CS684 Documentation

CS684 – 2010 Project

Depth Detection Based Obstacle Avoidance

Group No : 19

Hussain Manasawala 09307923 husainmanasa@ee.iitb.ac.in

Project Objective

The project involves the design and implementation of an engineering solution to the problem of autonomous geological obstacle detection and avoidance.

Given an Arena with objects placed in a random manner the Robot scans the area to determines the position of the objects creating a 3D model and takes precise action to navigate through the obstacles.

The implementation has three main components :

(i) a stereo vision algorithm for object detection,

(ii) construction of a 3D model of the area with the objects present and

(iii) visual servoing mechanism for motion control and obstacle avoidance.

Hardware

i. One FB5 with ATmega2560 microcontroller.
ii. Two USB Cameras and their mounting mechanism.
iii. Two 2.4GHz XBee modules : One mounted on FB5 and other connected to PC through USB interface.

Software

i. AVR Studio 4 - for coding n compiling C file to hex file and loading hex file on robot.
ii. MATLAB 7.9.0.529 (R2009b) – for image processing and controlling the robot through PC.

Code Description

Code Files.

Filename	Purpose	Executes on
husmainfb.c	Main C Program	Robot
husmaindepth.m	Main M-file	PC.

Deliverables

Filename	Contains
C-code.tar.gz	SourceCode of programs to be burnt on Robot. Contains documentation of the code as well.
PC-interface.tar.gz	Contains Matlab files.
Documents.tar.gz	Contains Project related doc files.

Execution Instructions

- Start AVR Studio and open the project 'huswirelesscontrol.aps' and open 'husmainfb.c'.
- Build the project creating the hex file.
- Connect the AVRISP programmer to FB5 and open the 'Connect' dialog.
- Select the appropriate settings and burn the hex file in the flash memory.
- Start Matlab and open directory containing the code (../PC-interface).
- Open the Image acquisition window using the 'imaqtool' command.
- Adjust the two cameras to align the images vertically.
- Open the file 'husmaindepth.m' and press Run.
- The robot will navigate around the nearest obstacle and redo the steps for next depth detection.