README : USER GUIDE

Project Title: MAP TRACER
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Project Objective

Exploration of an unknown environment searching operations inside buildings,
caves, tunnels and mines are sometimes extremely dangerous activities. The use of autonomous
bots to perform such tasks in complex environments will reduce the risk of these missions.

Hardware Platform

1. Five Proximity sensors mounted on Firebird for sensing the objects placed in various directions and to support proper navigation.
2. Firebird V ATMEGA2560
3. Five Sharp IR sensors mounted on Firebird Bot for sensing the objects placed in various directions and to support proper navigation.
4. Xbee for serial communication of sensor values.
5. USB Camera mounted on firebird for localization.
6. Two PC's with AVR Studio installed on one PC and Matlab installed on both PC's.

Software Requirements

1. AVR Studio 4 for navigation module
2. Matlab for Image Processing.

Instructions For Included Files

1. **PC-Interface.tar.gz-** This archive includes the matlab source code files which are-
   a. Xbee.m – It records the sensor values in a file called Xbee.txt.
   b. Video.m- It records the camera image frame data in a file called camera.txt.
   c. Combine.m- It combines above mentioned files to a single data file called combine.txt.
   d. Map.m- Using the file generated above(combine.txt) it draws the map.

2. **C-Code archive.tar.gz-** This archive includes c source code which executes on BOT. Files are-
   a. adc.c- It is responsible for the navigation of the bot. It senses the sensor values, converts them to distances and sends to Xbee sender.
   b. lcd.c- It displays the actual free distances in 5 direction on the lcd screen.

3. **Documents.tar.gz-** It includes all the documentation and presentation files. It also includes the doxygen files.

4. **README-** It includes the execution instructions.

Execution Instructions

1. Compile the code adc.c in AVR Studio and burn it on firebird. Note that lcd.c should be present in the same folder as adc.c while compilation.

2. Mount the USB camera on firebird and keep it connected to pc-2. Attach Xbee transmitter to pc-1. Keep the file Video.m on pc-2 and Xbee.m on pc-1. Keep the localization shelter above the arena(around 8 ft) so that the system can calculate it's position while navigation.

3. Place firebird in the arena and switch it on. The bot will start to navigate in arena. Run the programs Video.m and Xbee.m on respective machines. Keep caution that the camera remains still on the bot till navigation is complete.

4. After the bot has navigated the arena sufficiently, stop the bot. Also stop the programs Video.m and Xbee.m.

5. Two files Camera.txt and Xbee.txt will be formed on respective machines.

6. Get the two text files on one pc and run Combine.m with text files in same folder. A new file Combine.txt will be created.

7. Run Map.m with file Combine.txt in the same folder and the map of the arena will be drawn.

Project Setup:-

1. This picture shows the setup for localised GPS, in which three balls are used to track the location of bot in the arena.

Overhead Roof

2. This picture shows the movement of bot in the arena along with the view of overhead camera mounted on top of bot.

Bot in Arena

Overhead Camera View