WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Anti-riot drone with tear gas

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ABSTRACT:-

This paper proposed the development of an anti-riot drone system which is controlled by wireless technology through graphical user interface (GUI) . This proposed design capable to fly with help of user control and also capable to track target automatically Proposed mathemathical model and controlling algorithum technique by which quad rotor canbe capable to fly with the help of wireless control, trajectory tracking, graceful motion and accurate altitude hold performance. In this system we used Radiolink crossflight controller which ensure smooth movement, graceful motion and trajectory tracking. GPS and camera system make it more efficient. This work aimed to design a quad copter that will try stable its position according to preferred alititude. also her stability check has been done with pitch and roll .

Keywords— Anti-riot drone, graphical user interface,stability and performance

1. INTRODUCTION

The anti-riot drone system is a technological advancement developed to support law enforcement and security agencies in managing public disturbances, protests, and riots more effectively and safely. With the rise of drone technology in the 2010s, initially used for surveillance and reconnaissance, law enforcement began integrating these unmanned aerial vehicles (UAVs) into crowd control operations. The growing demand for non-lethal and remote methods of managing civil unrest led to the evolution of drones from passive observation tools to active intervention systems. Modern anti riot drones are equipped with high-resolution cameras, thermal imaging, loudspeakers, and payload systems capable of deploying tear gas, dye markers, or acoustic deterrents. These systems provide real-time aerial surveillance, allowing for better situational awareness and decision-making without endangering officers on the ground. Some advanced models even incorporate artificial intelligence for facial recognition and crowd behavior analysis. Countries such as China, India, and Israel have actively adopted these systems, while others, particularly in Europe, face legal and ethical constraints that limit their use. Despite their effectiveness in crowd management, anti-riot drone systems raise concerns regarding privacy, misuse, and escalation of violence, making their deployment a topic of ongoing debate in terms of legality, ethics, and human rights

2 LITERATURE SURVEY

In recent years, the use of drone technology in law enforcement has increased significantly, particularly for crowd monitoring and control in riot-prone situations. Anti-riot drones are designed to provide surveillance, gather real-time intelligence, and, in some cases, disperse crowds using non lethal methods. This literature survey presents an overview of the existing work in the field of anti-riot drone systems, highlighting their capabilities, technological components, legal and ethical considerations, and challenges.

Surveillance and Monitoring Capabilities:- A large portion of existing research focuses on the surveillance potential of drones in riot scenarios. According to a study by Park et al. (2018), drones equipped with high-resolution cameras and thermal imaging can effectively monitor large crowds from a safe altitude. These drones are often integrated with artificial intelligence (AI)-based image processing systems to detect violent behavior or sudden crowd movements.Patil et al. (2020) proposed a drone surveillance framework using real-time video processing and machine learning algorithms for behavioral pattern recognition in large gatherings. Their system demonstrated high accuracy in detecting panic, aggression, and stampede conditions.

Communication and Coordination:- Gupta and Sharma (2019) emphasized the need for drone swarms in riot control. Swarm intelligence allows multiple drones to coordinate autonomously, cov ering a broader area and increasing system resilience. Their study also explored the use of blockchain for secure communication between drones and command centers to prevent hacking or data manipu lation.Furthermore, the incorporation of 5G networks as discussed by Liu et al. (2021) has improved real-time data transmission and reduced latency, enabling faster response times and better coordi nation with ground units.

Non-lethal Intervention Techniques:- Recent innovations have enabled drones to carry non-lethal deterrent devices such as tear gas canisters, rubber bullet launchers, or acoustic weapons. Singh and Verma (2021) developed a prototype drone capable of dispensing pepper spray in a controlled and targeted manner. Their design includes a safety mechanism to prevent collateral damage to bystanders. However, the use of such drones raises ethical concerns. Johansson and Eriksson (2020) critically assessed the implications of drones being used for physical intervention, citing risks of misuse, lack of accountability, and potential escalation of violence.

Legal and Ethical Frameworks:- The deployment of anti-riot drones often falls into a legal grey area. A review by Cavoukian (2019) outlined the challenges in balancing civil liberties with security needs. The study stressed the importance of transparency, data protection, and the need for strict usage protocols. In democratic societies, deploying drones for riot control must comply with human rights laws and guidelines set by oversight bodies.

