Bullet Hit Point Detection From Video Streaming

Final Year Project Proposal

by

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Revision History

Compiled By	Checked By	Date	Reason for Change	Version
Nimra	Mr. Touqeer Ali	13th Oct 2021	Initial Version	1.0
Nimra	Mr. Touqeer Ali	14th Oct 2021	Introduction Revised	1.2
Hamad	Mr. Touqeer Ali	15th Oct 2021	Revised 5.1 & 8	2.0
Nimra& Hamad	Mr. Touqeer Ali	18th Oct 2021	Revised 2,7 & References	2.2

Project Description

This project idea is based on the real time detection of a bullet hitting a Thermal board or any material which may produce impact whether it is an air gun bullet or the conventional bullet through video streaming.

1 Introduction

In the recent turn of events, the United States faced the most devastating epidemic of Gun violence. More than 65,000 individuals were killed and several hundred thousand were injured in the last five years and according to the statistics 88 percent of the gun fire was never reported to the police. So in order to lessen this tremendous epidemic of gun violence they produced several systems, in which they were concluded to be somewhat successful but not always right.

Working of project:

1. We will provide videos dataset as input.

2. The system will detect the bullet hit point on the thermal board

3. As output it provide only those frames of the video where bullet hit the board.

2 Application/Literature Review

For Instance they produced a system in which they embedded acoustic sensors all over the city and when the gunshot is heard by these sensors they estimate the distance and perform a triangular trajectory in order to indicate the area where gunshot is fired and the precise location upto 1km.

There are several technologies to detect such possibilities but they all have their limitations. Few of these devices are described below after the research:

Laser Detection:[1] The gun wound can be detected through a computerized laser module and can give appropriate detective measures regarding the projectile of the bullet and where it can be hit. This can be calculated using several means but it has a dependency on the clear image where the projectile has been hit or where it might attack next according to the Artificial Intelligence algorithms of human psychology.

Sound Sonar:[2] This technique is fairly straightforward but not always acceptable as it has a tendency of detecting the sounds from different angles which may or maynot be diverted through a medium. However this technique is used by ShotSpotter Respond

Systems which is the crux of the decreased rate of Gun violence in the US.

Anemometer:[3] The basic technology which has been around for decades which measures the heat dissipated into the air and can detect the trajectory of the bullet and the point where it may impact according to the airspeed and heat measurement.

Acoustic Vector Sensors:[4] The latest Technology developed by the Microflown Technologies, which measures individual air particles which are affected by sound waves. They can even detect where the location of the sound is and which device produces such sounds, for instance the sound of conversation or a firing of a sniper rifle.

Table 1: Applications Comparison

Features	**Applications**			
	ShotSpotter [1]	Boomerang [2]	PIlAR V [3]	Proposed Solution
Camera Detection	✓	✗	✓	✓
Mobile Device Application	✗	✗	✗	✓
Remote Processing	✓	✓	✗	✓
Thermal Imaging	✗	✗	✗	✓
Sonar Detection	✓	✓	✓	✗
Bullet Impact Prediction	✗	✗	✗	✓
Bullet Hit Point	✗	✓	✓	✓

3 Problem Statement

The problem which I want to solve is to record the detection of a bullet impact and its trajectory hitpoint in video streaming which will be used in order to provide statistics of gun violence, crime reduction and will help in investigations of severe accidents from arms. However this is a fairly complex system if encountered with the raw camera footage which may or may not be on Gun or through any mobile device carried by a civilian.

Mobile device Cameras can detect flares and may have the possibility of capturing the bullet hitpoint but in order to enhance this capability there are several modifications which we have to make in order to be more precise and accurate. This will solve the predictions for the bullet projectile and the trajectory which it will be accustomed to make.

According to the latest research there are several systems working on this in order

to have a stable environment which will provide correct evidence and support to fellow investigators, but it is still in research and development.

4 Project Aim and Objectives

This project goal which we will set for this is the correct detection and identification of the trajectory and the prediction of the bullet projectile on the surface. As the research in this subject is still undergoing, this project will act as a baseline or the blueprint for the new hardware and the technology which will feed that hardware to be more precise and robust.

5 Scope and Significance

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5.1 Project Scope

A gunfire locator or gunshot detection system is a system that detects and conveys the location of gunfire or other weapon fire using acoustic, vibration, optical, or potentially other types of sensors, as well as a combination of such sensors. These systems are used by law enforcement, security, military, government offices, schools and businesses to identify the source and, in some cases, the direction of gunfire and/or the type of weapon fired.

