Weapon Zeroing and Warriors' Range Efficiency Analysis System of Small Arms for Bangladesh Army

User Manual

Group - B02
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Content

Chapter-1 (Introduction)

1.1 About the Project:

One of the most important aspects of basic soldering is weapon efficiency and its analysis. Weapon zeroing and its analysis is two major domains that works as a benchmark for achieving the goal of weapon training. Zeroing, or sighting in, a rifle is the process of aligning the sights on the weapon with the rifle so you can accurately aim at your target from a set distance. That means, to adjust the front sight tip or the back sight U of the weapon so that the bullet hits the point of aim.

1.2 Objectives

The objectives of the hardware along with the software are as follows:

- Making an effective zeroing tool to improve the accuracy of the firer thereby development of consistent shot firer will be ensured.
- To allow the sub unit commanders a scope of monitoring the results, and thereby the supervisors will be able to provide necessary correction for specific firers
- Making a database for firers to allow tracking of methodological development of firing standards thus individual interest and responsibilities will be improved.
- Minimizing the system loss by implementing application based target checking method which will incorporate AI for precision, and thereby human fatigue will be reduced, error detection, and MPI calculation will be automatic.

1.3 Target Users

Bangladesh Army is the target user of this hardware and software. It is designed to zero the BD-08 rifle of BD Army and the software to calculate the MPI of target along with the efficiency analysis of the firer.

1.4 Outline of the System

1.4.1Software

Using custom android application with the help of pattern recognition we will identify the bullet holes. Then, using MPI correction technique the application will calculate the specific distance needed to correct the impact point. At the same time, this application will also provide information on firer if he has any error. A separate camera will be used for target checking from the firing point. And the projection will be on TV or etc. Android phone will capture the target paper and will provide necessary corrections.

1.4.2 Hardware

Upon receiving the necessary correction, the zeroing tool will rotate accordingly and will correct the front sight tip of the weapon. The correction will be both for the horizontal and vertical side of the weapon.

1.5 Features

Weapon Zeroing is the process of bringing accuracy and correction in weapon. The system will automate the process of zeroing. The following features are included:

- Target Analysis: The bullet pierced target's image will be collected using camera which will be processed using the mobile application incorporated in the system. The application will identify the bullet piercing holes in the target and calculate the MPI value for weapon zeroing. MPI is calculated from the firing impact created on target. The firer fires 5 bullets in the target.
- Data Storage: The data collecting from image process will be storage in the web server which will be reference for analysis of performance of the soldiers. Besides, the data stored will be displayed to the commander to judge the performance of the soldiers.
- Data Analysis: The data collected in server will be analyzed to determine the range efficiency of the soldier. This data will be also used to analyze the firing efficiency of the firer. That is error can be generated due to weapon or due to the inefficiency of firer. Here the analyzed data can find out whether the error is due to weapon or the firer.
- Weapon Zeroing: The data (MPI) collected from image processing is used to zero the weapon. The weapon set at weapon zeroing tool will use its motors which will rotate to zero the weapon. Once it is done, the firer will check the weapon by firing and testing it.
- Firer Profile Management: The firers will have their individual profiles which will carry their own firing data. It will help them to determine their efficiency of firing based on the result analyzed by the system.

Chapter-2 (How to use the System?)

2.1 Hardware

The firer can zero the weapon in two ways:

- The firer can set the weapon on the structure (Figure 2.1). Here the firer needs to know the horizontal and vertical correction values. According to that he will input the correction values in the keyboard attached to the structure and the weapon will be zeroed.
- The second way of zeroing is for those who does not know the horizontal and vertical correction. They will find out the correction using the mobile application. Based on that correction value the mobile application will command the machine to zero the weapon automatically.

Figure 2.1 Structure of Zeroing Tool

2.2 Software

2.2.1 Web Based Management System

- The firer can login through login web page (Figure 2.2) to the web management system using the username and password provided by the system admin.

