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Photographing Bullet Trajectory Using Laser in Well-Lit Outdoor Crime Scenes

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Abstract: This study explores the use of laser technology to photograph bullet trajectories in well-lit outdoor crime scenes, addressing the challenge of laser visibility in bright conditions. Using a high-powered green laser, a Canon EOS R50 camera, ND filters, and long exposure photography, bullet paths were successfully captured under daylight. A moving reflector enhanced laser visibility for accurate trajectory representation. Tests showed early morning and evening offered optimal conditions, with lower exposure and higher apertures improving clarity. Findings highlight laser trajectory photography as a valuable forensic tool for crime scene reconstruction and courtroom evidence. Future research should explore automated reflector systems and advanced imaging techniques.

Keywords: *ND Filter; Long Exposure Photography; Laser; Laser Alignment.*

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I. INTRODUCTION

Investigators attempting to recreate the flight paths of fired projectiles or bullets have a number of options, including the utilization of trajectory rods, colored strings, and lasers. Each of these reconstruction tools has their benefits and weaknesses, but lasers have always provided the straightest and sharpest representation of a fired bullet. Lasers have typically been limited to use in out door crime scenes because of less or no visibility of their path in well lit environment. Even when the position of the shooter is not known we can use inclinometer like devices to locate the shooter position, yet the path photography is a matter of question. The project is meant to tackle with this problem by using a high-powered laser and a couple of photographic accessories along with some moving reflectors investigators should be able to photograph laser trajectories at in well lit out door crime scenes. Using lasers, we can track the path of the bullet fired in a crime scene. In this study we photograph this laser path through various photographic techniques and accessories which will provide as a permanent visual record of the bullet's path which helps in crime scene reconstruction, analysis of bullet path, and serve as compelling visual evidence in court.

II. METHODOLOGY

To capture the laser path in a well-lit outdoor crime scene, we employed a creative setup. First, we determined the shooter and target positions, then aligned a laser on a tripod along the bullet trajectory. A mirrorless camera equipped with an ND filter was positioned behind the laser, set to long exposure mode with a minimal aperture opening (f/22) and ISO below 500. Utilizing a 2 second timer, we moved a reflector - a white board (in order to reflect the laser towards camera) tied to a thin rope from the shooter's position towards the target, as the camera captured the image.

➢ *Objectives*

- To photograph bullet trajectory using laser in well-lit outdoor crime scenes.
- To find out best camera settings for photographing laser in different well lit outdoor crime scene.

➢ *Hypothesis*

- Bullet trajectory made by lasers in well lit outdoor crime scenes can be photographed by a camera.
- Lower exposures favor in photographing lasers

III. RESULT ANALYSIS

The photographs taken are then analyzed and presented with its details and camera settings involved in taking the particular photograph. The details include the time at which the photo was taken, measurement from shooter position to

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target distance, camera and lens used to take the photo, settings used on the camera to take each photo. All photographs were captured using similar techniques in JPEG format and basic adjustments like color and highlight adjustments have been done using lightroom app.