5.2 Project Significance

In order to tackle such a scenario we will use thermal imaging footage and map it onto the raw footage which will indicate the points and the trajectory prediction of where the bullet was hit and what are the precise chances the next bullet will hit. We will use the flare resonance technique from Thermal Imaging in order to determine the projectile which was carried out from the previous bullet and shock wave theory to depict the cone-shaped shock wave for a bullet which will be travelling with a certain velocity. The diameter and propagation angle will determine the next place of impact and the wave arrival time for the victims which are quite near.

6 Project Development Methodology

The Project modules will be divided into respective deliverables:

1. Research

2. Design

3. Implementation

4. Final Product

5. Testing

Research:

The research will be carried out in the scenario to depict the latest developments and research in the market in order to cater the possible solutions and new technologies amendments in it.

Design:

Design will indicate the process which we will follow in order to enhance the final product's limitation and precision.

Implementation:

The technologies which will be going to be used and the hardware if applicable in building the error free product.

Final Product:

The final product which will accumulate all the given scenarios and environment in order to perform better then other market competitive researched products.

Testing:

The testing phase in which we will test the product to its limits.

7 Tools and Technologies

The tools and technologies which we will going to use are defined as :

1. Python Language

2. Database MySQL

8 Work Plan

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8.1 Team Structure

Table 2 showns the member working on the project and their respective roles which have been assigned keeping their working abilities in mind.

Define roles of each team member in your group. See example Table 2.

Table 2: Team Structure

Sr. No.	**Team Members**	**Role**
1	Mr. Touqeer Ali	Project Manager
2	Hamad	Analyst
3	Nimra	Quality Assurance Engineer
4	Nimra and Hamad	Developers

8.2 Work Distribution

The work distribution among team members is given in table 3.

Table 3: Work Distribution

Sr. No.	**Team Member**	**Work Assignment**
1	Hamad	Analysis
2	Nimra	Design
3	Nimra and Hamad	Testing
4	Nimra and Hamad	Development

8.3 Gantt Chart

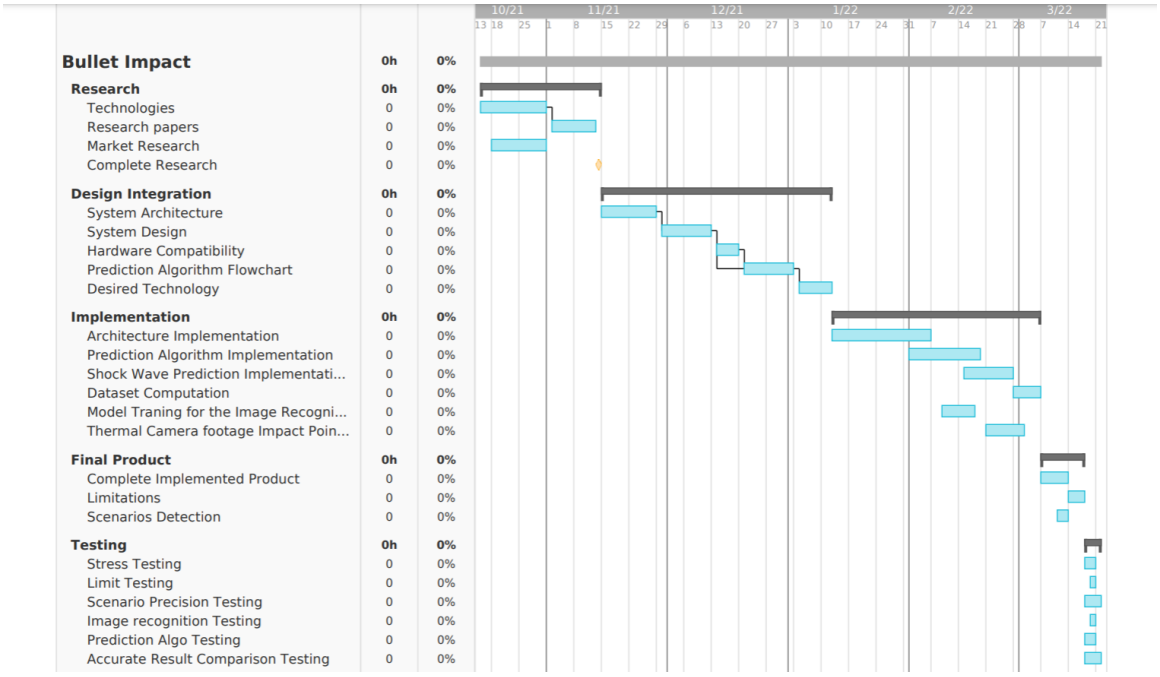

Figure 1: Gantt Chart

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