T.I.T.A.N.L

Design and Implementation of Targeted Aerial Navigator For Loitering

Presented by
MURUGESAN.A
SANJAY.S
MUKILAN.R
RAGHUL.R
UG Scholar, Department of ECE, Panimalar Engineering College

Guided by
Dr.J.JENEETHA JEBANAZER
Professor, Department of ECE, Panimalar Engineering College

TITAN.L

CONTENTS

PRODUCT MARKET

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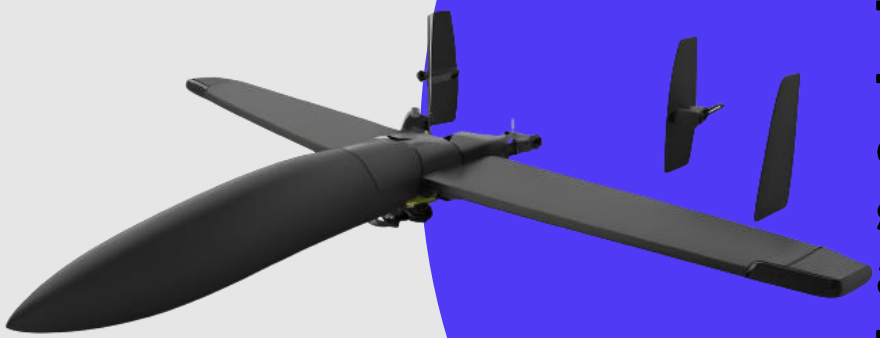
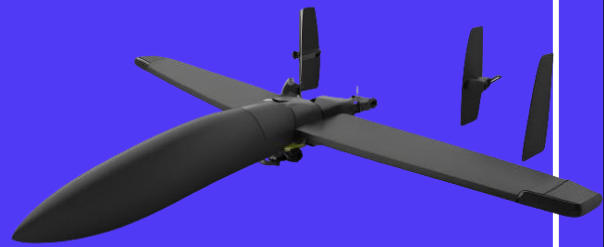


Product Intro

1. The Tactical Indigenous Targeted Aerial Navigator for Loitering (TITAN.L) embodies this paradigm shift, providing an agile and responsive solution for military operations.

OBJECTIVE

- This research focuses on designing a loitering munition using a compact yet powerful procedure designed for target destruction in a war zone scenario.
- Operating without the complexity the UAV relies on control systems and communicates with a base station for navigation and mission execution.
- Equipped with a warhead, the UAV autonomously identifies and neutralizes potential targets using the YOLOv8 algorithm for object recognition.



NEXT

INTRODUCTION

- The evolution of Unmanned Aerial Vehicles (UAVs) has witnessed substantial progress, particularly in the context of loitering munitions.
- This comprehensive system ensures the successful execution of missions, offering potential applications in surveillance, reconnaissance, or other fields
- requiring precise target acquisition and tracking.
- This research diverges from conventional surveillance applications, emphasizing a small yet formidable model tailored for target destruction.
- Object recognition and target localization are achieved through the YOLOv8 algorithm, underscoring the UAV's precision in identifying and neutralizing potential threats.

LITERATURE SURVEY

S.NO	TITLE	AUTHOR & JOURNAL	METHOD	INFERENCE
1	**Small object detection in UAV image based on slicing aided module**	**Hengshan Zong,Hongbo Pu,Haolong Zhang,Xingyu Wang,Zhenyu Zhong,Zeyu Jiao 2022 IEEE 4th International Conference on Power, Intelligent Computing and Systems**	**YOLOV5 Algorithm**	**The proposed method makes use of the relatively abundant small target features in the shallow network, adds a layer to the YOLOV5 detection head to upsample the feature map, continues to expand the feature map**
2	**Path Following for Unmanned Combat Aerial Vehicles Using Three-Dimensional Nonlinear Guidance**	**Zian Wang , Zheng Gong , Jinfa Xu, Jin Wu , and Ming Liu , Senior Member, IEEE**	**3-D Nonlinear Guidance**	**An effective path-following guidance algorithm for unmanned combat aerial vehicles by pursuing a look-ahead target-point along the desired path is devised using 3-D path Following method.**

