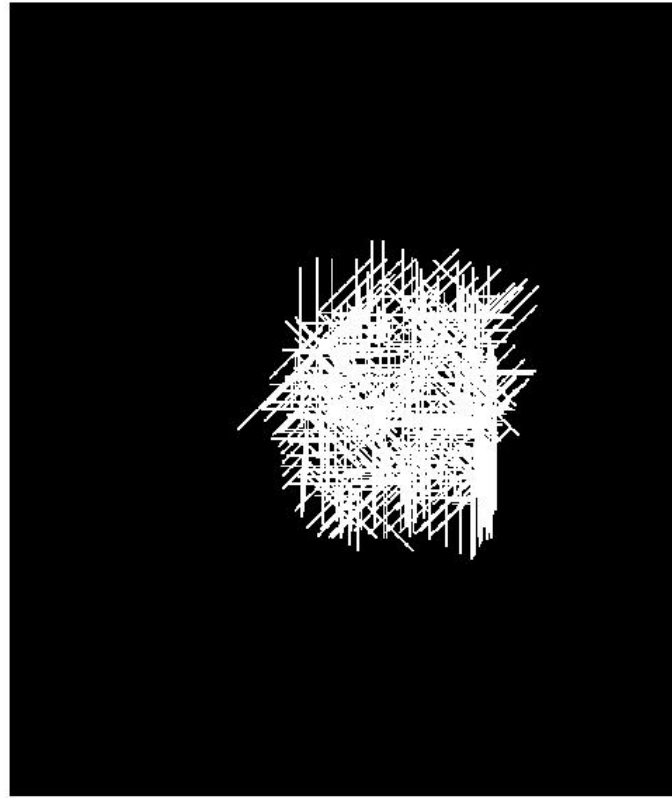


Test Case Description	Expected Output	Actual Output	Important Data/Assumptions
Localize the bot using local GPS	Estimating Actual location of the bot on the field	Get the actual position by simple image processing on captured image	All the three balls will be visible all time. Sufficient white light should be there on the balls.
Reliable sensors values communication using Zig-Bee	Reliable communication path	Not good enough because it is not a reliable serial communication path	Sensors give best value with white obstacles.
Object Exploration using sensors	Reliable sensors values	Not good enough due to poor quality sensors	Sensors should be of good quality
Conversion of view to world coordinate system	Accurate position of bot in world coordinate system	Devices work in 3rd coordinate system and give approximate point	Environment should be correctly lighted with white light

