Drone In IOT: Application, Research, Issues

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Abstract: The Unmanned Aerial Vehicle (UAV) is becoming famous in recent years. Especially in none line of sight (NLOS) situations such as indoor environment, GPS is unable to find location. Recent times have been a witness to the prowess of UAV technology being exploited for illegal activities such as criminal, terrorist purposes, and drug delivery platform across the border. The main area of concern is drone localization. A common way to find location is to use GPS. However, GPS has several limitations such as its reliability, some of the localization technique will be discussed in this paper.

IndexTerms **– Unmanned Aerial Vehicle(UAV), GPS, localization Techniques, Robot Operating System(ROS), None line of sight(NLOS)**

I. INTRODUCTION

A drone, or an unmanned aerial vehicle (UAV), is an aircraft which is remotely or non-remotely piloted. Drones are originally developed for soldiers and for military purpose. However, nowadays drone can be used in industrial parks, surveying, firefighting, disaster relief, commercial use, delivering a courier, scientific research, in mining industry, etc. Furthermore, drone technology is attracting quite significant research interest. In addition to the security and military applications, typically involving tracking or surveillance, the Earth Sciences present challenges entailing the coordination of air and ocean vehicles. Examples include studies of air-sea fluxes or of coastal fronts. A quadrotor is a complex electromechanical dynamical system.

A robust controller is essential for any application of quadrotor. A conventional PID is widely used for quadrotor for its practicability and robustness over the years. These advancements have not only seen drones becoming popular amongst even the most casual of hobbyists, but also in commercial endeavors. Large companies such as Facebook, Google and Amazon have already invested heavily in research related to drones. More recently news agencies have begun to look at using drones to cover certain stories. The US has two separate 'squadron' of armed drones one run by US Air Force and one run by CIA. Using drones, the USAF Air force has increased the number of combats and air patrols.

Drones gained a negative image with their recent military use, but the stigma of the world "drone" has largely worn off over the past few years with the proliferation of hobby and commercial models. Drone also can be used in military purpose, video-making, film making, inspection, agriculture, news gathering, spraying of pesticides, for security purposes, oil spill monitoring, shipping emission monitoring; further uses include target monitoring and designation, as well as the elimination of designated targets. These small aerial acrobats are able to pack a lot of accessories into their metal or plastic frames. Most drones are ready-to-use, however, some people like building a drone themselves using kits, and to get more familiar with that topic, we suggest reading our article about the best drone kits and why are they the best. Figure 1 shows the total investment made by government,