S.NO	TITLE	AUTHOR & JOURNAL	METHOD	INFERENCE
3	Secure, Efficient and Lightweight Authentication Mechanism for Unmanned Aerial Vehicle Network	Waqas Salam Syed Khaliq-ur-Rehman Raazi Nauman Hafeez Ansari 2023 7th International Multi-Topic ICT Conference	SELTHA has defined three phases for a drone-to-ground control station and drone-todrone authentication and key agreement (AKA)	SELTHA mechanism to secure drone communication with the ground control server and with droneto-drone.
4	Hierarchical Intrusion Detection System for Secured Military Drone Network	Vivian Ukamaka Ihekoronye, Simeon Okechukwu Ajakwe, Dong-Seong Kim, Jae Min Lee	This study proposes an optimized e IDS framework to provide artificial intelligence (AI)-based security to the IoD network, securing their activities	This paper proposed an optimized hierarchical anomalybased intrusion detection system capable of detecting and alerting the internet of drone networks of lethal attacks in military operations.

NEED FOR THE PROJECT

- The Tactical Indigenous Targeted Aerial Navigator for Loitering epitomizes a new era in military capabilities, offering unparalleled precision in responding to emerging threats while maintaining a strategic advantage through selective targeting.
- Portable, robust and suitable for mass production to engage in army arsenals
- Provides High-Profile Target Destruction with minimal amount of inventory cost and maximum amount of efficiency.

Novelty of our Project

- Utilizing Efficient Yolo V8 Algorithm and CSL angle processing.(CSL angle processing helps in detecting corners or junctions in aerial images. Corners are important features in image processing, especially in tasks like object recognition, scene understanding, and image stitching).
- Portability and Payload Capacity(upto 1.5to3 Kg).

EXISTING SYSTEM

- Traditional target detection and tracking systems often lack integration, requiring manual intervention and coordination.
- The traditional target detection method uses the Three dimensional Non-Linear Guidance Method.
- Limited accuracy in target acquisition due to reliance on manual processes or standalone sensors.
- Lack of real-time spatial information, hindering efficient decision-making and autonomous operation.
- Also The Existing system utilizes the traditional Yolo v3 Algorithm and Small object detection method

Proposed System

- In our project, the Raspberry Pi 4 serves as the central processing unit, orchestrating the entire system.
- The Pi Camera is utilized for target detection, capturing visual data that is processed to identify the target using YOLO V8 ALGORITHM.
- A servo motor is employed to precisely point a laser light at the detected target, enhancing accuracy. Simultaneously, a laser light sensor is utilized to further confirm the presence of the target.
- The GPS module integrated with the Raspberry Pi enables real-time location tracking, providing crucial spatial information.

- All components are interconnected via relay or through a central control mechanism. Once the target is confirmed and its location is determined, the Raspberry Pi triggers the necessary actions through relay it ignites the payload.
- The payload or Warhead Contains the Explosives with chemical agents and Electronic trigger(Relay).

- HARDWARE REQUIREMENT
- 1. POWER BANK 5V 3AMP
- 2. RASPBERRY PI
- 3. PI CAM 8MP
- 4. GPS
- 5. SERVO MOTOR
- 6. LASER LIGHT
- 7. RELAY
- 8. MEMORY CARD 32 GB