Challenges and Limitations:- While promising, anti-riot drone systems face several technical and operational limitations: Battery Life: Limited flight time restricts long-duration operations. Environmental Conditions: Wind, rain, and other weather factors affect drone stability and data quality. Autonomous Decision-making: Full autonomy in hostile scenarios remains a complex challenge, especially in ethical judgment and threat evaluation. Ahmed et al. (2022) explored hybrid drone systems powered by solar energy and AI-enhanced navigation, which may extend operational capacity and improve autonomy in dynamic environments.

3 PROPOSED METHODOLOGY

To overcome problems we specially designed drone makes use of a controller- based circuit system coupled with 4x High RPM quad copter motors for easy navigation and control. camera with transmitter to transmit live footage. When the drone approaches the crowd the security person controlling the drone will press a button on the remote which will cause the smoke canister to drop. Thus, activating the tear gas canister when it impacts the ground which will be dropped on to the crowd using a servo mechanism. And also for live location tracking a GPS(Global Positioning System) module is used to navigate and hover in the place.

System Architecture

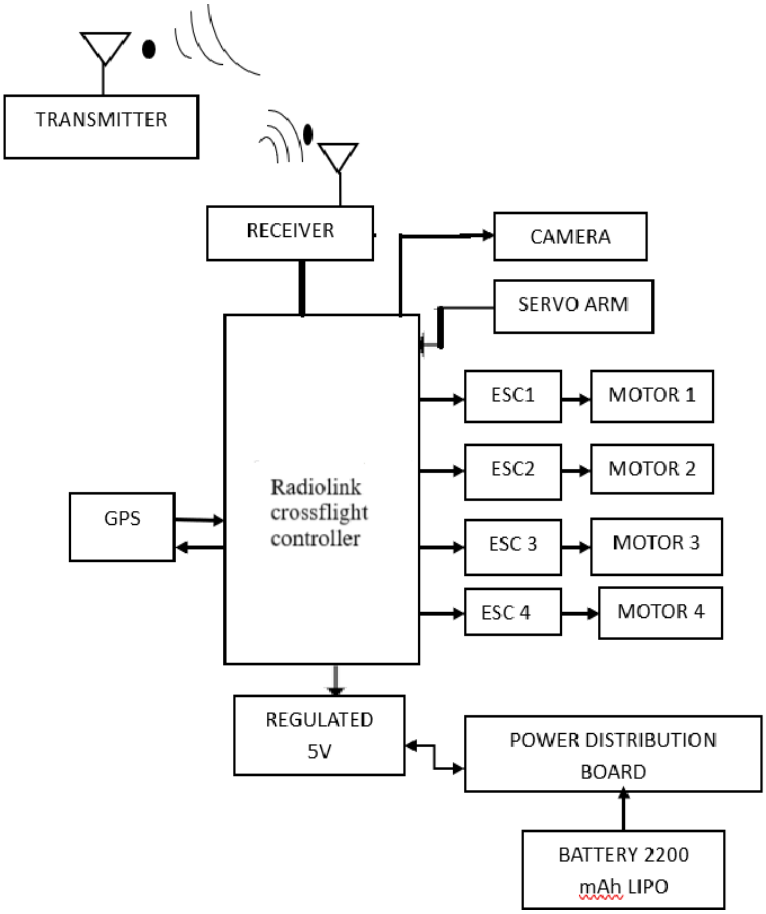

Figure 1: Block diagram of System Architecture

a)TRANSMITTER AND RECEIVER(FLY SKY CT 6B):

The Transmitter is an electronic device that uses radio signals to transmit commands wirelessly via a set radio frequency over to the Radio Receiver, which is connected to an aircraft or multi rotor being remotely controlled.

