GUN IDENTIFICATION USING IMAGE SYNCHRONIZATION FOR DTI's VIRTUAL SHOOTING RANGE

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Abstract— **The DTI's current virtual shooting range detect only one shooting gun. If there are many gun shots upon the same training scenario, the system cannot know what gun shoot belongs to what gun. The goal of this research project is to prove the concept of developing an algorithm to classify gun identification. The gun identification plays an important role in multiple weapon shootings of the virtual shooting simulator. The image synchronization technique was used to interface the shooting to a microcontroller module. A simulated model was experimented to represent a real system for convenience. The result showed that the adopted technique was reliable and at the same time the algorithm yielded correct and acceptable results. The idea can be applied to infrared laser point detection of more than one trainees being trained simultaneously.**

Keywords— *Gun Identification; Image Synchronization; Virtual Shooting Range, Shooting Simulator*

I. INTRODUCTION

The virtual shooting range is a combined architecture of hardware and software that shooters can be presented with defined exercises of different terrain backdrops, various environmental conditions and virtual ranges. The 3D visualization software lets trainees to practice firing in realistic, projected terrains like deserts, mountains, jungles and plains. The system helps the trainer to simulate real-world scenarios to enhance the skill level of trainees. The Royal Thai Air Force officers were introduced to the system as shown in Fig. 1.
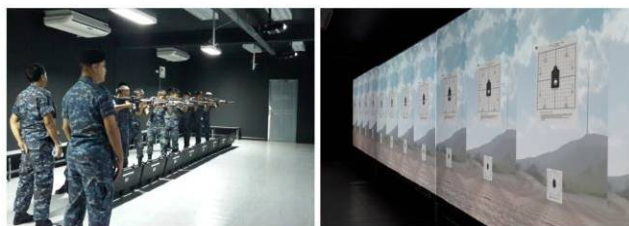

Fig. 1. DTI's virtual shooting range

The officers were often trained with a number of small arms, i.e. M-16 rifles, 9 mm pistols, automatic grenade launchers and .50-caliber machine guns [1]. At the time when many types of gun are being shot at the same scenario, the trainees can hear and obtain a report for realism, and see where their shots land with green for misses and red for hits.

Zen AWeSim® [2] is a state-of-the-art firearms simulator aimed at training recruits to Special Forces and Commandos. The simulator can be adapted to a number of firearms and the versatile simulator imparts basic training, improves weapon handling skills and tests the skill level of trainees in complex and war-like scenarios. Four trainees can be trained simultaneously with the system being able to upgrade up to 8 trainees. The simulator also enables annual range classification to be carried out and the individual firing data stored for records.

There has been a few works in the field of shooting simulator to address the approach to classify the identification of different weapons because it is a secret and proprietary of the business. Therefore, our system was in-house design in both hardware and software configuration for test and evaluation. How each component was designed and operated will be described in the next section.

II. SYSTEM DESIGN

The virtual shooting range is designed for training and practicing the trainees' shooting skills. It can support multiple types of training scenarios that are made for different training objectives. The training procedures are different in these scenarios as well as the targets in the scenes and the training weapons used. The flexibility that the virtual shooting range provides could also raise some system design issues. One of the main issues, and the objective of this research paper, is how to identify which weapon the on-screen shot comes from. For better understanding of this issue, the system diagram of DTI's