Enrollment No: MIT2021117

Title: Using Drones to Enhance the Policing, Surveillance & Rescue Operations

Summary:

There have been many incidents when it becomes difficult or, in the worst case scenario, impossible to monitor some region. For example, a building which is under fire, or some remote location where no one lives. In such places or situations it is very difficult for a human to go to that place. Drones can help in such situations. They offer a secure way to monitor any region without the need for a human to be present at that location physically. With the rise of cheap and easy to assemble drones, they are also a better economical option rather than hiring any human for doing the same task. In this proposal, we propose the construction of an IT infrastructure which will consist of a number of drones and associated computer systems and equipment to achieve better results in policing, surveillance and rescue operations.

National/International Status:

Some states within India are already utilizing the capabilities of drones to achieve better surveillance and disaster relief management. For example, in Nov 2021, The Tamil Nadu government passed a sanction to establish a mobile drone unit in the Greater Chennai police at a cost of Rs 3.60 crore for enhancing surveillance and to rescue people stranded in beaches and high rise buildings.

The Government of India(GoI) is also attracting startups to build solutions for drone infrastructure. In its 2021 budget, GoI has announced a corpus of INR 1.97 Lakh Cr for 13 Production Linked Incentive (PLI) Schemes. Out of which the government has now reserved INR 120 Cr for drones and drone components. The scheme offers a 20% incentive over the value addition to manufacturers of drones and related software. Many startups have already started developing such solutions. For example, Drone delivery startup TechEagle is building an end-to-end technology solution for enabling a drone logistics airline for last-mile and mid-mile deliveries. In September 2021, they raised $500,000 in seed funding led by India Accelerator, with participation from Vinners Group, Sitics Logistics, and marquee angel investors.

Justification:

Traditionally, the job of surveillance, policing and disaster relief is primarily done by humans. Although, in recent years, technology has been used to do all of this in a much better way, there are still far too many cases where automation can be increased. For example, if a residential building comes under fire, then it is very difficult even for firefighters to go inside the building and save people. In such situations, fire-proof drones can be used effectively to locate all victims without the need for a human to go in such a situation.

Drones have also been proven to be an exceptional part of rescue and disaster relief operations. In 2011, a nuclear accident took place at the Fukushima Daiichi Nuclear Power Plant in Ōkuma, Fukushima Prefecture, Japan due to the Tōhoku earthquake and tsunami on Friday, 11 March 2011. This resulted in massive uncontrolled radiation and made it impossible for any human to go to this nuclear plant to examine the situation. Then, the natural choice was a machine and a drone was used for this. The relief team deployed a remote control drone to capture the images of the insides of the plant and successfully contained the radiation within radiation proof walls.

Background:

Drones have been in active use in many military operations including monitoring, surveillance, defense not just in India but in other countries as well including US, Israel etc.

They offer a cheap alternative to a rather expensive and dangerous job of monitoring & surveillance. Many governments and technology companies are investing in drone technology for it to be available at even lower cost. India, as a country, also has necessary IT infrastructure with its enhanced internet connectivity, availability of cheap computing devices etc. to support the development & maintenance of systems related to operating drone.

Objectives:

We propose to design a framework of the construction of an IT infrastructure to support the system responsible for the operations of drone related usages. This will help the local authorities to equip themselves with better resources to ensure the safety of their people and land. Within the scope of this project will be the development of:

- Control Room System(consisting of computer system)
- Data Center System(to store all the data captured by drones)
- Associated Machinery(Computers, Databases, Network Cables)

Along with that, to ensure viability, a cost assessment of the planned system will be carried out.

Research Plan & Time Schedule:

Phase 1: Planning

- Literature survey, study and analyses of current developments
- Consult experts working in the field of Drone construction
- Develop a preliminary design of system

Phase 2: Identification & Selection:

- Identify the main components required for building drones(blades, batteries, motors)
- Identify the manufacturers of drone components
- Finalize the system design and perform economic analysis

Phase 3: Development:

- Development of a small scale drone monitoring system capable of monitoring 500m^2 of area
- A network of such small drone monitoring stations where any drone of one station can be captured safely on any other station

Phase 4: Testing

- Testing the developed unit.

Time Period	**Targets**
0 - 2 months	● Literature survey, study and analyses of current developments ● Consult experts working in the field of Drone construction ● Develop a preliminary design of system
2 - 4 months	● Identify the main components required for building drones ● Identify the manufacturers of drone components ● Finalize the system design and perform economic analysis
4 - 8 months	● Development of a small scale drone monitoring system capable of monitoring 500m^2 of area ● A network of such small drone monitoring stations where any drone of one station can be captured safely on any other station
8 - 9 months	● Testing the developed unit.

Expected Outcome:

In the end, we will have a complete IT infrastructure with a Control room to track the location of every active drone along with Data Centers that will be storing the data(images, videos and audio) that will be sent by various drones.

We will also establish a robust supply chain of drone components necessary for assembling various kinds of drones.

Any government body or private company will be able to use this framework as a blueprint to develop the necessary IT infrastructure & logistics for themselves in case they want to develop the same system for their specific use cases.

Proposed Budget:

Technical assistant salary cost(monthly): 15000 * 9 = 1,35,000

Expert consultation cost(4000/hr): 4000 * 20 = 80,000

Computer Systems(assuming per computer 35000): 35000 * 20 = 7,00,000

Data Center: 10,00,000

Miscellaneous expenses: 1,00,000

Total cost: 20,15,000

BUDGET			
Serial No	Expenditure	Cost	In words
1	Technical assistant salary cost(monthly)	15000 * 9 = 1,35,000	One Lakh Thirty Five Thousands
2	Expert consultation cost(4000/hr)	4000 * 20 = 80,000	Eighty Thousand
3	Computer Systems(assuming per computer 35000)	35000 * 20 = 7,00,000	Seven Lakh

4	Data Center	10,00,000	Ten Lakh
5	Miscellaneous expenses	1,00,000	One Lakh
	GRAND TOTAL	20,15,000	Twenty Lakh Fifteen Thousand

Literature References:

[1] Kim B, Min H, Heo J, Jung J. Dynamic Computation Offloading Scheme for Drone-Based Surveillance Systems. Sensors. 2018

[2] Sayani Sarkar, Michael W. Totaro, Khalid Elgazzar, "Intelligent drone-based surveillance: application to parking lot monitoring and detection," Proc. SPIE 11021, Unmanned Systems Technology XXI, 1102104 (13 May 2019)

[3] G. Ding, Q. Wu, L. Zhang, Y. Lin, T. A. Tsiftsis and Y. Yao, "An Amateur Drone Surveillance System Based on the Cognitive Internet of Things," in IEEE Communications Magazine, vol. 56, no. 1, pp. 29-35, Jan. 2018,