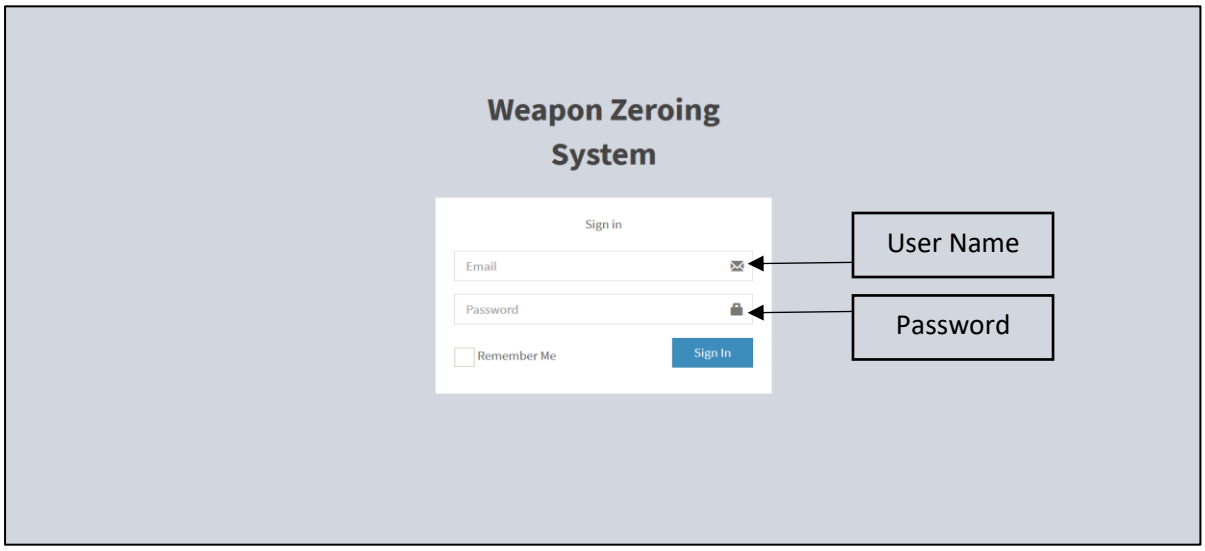

Figure 2.2 Web based Management System Login

- Getting logged into the system, the user will find a dashboard (Figure 2.3). Dashboard will help the user to navigate to all other web pages of the system.

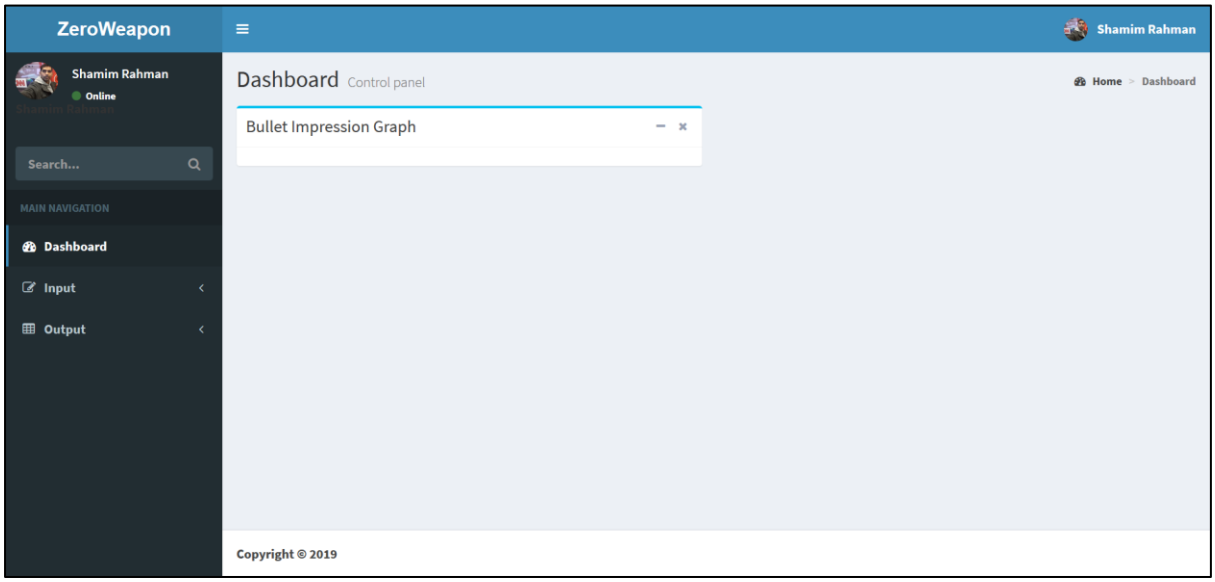

Figure 2.3 Web based Management System Dashboard

- The firer can update his/her profile through the profile update web page (Figure 2.4) from the web based management system.