Figure 2: transmitter and receiver(fly sky ct 6b)

b)RADIOLINK FLIGHT CONTROLEER :

The Radiolink CrossFlight Flight Controller is a state-of-the-art device tailored for both beginners 3 and seasoned drone enthusiasts. Engineered with precision and reliability in mind, this flight con troller offers exceptional control and stability, making it ideal for a wide range of drone applications, from aerial photography to FPV racing. With its advanced gyroscopic sensors and flight algorithms, it provides accurate and responsive control, allowing pilots to execute precise maneuvers with ease. Featuring a sleek and compact design, the CrossFlight Flight Controller is easy to install and integrate into various drone platforms. Its compatibility with Radiolink transmitters and receivers ensures seamless connectivity, while its user-friendly interface simplifies setup and configuration. Whether you're capturing stunning aerial shots or participating in adrenaline-pumping racing com petitions, the Radiolink CrossFlight Flight Controller delivers the performance and versatility needed to elevate your drone flying experience to new heights.

Figure 3: Radiolink crossflight controller

c)GPS MODULE:

Figure 4: GPS module

Neo 7M GPS module that includes an HMC5883L digital compass. The new NEO 7 series is a high sensitivity, low-power GPS module that has 56 channels and outputs precise position updates at 10Hz. This GPS module also comes with a molded plastic case which keeps the module protected 4

against the elements making it ideal for use on your aircraft or quadcopter. This Neo 7M GPS module uses an active circuitry ceramic patch antenna to provide an excellent GPS signal which outperforms the older Neo 6 series modules. This Neo 7 module also includes a rechargeable backup battery to allow for HOT starts and also includes an I²C EEPROM to store the configuration settings.

4 .IMPLEMENTATION AND WORKING

The main goal of this project is to provide safety to police and armed forces and gives quick response for those who are in danger. To do this, Mission planner software is used to program. When I started my project design and make plan for the project, I faced lots of problems that are lack of the parts and hard to have them in short period for our project such as accurate and budget friendly f light controller ,special type of motors and servo mechanism system design to build droping mech anism.another challenge is that proper connection of power distribution board to ESC and flight controller ,and also do the accurate programming by using mission planner. However, we should take considerations on the weight of design and focused on the thrust strength of the motor to rise the design without cause any over load so, we can fly it in easily method.

1.Remote Operation: Operated without placing humans in dangerous environments (e.g., riots, war zones).
2.Cost-Effective: Generally cheaper than manned aircraft for surveillance, monitoring, and map ping.
3.Real-Time Data: Provides live video and telemetry data for immediate decision-making.
4.High Maneuverability: Capable of accessing tight or hazardous areas where manned vehicles cannot reach.
5.Rapid Deployment: Easy to launch and deploy quickly during emergencies or dynamic situations.
6.Autonomous Capabilities: Can perform pre-programmed missions with minimal human input.
7.Versatile Payloads: Can carry different sensors or tools based on mission requirements (e.g., cam eras, gas detectors, sprayers).
8.Scalable: Use Useful in a variety of fields—agriculture, defense, surveillance, delivery, and dis aster response.

5 RESULT

Figure 5: Computer Transmitter

Figure 6: Rotation of propeller

Figure 7.Drone movement

Figure 8:Servo mechanism for tear gas holding

Figure 9:Overall drone structure

6. CONCLUSION AND FUTURE SCOPE

In this paper, we researched about implementation of ”Anti- riot drone with tear gas ”has been successfully designed and tested.in this system,the drone will have an assembly to carry tear gas canister for this we designed servo mechanism to hold canister .In condition of riot security officers who control drone will press a button of transmitter will causes canister to drop down on crowd area.thus,activating canister which will be dropped on the crowd using servo mechanism. The devel opment and deployment of Anti-Riot Drones represent a significant advancement in the field of public safety and crowd management. Through the integration of surveillance systems, non-lethal deterrent mechanisms, and autonomous or semi-autonomous navigation, these drones offer a proactive and ef f icient means of monitoring and mitigating civil disturbances. This research highlights the potential of such systems to reduce human risk, enhance situational awareness, and enable rapid response in high-tension scenarios. However, the implementation of Anti-Riot Drones must be carefully regu lated to address ethical concerns, protect civil liberties, and ensure compliance with legal standards. Future research should focus on refining AI-based decision-making, improving sensor accuracy, and establishing robust frameworks for accountability and transparency in their operational use.

7 . REFERENCE

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