

CS684 Documentation



CS684 – 2010 Project

Project:

The objective of this document is to help someone else run the code that is delivered as part of this project.

Project Title: Automated Electronic Toll Tax Collection System

Students: Group14

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Project Objective

The objective is to make prototype of an Automated Electronic Toll Tax Collection (AETC) system using FIREBIRD V robots. This system detects vehicles passing through toll plaza and automatically deducts the toll tax from the vehicle owner's prepaid account. The same will be intimated to owner through SMS on GSM registered mobile number. Also, this system stores the licence plate number of every vehicle using image processing and calculates the speed of the vehicle.

AETC is the effective solution to avoid traffic jams and to maintain the transparency in transactions at toll plazas across India.

Hardware Platform

1. Firebird V ATMEGA2560
2. GSM module (Serial port communication)
3. XBee communication

Software

1. AVR Studio 4
 2. Matlab
 3. Gcc complier
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Code Description

Code Files

Filename	Purpose	Executes on
AETC_Robot.c	Main Program	Robot
AETC_lcd.c	Contains the abstractions of major operations.	Robot
AETC_TollPlaza.m	Main Program	Toll Plaza PC
AETC_GSM.m	Main Program	GSM Communication system PC
AETC_GSMS.c	Contains message to be sent on a particular number when toll is deducted successfully	GSM Communication system PC
AETC_GSMF.c	Contains message to be sent on a particular number when toll is not deducted successfully	GSM Communication system PC
AETC_Record.xls AETC_LicNum.xls	Contains the ID, account balance, timestamp of last time vehicle has crossed the toll plaza and no. of times the vehicle has violated the rule.	Toll Plaza PC

Deliverables

Filename	Contains	
C-code.tar.gz	SourceCode of programs to be burnt on Robot.	
TollPlaza_PC-interface.tar.gz	Contains Matlab and xls file.	
GSM_PC-Interface.tar.gz	Contains Matlab and C files.	
ProjectDocuments.tar.gz	Contains Project related doc files.	

Execution Instructions

- 1) Compile the C code AETC_Robot.c given in the zip folder C-code.tar.gz and burn it on Firebird V robot using AVR software interface.
- 2) Make a white line strip which has two black patches slightly away from the starting position of the robot. The distance between the two black patches can be around 25 to 30 cm. Also keep the third black patch at a sufficient distance from the earlier two black patches. Mount the camera near this third black patch. You will have to adjust the orientation of camera according to the place where the robot would actually stop on this black patch. Also, make sure that light conditions are properly set for the camera so that goocr algorithm will not fail. The setup is shown in the figure on next page for you reference.



Figure 8.1: Image Capture Mechanism

- 3) Run the matlab code AETC_TollPlaza.m given in the zip folder TollPlaza_PC-interface.tar.gz on windows machine simultaneously with the code AETC_GSM.m given in zip folder GSM_PC-Interface.tar.gz on Linux machine which has a GSM module attached via serial port. Make sure that the two C codes given in GSM_PC-Interface.tar.gz are kept in the same workspace from where Matlab (Linux) is invoked.

In order to check every functionality written in code, we advise you to place robot on white line and start before starting Matlab.

- 4) You may wish to send multiple robots one after the other. In such case, ensure that you are changing the ID of the robot during programming in AETC_Robot.c file. The ID's should be same as those mentioned in the file AETC_Record.xls which is kept in the same Matlab

(Windows) workspace. A sample file is attached in the zip folder TollPlaza_PC-interface.tar.gz.

5) Output of the gocr algorithm can be observed in the file AETC_LicNum.xls which is generated by matlab (Windows) code in the same workspace. Deduction of toll, no. of times the vehicle has violated the rule, speed of the vehicle, timestamp of vehicle last crossing toll plaza can be observed in the AETC_Record.xls file.

6) Make sure that XBee module used for communication are programmed in unicast mode in order to avoid interference of the other XBee module running in parallel. This can be done using a software X-CTU

Coding Guidelines

Please find attached a zip file with this document. Please refer to this code to write your own code.