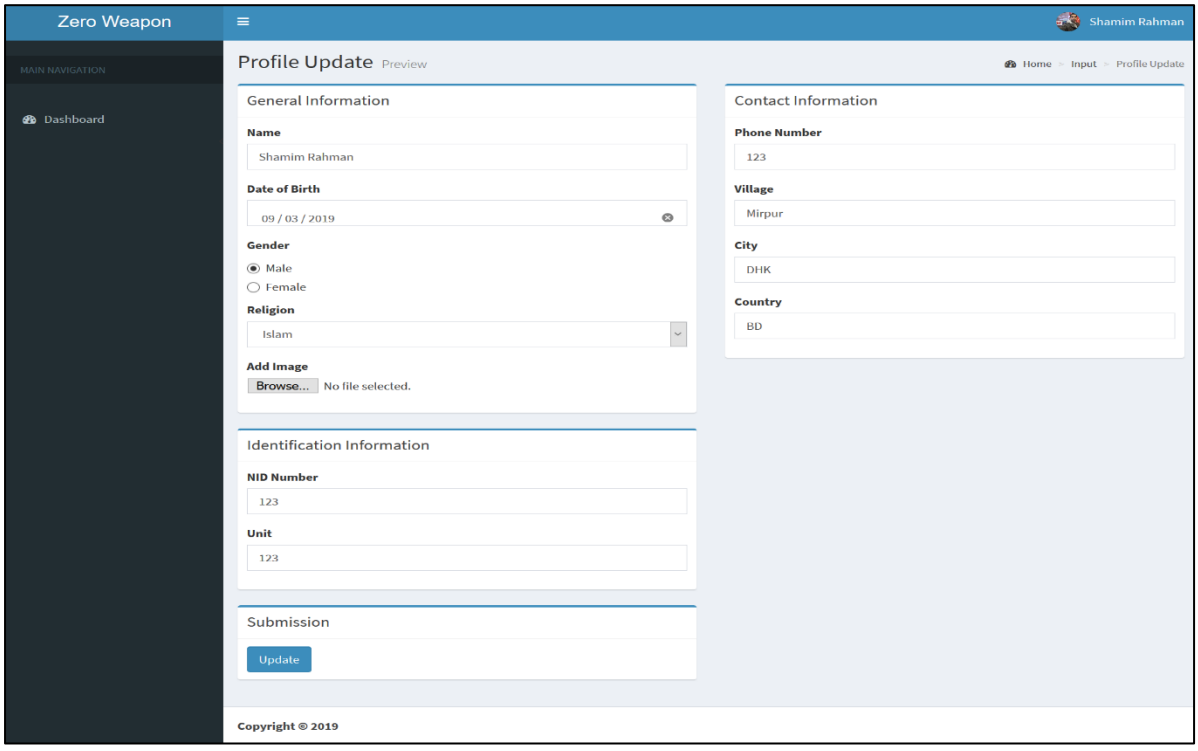

Figure 2.4 Web based Management System Update Profile

- The firer can manually input the of the bullet coordinates from the target paper in the bullet coordinates input web page for every time he has fired to calculate the MPI value or the system will generate those values from the mobile application based target paper image processing.

- The firer can check his previous history of MPI values from this MPI data web page. However the company commander can see the result of all firers under his company.
- Besides, the company commander can also add firer profile through his account.

2.2.2Android Application

- The user can login (Figure 2.5) using the android application. The username and password (same as that of the web based management system) will be provided by the system admin.
- Getting logged into the system the firer can see his profile (Figure 2.6).
- The firer can tap on the Process Image icon of profile activity (Figure 2.7) to go forward to select image and calculate MPI.
- In the error status activity (Figure 2.7), the firer will get the option to select the image of target paper from the gallery. The image will be processed and the correction values will be generated which will be shown in the upper part of the current activity. Here the firer will tap on the Zero Weapon button which will send the correction values to the hardware automatically and finally it will zero the weapon.
- Apart from image processing, the firer can directly or manually input the correction values of the weapon to the application manually (Figure 2.8). It will send those values to the machine which will in return zero the weapon.
- The firer can also observe his previous firing records and the error data from the previous MPI data record activity.

