

# **Software Requirements Specification**

## **Embedded Systems(CS 306) Course Project**

**Autonomous Target Acquisition and Engagement**

**Group 06**

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# 1 Introduction

The aim of this project is to create an autonomous bot which scouts and identifies possible targets. It then aims and shoots with a mounted laser. The targets are identified based on a predesignated color.

## 1.1 Definitions, Acronyms and Abbreviations

- o **Centralized Server(CS):** Does the image processing and coordinates mechanisms in the robot.
- o **Camera Positioning (CP):** Scouts for possible targets and sends images back to CS.
- o **Mounted Laser Positioning (ML):** Receives commands from CP and aims accordingly at the target.
- o **Firing Mechanism (FM):** Receives commands from Centralized Server and performs fire action.

## 1.2 References

- <http://www.nex-robotics.com/>
- <http://winavr.sourceforge.net/WinAVR-user-manual.html>
- [http://amath.colorado.edu/courses/5720/2000Spr/Labs/Worksheets/Matlab\\_tutorial/matlabimpr.html](http://amath.colorado.edu/courses/5720/2000Spr/Labs/Worksheets/Matlab_tutorial/matlabimpr.html)
- FireBird V Software Manual
- FireBird V Hardware Manual

# 2 Overall Description

We intend to create a autonomous robot which , against a target specification acquires possible targets and shoots at it with desired accuracy. This process begins with a scouting module in which the camera will be 'scouting' , taking pictures and sending them back to the CS for processing. The CS upon recognition of a possible target invokes the MG to aim at the object. Then MG invokes CP to check the aim(this is optional). Then if CP returns confirmation to CS which invokes the FRM or CP again invokes MG.

Then FM return back a 'finish' message to CS. Now CS invokes CP to see if the target is still live i.e. , the target hasn't been displaced by a considerable distance or out of the image frame . If the target is found live the CS repeats from ,invoking MG else we would hear a beep.

The main focus of this project is to create a model-driven target acquisition module ensure proper co-ordination between the mechanisms

### 3 Details

#### 3.1 Functionality

##### **Centralized Server** Requirements:

- o It should be able to perform Digital Image Processing and identify the required objects and compute the final position of the firing arm.
- o It should be able to issue commands to take appropriate actions.

##### **Camera Positioning** Mechanism requirements:

- It should be able to move and scan the field.
- It should be able to send the images to the CS periodically .

##### **Mounted Laser positioning** requirements:

- Aim at the target
- Perform necessary correction by checking the confirmation message.

##### **Firing mechanism** requirements:

- The firing mechanisms must be accurate hence it should be calibrated.

#### 3.2 Supportability

- The code should be written in a modular fashion.
- Interfaces of each module should be properly defined.
- Standard naming conventions should be followed for variables and functions.
- In addition these variable and function names should be self explanatory.
- The code should be well commented.

#### 3.3 Design Constraints

- **Mounted Laser movement precession:** The low resolution of mounted-assembly imposes a constraint on firing at a target.
- **Low Camera Resolution:** limits the accuracy of target detection and confirmation.

#### 3.4 On-line User Documentation and Help System Requirements

- Detailed Documentation
- Project Final Report

### **3.5 Interfaces**

The system requires the following interfaces for its functionality.

#### **3.5.1 User Interfaces**

- Command interface at the centralized server for allowing the user to initiate or terminate the system operations.

#### **3.5.2 Hardware Interfaces**

- Camera hardware interface .
- Laser hardware interfaces.

#### **3.5.3 Software Interfaces**

- Matlab
- Winavr Library

#### **3.5.4 Communication Interfaces**

- Serial communication