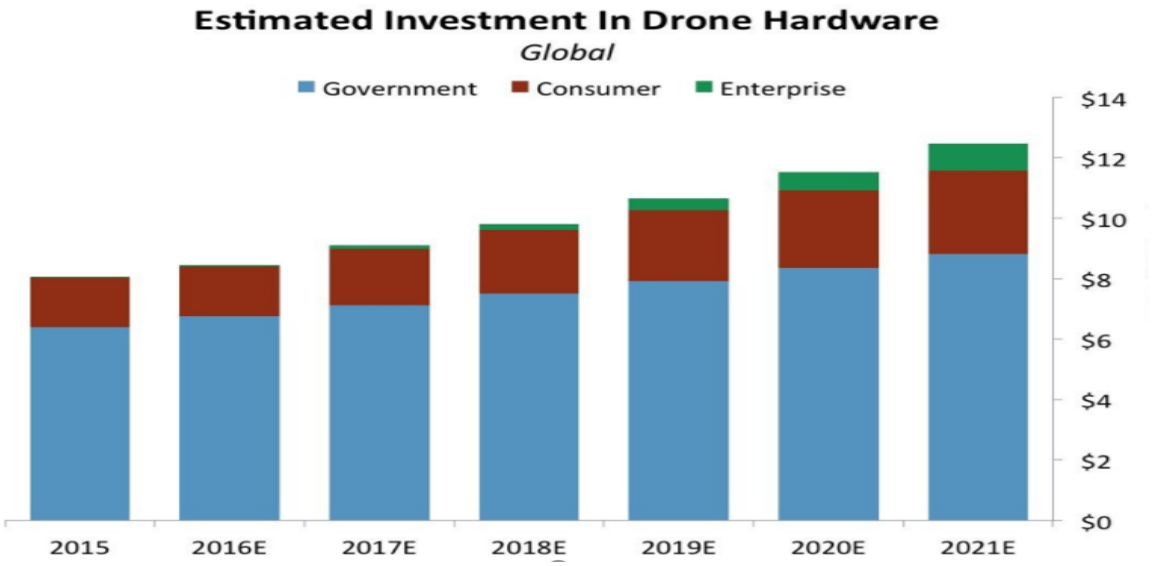

Figure 1 total investment made by USA government in billions[1]

II. ISSUES RELATED DRONES

They're set to devastate the world and begin the end of the world by ruling over humans, however one-hour courier would be very sweet, Don't you think? It's advantageous to consider the genuine and unsolved issues with drones in the present military so as to paint a precise picture of humanity. Drones are very dangerous if we don't use them wisely. Because of drones' rapid rise to popularity, many drone companies have been surprisingly keeping their products hacker-proof so their products don't do any damage to society. Some of the hackers and researches hacked drones in order to recognize the safety issues like one dutch researcher successfully hijacked drones with use of laptop and USB port. A drone operator can usually control a commercial drone's movements by sending signals from an app or computer-based controller to the drone's flight controller, which acts as the drone's "brain". Some of the drone relates issues are listed below,

1. Air Safety:

According to the Federal Aviation Administration (FAA), more than 650 pilot have reported seeing unmanned aircraft as of Aug. 9 this year, compared to a total of 238 such sightings for all of 2014. These devices are becoming ubiquitous," former airline captain Chesley "Sully" Sullen berger said recently on the CBS program Face the Nation. "Imagine what a device ... can do that might weigh 25 or possibly up to 55 pounds to bring down an airplane," he warned. "It is not a matter of if it will happen. Itis a matter of when it will happen."[3]

2. Regulation:

Staring from the last year, 36 states of USA introduced legislation to protect humanity from drone related privacy issues. So far just 17 states have passed laws restricting drone usage.

3. Flying Weapons:

A video published last month of a handgun being fired from a flying drone quickly went viral [3], this led to some serious issues related drones that can be turned into potential weapons. The newspaper also reported that Connecticut's state senate is expected to make banning weapons on drones a priority issue when its new legislative session begins next February. [3]

4. Privacy Policy:

Government and military have lethal weapons, they can watch you from over 60000 feets, they can crack your cells in matter of time, they have high tech cameras that can search entire cities in some time, they can easily determine your location, intercept your calls and much more, Drone manufacturers even admit they are made to carry "less lethal" weapons such as tasers or rubber bullets [3], government needs to think about privacy of peoples.

5. Collison Detection:

Drones are poised to become technology for agriculture monitoring, packet delivery, gathering news, monitoring urban environments, as the use of drones are increasing there may be a chance of collision in multiple drones. On this front, the Stanford Intelligent Systems Laboratory (SISL) is part of a broad partnership led by NASA Ames to create an unmanned aerial system traffic management system, or UTM, to manage the expected surge in unmanned flights. [4]

6. Commercial Use:

Nowadays drones are used to surveillance around mall, monitoring of traffic, monitoring of industrial parks, gardens, monitoring of private property. As we can say it will lead to the privacy of the peoples and that's very dangerous issue. One of the project related drone is amazon prime which will courier your package in less than 30 minutes, in this scenario large number of drones will fly into limited air space, this will lead to collision of drones and it will create the problems to government because identification of all the drones will be much difficult. This will lead to the serious security issues for the nations.

III. RELATED WORK (RESEARCH)

In this paper [5], Author make use of Several state-of-the-art privacy filters were applied with different degrees of strength to each content shot with the mini-drone, in order to understand if a balance can be found between privacy issues and surveillance effectiveness. To better understand the privacy policy of humans, author held a survey by showing some video and asking some related question like what is the main activity happening in this video?