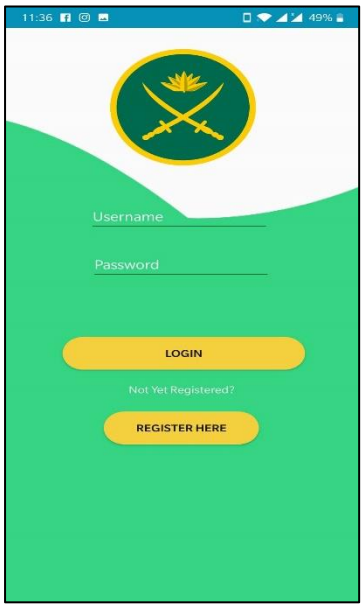

Figure 2.5 Android Login

Figure 2.6 Android User Profile

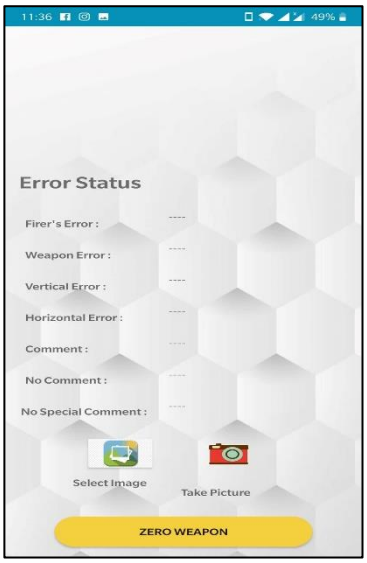

Figure 2.7 Android App Error Status

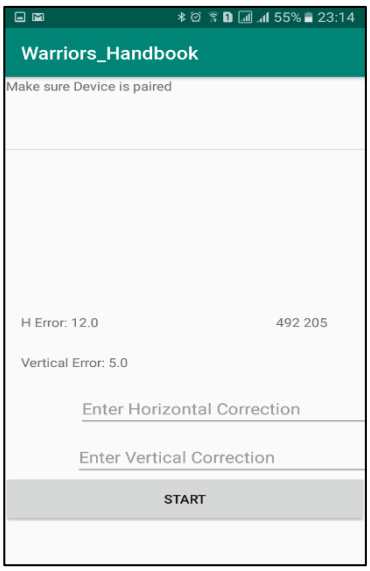

Figure 2.8 Android App Manual Correction

2.3 System Requirements

The firer will be able to use the web based management system using the IP provided by the system admin. Since it is system designed for Army, the system will be available through the IP provided and also within the network connectivity inside the Firing Range. The mobile application can be installed easily in an android phone without any hassle. However, the mobile where the app is running needs to be connected to the IP provided by the system user within the firing range network connectivity so the app reaches out the central database.

Chapter-3 (Safety and Precautions)

3.1 Safety Requirements

The machine for zeroing has motors and actuators along with other circuits. As a result, the user needs to be very careful while handling all these things. The weapon need to be inserted properly so that it does not do any harm to the structure and circuit. Besides, it must be protected from environmental hazards like rain, wind, snow etc. No human interruption should be done in zeroing process.

3.2 Security Requirements

The system being made for Army must be kept under proper security steps and measures. The application should not be allowed to be used by public users.

Chapter-4 (Troubleshooting)

4.1 Hardware

- If the system is not starting check the power supply and even if not working contact maintenance engineer.
- If the zeroing accuracy is anyhow disrupted contact the maintenance engineer for tuning the machine.

4.2 Software

- If data is missing in application check that whether it is connected through the IP of the local network connectivity to the database server.
- If image processing fetches error then consult the system admin immediately.
- If the firer faces problem while using the applications contact system admin.
- If there is hassle while installing the application please contact maintenance engineer.

Chapter-5 (Frequently Asked Questions)

Several FAQs are discussed here.

- Can I register as new firer?
  Ans: No. Since it is Army based project, security is maintained here.
- Can I hack the system?
  Ans: If yes then please inform the developers to remove the back-doors and rectify the security breach problem.
- Can I zero any weapons?
  Ans: No. Only BD-08 Assault Rifle.
- Do I need Internet to use the system?
  Ans: No. But you have to be connected to the database server through the IP provided by system admin in the local network connectivity.
- What is the efficiency of the system?
  Ans: Very high.