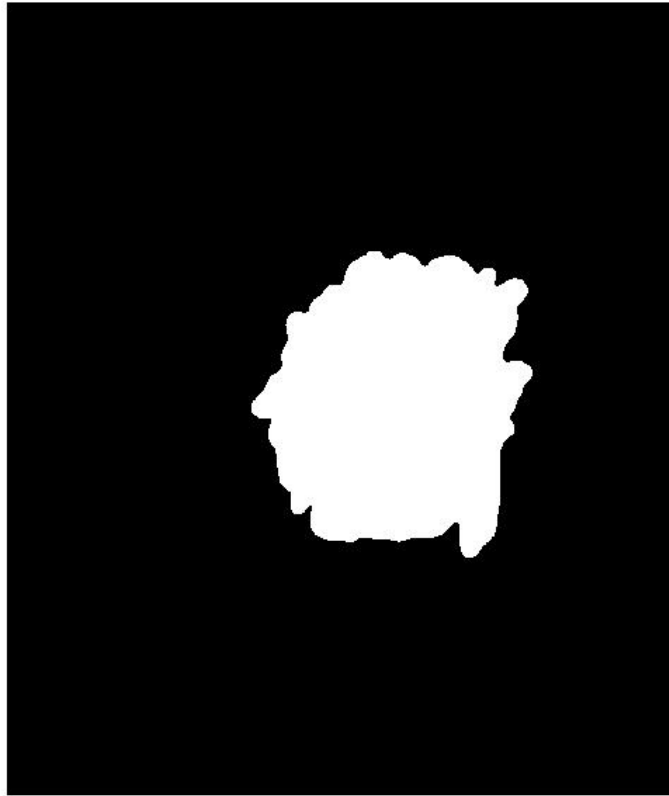
Sample #1



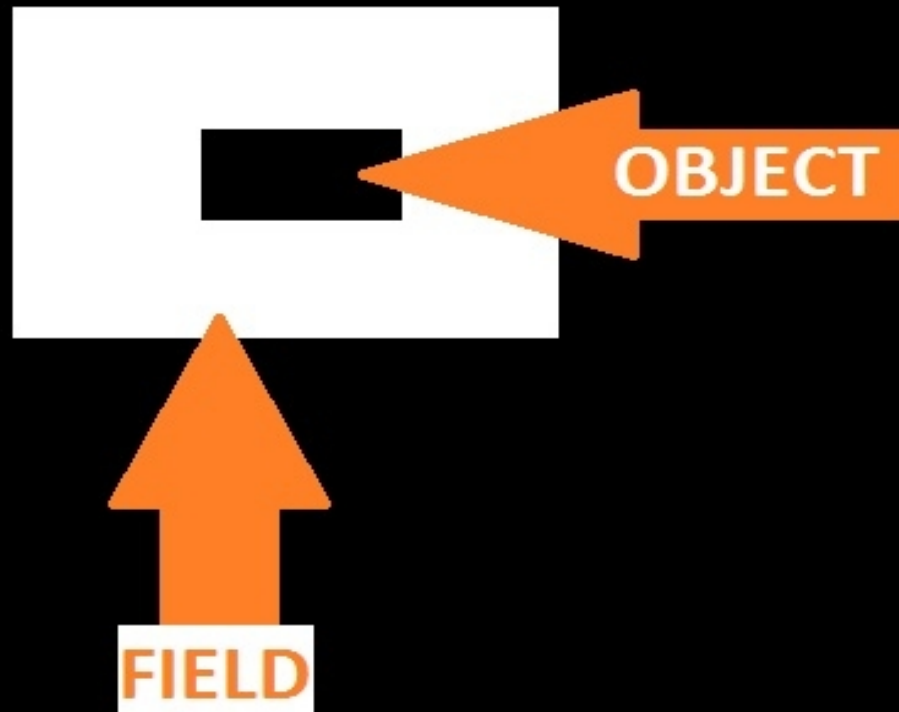
Actual Output



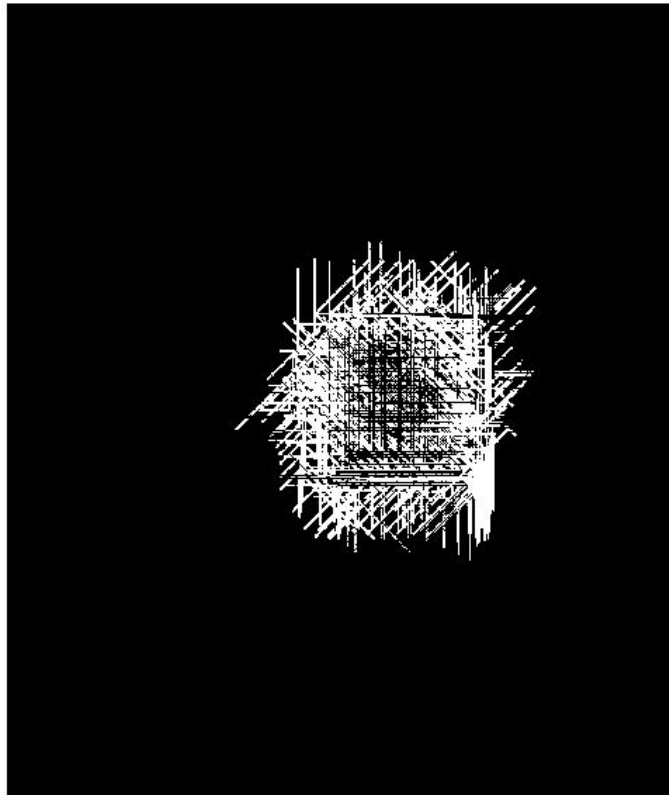
Processed Output



Sample #2



Actual Output



Processed Output



Reusability Feature

- Our whole code is well commented.
- We have divided our code into different modules to increase the understanding and readability of code.
- Code is either in C or in Matlab language.
- The different modules are independent of each other.

Applications



A photograph of a narrow, dark cave passage. The walls are composed of dark, layered rock formations, some of which are covered in green moss. The floor is covered in a thick layer of brown pine needles and small twigs. A bright light source is visible at the end of the passage, creating a strong contrast with the dark interior. The text "Robots Can Reach there" is overlaid in white, bold, sans-serif font in the upper right corner.

**Robots Can
Reach there**

And There!!



During Rescue



Future Enhancements

- We can have sensors of good quality to reduce the error.
- We can use actual GPS for localization of our bot.
- We can modify our map drawing and navigation algorithms to provide better results.