Crowdsourcing has shown to be a viable alternative to conventional laboratory-based subjective assessments, especially for cognitive tasks, 3 types of behavior were depicted in this paper: normal, illicit and suspicious. Mini-drones can be used for monitoring the area, helping in managing parking spaces, controlling crowds and reporting useful information such as suspicious behaviors, miss-parked cars, number of free parking spots, etc. Privacy protection filters were applied to body silhouettes and cars. In this way, faces, license plates, and accessories were also filtered at the same time [5].

In this paper [6], Author discussed a way to find the location is to use GPS, however GPS is unable to find the location in indoor area or None Line of Sight (NLOS), and this may be serious for the drone because we may lose the control of the drone. Problems in Drone fleet:

- First drone moves vertically as well as horizontally with respect to car, humans move horizontally, that changes the localization for the flying of the drone.
- Usually drone go from land to aerial area that may have different environment compare to ground, so the easy flying of the drone between ground and aerial area is difficult.
- Location estimation error is critical to drone because if the drone gets wrong location, it affects the mission achievement and location error may cause the drone to damage and may result in collision.

Some of the techniques like GPS, Received Signal Strength Indicator(RSSI), Angel of Arrival(AOA), Time of Arrival(TOA) is discussed in this paper [6].

In this paper [7], Author had discussed about quadcopter and Robot Operating System(ROS). The official description of ROS taken from their website is "a flexible framework for writing robot software. It is a collection of tools, libraries, and conventions that aims to simplify the task of creating complex and robust behavior across a wide variety of robotic platforms." The author created three different ROS nodes that generated trajectories using cubic polynomial functions, B´ezier, and artificial potential fields. The first two published each trajectory point in real time to a position PID controller while the third one published velocity commands directly to the ardrone autonomy driver. The controller had the task of guiding the quadcopter so that it followed a similar trajectory published by the generator [7]. Author tested the software using the simulator Gazebo7 to ensure adequate flying behavior. Both our simulated and real tests generated and tracked trajectories longer than 20 meters.

Author stated that radar detection of micro UAVs presenting challenging factors, as these tend to be low and slow flying, with small Radar Cross Section(RCS) [8]. The micro Doppler components from the two different polarizations is markedly different. Classification of mini-UAV based on spatial resolution in form of high range resolution profiles or inverse synthetic aperture radar images. Tri-copter, quadcopter and octocopter like UAVs normally use rotor blades made of carbon fiber and plastic materials. [8]

The main contribution of this paper [9] is to create essential outcomes on the scope and ideal arrangement of wireless Drone Small Cells (DSCs). To start with, we dissect the ideal tallness for a DSC for which the required transmit control for covering an objective zone is limited. Next, to accomplish the greatest scope execution for a specified region, the ideal arrangement of two DSCs in both interference and interference free is contemplated. To this end, to this end, author find the optimum altitude ensuring sufficient coverage using minimum transmit power.

The aim of this paper [10] is to present a unique approach to identify an intrusion by an UAV in a prohibited area, its classification and a platform to neutralize the threat. Visual identification of a drone is simple if the area being observed is small and confined. However, it is practically impossible to carry out 24x7 surveillance over large areas such as an airport or across international borders to identify drone with a malicious intent. With an increase in drone technology being used for malicious purpose such as transportation of narcotics across borders, for cyber eavesdropping and flying into sensitive areas such as airports which might cause unintentional accidents or threat to planes. This study focusses on analyzing and mining the drone sound samples for successful classification and identification of drones. 100,000 sample values have been extracted for further analysis to determine the complete range and classification of the UAV platform [10].

In this paper [11] Author stated that anchors must be truly "fixed", otherwise an adversary could simply move one of them to jeopardize the security of the system, this influences the foundation to cost much higher, since the stays can't be appended to the ground or to the dividers in a modest and uncertain way. creator investigate the likelihood of utilizing the developing automaton innovation to understand these issues. Automatons, or Unmanned Aerial Vehicles(UAV), are flying machine with no human pilot on load up. Now, the problem becomes how to determine a convenient path for the drone, author stated that we cannot use existing path planning algorithms, because they are not thought for verifiable multilateration [11], author contributed approach of using drones to securely localize a set of devices by means of verifiable multilateration.