➢ *Sample 1*

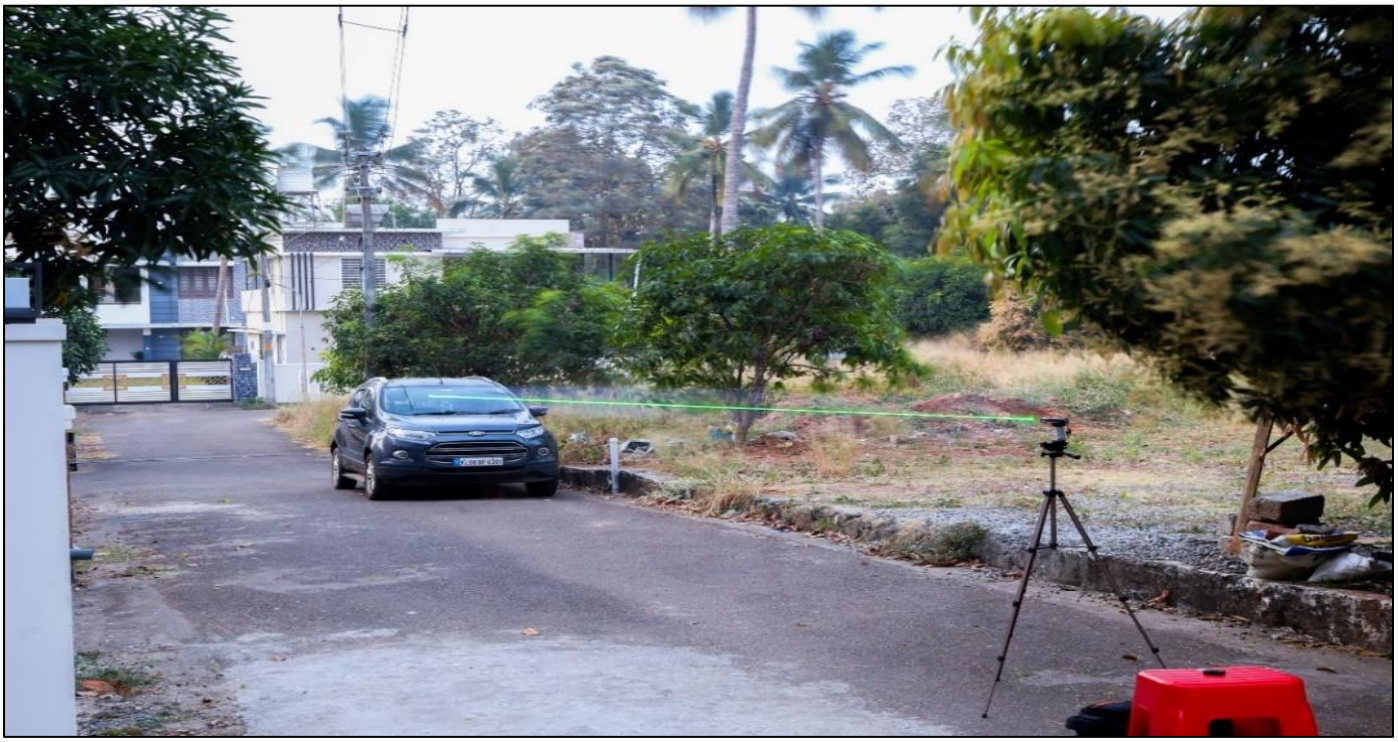

Fig 1 Crime Scene Photograph no.1

This photo depicts a shooting crime scene in which the victim was sitting inside the car. This photo was taken at 8 am in the morning using a canon EOS R50 camera with kit lens 18-55mm. The measurement from the shooter to target is 11 meters. The camera shutter was opened for 10 seconds with an aperture of f/22 with 100 ISO. The focal length of the lens used was 27mm. From this photo we also understand that capturing the laser trajectory in the early hours of a day results in better image.

➢ *Sample 2*

Fig 2 Crime Scene Photograph No.2

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This photo depicts a shooting crime scene from a balcony of a house. This photo was taken at 5PM in the evening using a canon EOS R50 camera with kit lens 18-55mm. The measurement from the shooter to target is 7 meters. The camera shutter was opened for 13 seconds with an aperture of f/22 with 200 ISO. The focal length of the lens used was 18mm. From this image we understand that early evenings are more favourable for laser photography

IV. CONCLUSION

The present study showcases on how to photograph a bullet trajectory using laser in well lit crime scenes using a camera and different accessories. This study is rather like a tutorial on how to photograph a bullet trajectory using laser in different well-lit crime scenes. In this project we have taken 5 different crime scene photographs and analyzed those to find out the best settings to photograph the laser in different daylight lighting conditions. These photographs serve as a visual documentation of the bullet trajectory and can be used in crime scene reconstruction and as evidence in the court. However further studies and possibilities with different angles and perspectives using modern technologies and accessories are to be done in future projects. The present study can be used as a relevance for upcoming future studies related to this topic.

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