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Design and Control of Drone Using Raspberry PI model and APM 2.8 Flight Controller

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ABSTRACT:

Unmanned Aerial Vehicle (UAV) is commonly known as Drone. It is extensively being used these years. Nowadays drones are used in various Military applications, Commercial Cargo Transport, and 3-D Mapping etc. For supporting the weight of the plane, and shock absorption functions, landing gear design is highly needed. Unmanned aerial vehicles (UAV) are the logical successors to modern aircraft and advancements in automated technology. The current generation of UAVs is focused on wartime capabilities and reconnaissance, leaving an existing market untapped by UAV technology: the commercial field. There are thousands of applications for UAV technology in the civilian market, from quick response applications and media outlets to communication technicians and horticulturalists. Drones represent a compelling subject of inquiry, prompting an exploration into their intricate mechanics, constituent elements, and their expansive array of applications that profoundly shape their future prospects. Integrating principles from electronics, mechanical engineering, and particularly aviation, drones epitomize a convergence of diverse disciplines. These aerial vehicles manifest in various forms, categorized by distinct configurations such as
bicopters, tricopters, quadcopters, hexcopters, octocopters, and more.

INDEX TERM:

Unmanned Aerial Vehicle, Artificial intelligence, Random Access Memory, integrated development environment , Visual Studio

INTRODUCTION

As we know we have a drone for spying and combat (in development) but we think it is not enough for army and other forces.

Consider the following conditions :

1. Surgical strike (we have a drone but only for spying and track the movement of terrorist)

2. Neutralizing militants in JK

3. At the time of Terrorist attack (drone just see the movement and notify to force)

4. Naxalite attacks or keep tracking of their movement

We mean we don't have a quick reaction drone which can fire missile similar to Pike 40mm (Length:16.8 Inch , maximum firing length: 2000m). Due to increasing interest, Drones are being commercially

launched in the market today in various size and forms. Quadcopter or quad rotor is a special kind of Drone that consists of four rotors and is being actively applied in the field or research and development in recent years. The major technological advantage of Quadcopter over other species of its kind is its stability, simpler design and maneuverability. In helicopters tail rotor is provided to control yaw motion. Unlike helicopter, Quadcopter has four rotors where a pair of rotor move in clockwise direction and a pair rotate in anticlockwise direction.

BACKGROUND:

We have seen many terrorist attacks and in those disaster ,we lose many peoples and soldiers. According to Wikipedia:

No of incidents :12,002

Total Deaths :19,866

People injured: 30,544

And also, we heard about the soldiers deaths on border as well as attacks of Naxalites. So we have to develop the quick response drones for our forces**.**

PROBLEM STATEMENT:

We need to develop a quadcopter or hex copter for forces for above conditions which is purely electric as well as attached with minimum three 40mm missiles for quick reaction and helps our forces to control the situation. Also , it has to be smart for team , so we can integrate it through Artificial intelligence and hence at the time of network failure it can operate for the forces .[7] The integration of Artificial Intelligence (AI) technology into our unmanned aerial vehicle (UAV) adds an unprecedented dimension to its operational capabilities.

OBJECTIVES:

(a) To design Quadcopter controlled by using raspberry pi.

(b) To communicate and control Quadcopter on global network .

(c) demonstrating proficiency in both hardware integration and software development for unmanned aerial vehicle (UAV) applications.

(d) Develop robust communication protocols and interoperability standards to facilitate seamless integration with ground control stations, other UAVs, and existing infrastructure, ensuring reliable data exchange and command dissemination.

LITRATURE SURVEY:

UAV Swarms contain the possibility of numerous capabilities and applications. Within the military domain the applications are abundant. In an article by [1] a layered, multi-purpose UAV Swarm is described. The swarm contained four distinct layers of capability, each having a specific set of functions. The layers are: 1) communication and visual reconnaissance, 2) attack site coverage, 3) anti-missile sensing (defensive), and 4) securing tactical zones (offensive) There are three primary variables that can be used to evaluate the overall success, or effectiveness, of a swarm, as described by Edward [2]. The three variables are 1) elusiveness, 2) standoff capability, and 3) superior situational awareness. Elusiveness is the ability to stay undetected by the enemy until the units converge on the enemy, overwhelming the enemy by surprise and sheer numbers. Standoff capability is the ability to cause damage to the enemy over some distance, while accepting little damage in return. Finally, situational awareness is the ability to measure and know the environment and the position of other systems within the SoS. This awareness allows for calculating the best attack vector on the enemy while coordinating with other systems. When assembling a swarm of systems there are two key types of coordination that are necessary. Based on the research presented at the AIAA conference in 2003 [3], spatial and temporal coordination along with the specification of distinct roles

within the team are paramount to the successful implementation of a swarm in theatre. ‘‘Spatial co-ordination distributes units over the area being observed, and includes such tasks as determining the maximum spread between vehicles and the minimum acceptable number of revisits per unit area, assigning sectors to each unit, causing a team to converge in a specific location, or stationing UAV’s in a particular formation’’ [3]. ‘‘Temporal coordination ensures that all UAV’s act at the right time or with the right frequency, provide their input at the right moment, and assume their designated locations and operating roles at the right time for the constellation to work as a whole.’’ [3] Given the spatial and temporal coordination, the systems must form a team to achieve a common goal [4].

Recent decades have seen a surge in the use of small-scale unmanned aerial vehicles,
including quadcopters, for various applications. Quadcopters are praised for
their simplicity, reliability, and maneuverability, making them ideal for autonomous missions .Ongoing research focuses on enhancing quadcopter capabilities through advancements in communication,
environment exploration, and maneuverability.

SYSTEM REQUIRMENTS:

Hardware Requirements:

RAM:8GB

Hard Disk : 40 GB

Processor : Intel i5 Processor

Raspberry pi

Apm 2.8

Ardiuno UNO

Raspberry camera module v2

Software Requirements:

IDE :VS Code

Coding Language : Python Version 3.5

Operating System : Window

CONCLUSION:

In this thesis, the design, modelling, and control of a UAV was presented. The conceptual design stages of the UAV were analyzed in detail. UAVs will continue to be useful as sky watchers indefinitely. UAVs are an effective and successful equipment in the field, and they play an important part in the military. Drones have been used to transport IEDs and destroy hostile locations. Agriculture, Drones, tree-based remote
sensing applications, water quality
monitoring, disease detection, crop monitoring, yield forecasting, and drought monitoring are just a few of the data sources. Drones can carry health care, microbiological and laboratory samples, medications, vaccines, emergency medical supplies, and patient transportation. Aspects such as lifecycle, current mission, future missions, and performance will be crucial factors in alternative selection for use in the development.

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