In this paper [12] author proposes a novel numerical approach to the design of smooth trajectories for fixed-wing Unmanned Aerial Vehicles (UAVs) with applications to target tracking of marine vehicles. Given a desired geometric path with respect to a possible moving target vehicle. The ocean presents new challenges to the operation of Unmanned Aerial Vehicles (UAVs). In addition to the security and military applications, typically involving tracking or surveillance, the Earth Sciences present challenges entailing the coordination of air and ocean vehicles [12]. UAV trajectory is based on the motion of an ASV which has an arbitrary motion specified by its linear and angular velocity. Moreover, space-varying wind fields, state and input constraints, and path constraints are taken into account.

In this paper [13] author present an optimal dimensioning for drone small cells. Author extend the traditional models to include transmitter antenna gain patterns and wireless channel multipath fading. He shows that for the enhanced model there exists an optimal drone height which ensures the best performance in terms of various metrics. The optimization considered two parameters: the first is the distance between two operating drones where co-channel interference between them exists; the second is the altitude of the two drones. In such applications, the path loss calculations should consider more realistic models which reflect physics of propagation. More comprehensive modeling and parametrization is considered in terms of path-loss and comparison between two antenna propagation patterns [13]. Author numerically find and prove the existence of an optimal drone height that leads to optimal average performance metrics for all the possible locations of the mobile user in the drone coverage area.

In this paper [14], a gradient decent based methodology is to use Proportional-Integral-Derivative (PID) controller parameters for AR Drone quadrotor. The proposed technique has been demonstrated through two test cases. One is the way-point navigation and other is the leader follower formation control. The experimental result as well as simulations result have shown for both the cases. In case of way point navigation, a set of points have given to drone. The drone has to go through all the points [14]. The drone will tune the parameters while moving towards the target points.

IV. APPLICATION OF DRONES

Successful application of the drones is stated below:

- Surveying of objects and ground on the basis of digital heights and 3d models from the sky.
- Industrial inspection of solar parks, wind parks and inspection of agriculture, monitoring of private firm, monitoring of government body, inspection of parking areas.
- landscape photography, up to 360° spherical panoramas, Point-of-Interest (POI) imaging and Circle-of-Interest (COI) imaging, real estate photography.

- Monitoring of plant and wildlife preservation and conservation, inspection and monitoring of disaster relief areas [15].
- Drone based inspection and monitoring and repairing of damaged pipes, oil areas, in mining industries.
- Drones are used to search and rescue the human from fire by doing fire-fighting work by giving the location of a person and drone can determine co2 and o2 into the atmosphere by using special equipment.
- Unmanned cargo system – Drones also serve in delivering of lightweight packages and bundles of all sorts. This way, you can have a safe, environmentally friendly and fast transport of goods by air, and you can find out more about this topic by reading.
- Drones can be used in search and rescue operation in flood.
- Drones also can be used in shipping and delivery of the packages.
- 3D mapping with drones: Industry that deals with infrastructure projects, airport planning tasks, maintenance and construction activities. Drones are capable enough to perform surveys with increased efficiency [16].
- Can be used in agriculture where we can inspect crop type, plant count, canopy cover, soil type, growth strength, plant height, detasseling, yield monitoring.
- Can be used in irrigation land mapping, watershed mapping.
- Best use of drone in vegetation management, forest health.
- Can be used to protect persons from potential threats.
- Drones are best used coastal surveillance, perimeter monitoring, anti-piracy operations.
- Can be used in geographic management, feeding weather forecast [17].
- Drones are being developed to provide entertainment for players so that they can be used in fight clubs. Known as a cage match, two contenders and their drones are put up against each other [18].

V. CONCLUSION

As we know that drone is gaining so much popularity now days. Time is near where all the application will use drones instead of human for their work. Drones are originally developed for soldiers and for military purpose. However, nowadays drone can be used in industrial parks, surveying, firefighting, disaster relief, commercial use, delivering a courier, scientific research, in mining industry, etc. Furthermore, drone technology is attracting quite significant research interest. In addition to the security and military applications, typically involving tracking or surveillance, the Earth Sciences present challenges entailing the coordination of air and ocean vehicles.

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