FLOW CHART DIAGRAM

1.RAW IMAGE

2.GPS/NavIC DATA

OBJECT DETECTION

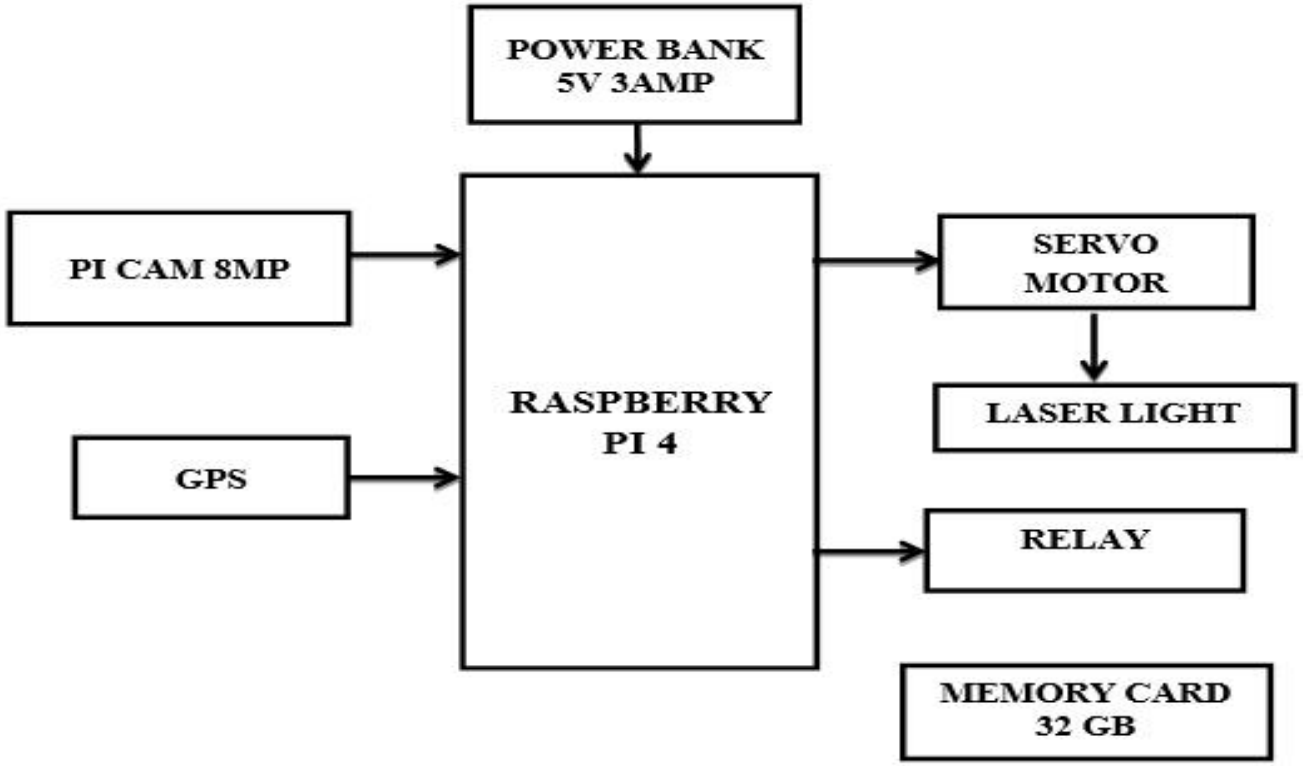
YOLOv8 ALGORITHM

TARGET POSITIONING

PAYLOAD IGNITION AND TARGET DESTRUCTION

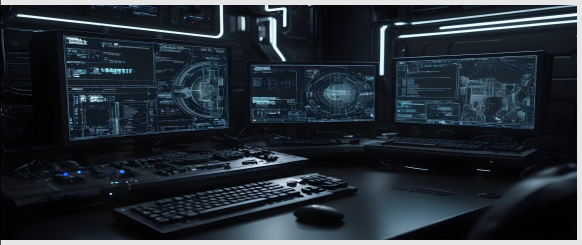
3.Target Destruction Confirmation Message

BLOCK DIAGRAM



RESULTS

Application Scenario



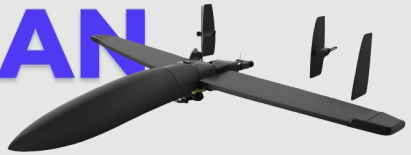
Target Detection and Tracking: Utilizing Raspberry Pi 4 as the central processing unit, our project employs a Pi Camera to capture visual data for target identification, facilitating efficient detection and tracking.

Precision Targeting with Laser Technology: A servo motor is integrated to precisely direct a laser light towards the detected target, enhancing accuracy in pinpointing desired objects or locations.

The Indian military landscape has witnessed a significant boost with the induction of indigenous loitering munitions, marking a paradigm shift in defense capabilities.

Future Advancements

TITAN



TITAN2

- Implementation of information sharing among multiple drones and the base station, creating a networked environment.
- Implementing RF absorber coatings for stealth enhancement, reducing the radar cross-section of UAVs, thus minimizing the risk of detection by enemy radar systems in operational environments.
- Proposing a robust Intrusion Detection System (IDS) for the Internet of Drones (IoD), this system monitors telemetry data among participating nodes, effectively thwarting potential malicious attacks. Utilizing a hierarchical and optimized Random Forest (RF) anomaly-based model, fine-tuned through Randomized Search Cross-Validation (RSCV)

THANK YOU FOR WATCHING THIS