Drone Utterance Cast Analysis using Machine Learning

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***Abstract*: Unmanned aerial vehicles (UAVs) networks square measure still untouched and much from analysis field. Security problems square measure the main issues as a result of these networks square measure susceptible to varied attacks which can cause data leak. Cyber Physical Systems (CPS) play a very important role in providing vital services in industries like autonomous vehicle systems, energy, health, producing, etc., by integration computation, physical management, and networking. Most of those systems aren't solely cyber-physical, however additionally operate in an exceedingly safety-critical application wherever a failure or malfunction may lead to injury or perhaps loss of life. An pilotless Aerial System (UAS) meets the wants of a cycle per second and safety-critical system with its dependence on wireless communication, sensors, and algorithms that job synergistically to perform its practicality. Innovation technology has followed the paradigm of enhancing performance as a main priority, with security as either AN afterthought or not thought of in the least, inflicting an absence of security against cyber-attacks in most UAVs. within the past UAVs have costly, heavy, and most typically utilized by the military, however, cost, size, and weight have cut drastically, whereas their capabilities, attributed to technology, have accumulated well.**

Keywords: Unmanned Aerial Vehicle (UAV), Drone Communication, Machine Learning.

I. INTRODUCTION

Technological advances are rapidly increasing in unmanned systems and secure solutions must keep-up with the technology to maintain safety and assurance. The increased interest in UAS due to semi and fully autonomous flight has benefited the civilian and military community and lead to increased efforts to incorporate UASs into industry. The shift of control from a human pilot is to automated, computerized autopilot has tremendous advantages; however, the dependence on embedded electronics exposes UASs to new threats of cyber-attacks. The cyber threats to UASs are becoming more evident and research in the area of securing safety-critical CPSs is increasing. Current research is focused on creating attack assessments and discovering vulnerabilities, but has not significantly addressed detection and prevention of cyber-attacks on UASs, and more specifically the UAS Flight 3 Control System (FCS). Information for environmental monitoring, emergency, rescue and recovery operations, and disaster assistance. Setting an ad-hoc network consisting of UAVs is very challenging because they differ from mobile ad-hoc networks (MANETs) and vehicular ad-hoc networks in terms of mobility, connectivity, routing, services, and applications. A survey has been conducted on cyber-attack vulnerabilities and defenses for flight control systems.

Unmanned Aerial Vehicle (UAV), which is also called as drone, is very popular in new technology area. The wireless communication is drone related communication topics are also popular in many emerging areas, like emergency communications, device-to-device communications, Internet of Things etc. Because of the flying characteristic of drones, the drones can be used to construct a communication network is very flexible and fast way regardless of the environment and trained. Therefore, drone communication is very suitable for emergency communications which need is flexible and fast recovery of communication after disaster happens, or for IoT and D2D communications which needs is a useful way to carry out the wireless connection everywhere.

In drone application area, it is important to guarantee the safety for the flying vehicles when drones are flying and doing their tasks. If there are number of deployed drones over an area is drastically increasing, drones information is becoming essential to avoid collision and interference. Besides, if there is any manned aircraft nearby like helicopter, it might be very dangerous for the manned aircraft because the pilot might miss viewing the drones. Besides, to enhance and promote the application of drone communications, we develop a drone location information sharing system using 920MHz band. We use this system to do field experiment for data collection and model establishment.

Currently realizing this kind of drone application needs huge number of field measurements to collect enough information for establishing a useful model, which requires great effort if the area under measurement is large. Besides, in field experiments, there may be situations, where unpredictable things happen, which results in data missing. In this kind of situations, a good model establishment approach which can recover missing data is important to avoid re-doing the field measurements. Although there have been some methods like compressive sensing which can recover data from a set of under

sampled data, there are still some limitations, e.g. some statistical characteristics are needed, to realize the method. Therefore, it would be very helpful if there is smarter way to establish this kind of model by using more intelligent approaches, like artificial intelligence (AI) or machine learning based methods.

Machine learning (ML) is the scientific study of algorithms and statistical models that computer systems is used to perform a specific task without using explicit instructions, relying on patterns and inference instead. It is the seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make the predictions or decisions without being explicitly program to perform the task. Machine learning algorithms is used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop the conventional algorithm for effectively performing the task.

II. LITERATURE SURVEY

A DYNAMIC TRAJECTORY CONTROL ALGORITHM FOR IMPROVING THE COMMUNICATION THROUGHPUT AND DELAY IN UAV-AIDED NETWORKS METHOD [1]

Authors: Daisuke Takaishi, Hiroki Nishiyama, Nei Kato

Dealt with the path planning problems in two steps. In the first step, based on the information from an environment map constructed a priori, a path that avoids static threats is planned. In the second step, when the UAV is in flight following the path, it update the map and corrects the paths with sensor information. That particular work, although useful for constructing three-dimensional paths of a single UAV, may not be directly applicable to the swarm of UAVs that need to cooperate with each other, particularly in the case of a communications network formed by the UAVs.

Propose a simple but effective dynamic trajectory control algorithm for the UAVs in order to improve the performance of our considered UAV-aided network. Our proposed algorithms considers that UAVs with queue occupancy is above a threshold are experiencing congestion resulting in communication delay. To alleviate congestion at UAVs, our algorithm is executed at the control station and instructs the UAVs to dynamically move their centers of trajectory based on the traffic at a crowded or “busy” communication link. The UAVs react according by moving to shorten length of the link.

AC-POCA: ANTI-COORDINATION GAME BASED PARTIALLY OVERLAPPING CHANNELS ASSIGNMENT IN COMBINED UAV AND D2D BASED NETWORKS METHOD [2]

Authors: Fengxiao Tang, Fadlullah, Nei Kato

The issue of assigning POCs can be considered to be an optimization problem in which the available communication channels need to be mapped to network interfaces for minimizing signal interference and maximizing the communication capacity. The interference range is defined as the distance within which interference occurs. Furthermore, in a network having multi-channels connections, there are four different types of interferences which should be addressed due to their influence of network capacity: co-channel interference, orthogonal channels interference, adjacent channels interference, and self interference. Next, we present a model to describe these different types of interferences.

Proposed a new channel assignment strategy based on non-overlapping channels, and demonstrated how this contributes to spectrum utilization and improves the bandwidth available to the network users. On the other hand, the works, demonstrated that the use of overlapping channels leads to better performance in contrast to three non-overlapping channels for wireless networks. Following these finding, new heuristic channel assignment algorithms. In our earlier work, instead of heuristics, an optimal channel assignment exploiting POCs for wireless mesh networks was proposed. However, earlier research works did not consider the effect of algorithm convergence time and how to adjust the algorithm to the highly dynamic network scenario. Furthermore, in the existing works, many channel assignment algorithms are based on the traffic loads of nodes without taking into account the situation of dynamic traffic load.

BIG DATA ANALYTICS, MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE IN NEXT-GENERATION WIRELESS NETWORKS METHOD [3]

Authors: Mirza Golam Kibria, Kien Nguyen, Gabriel Porto Villardi

The ML and AI tools can correlate multiple sources of data and find the what is relevant. They may also reveal interrelations and dependencies that were not previously identified because their automated mechanism have the capability of the anatomizing and inspecting data more intensely and more methodically. Although human expertise is useful in confining the focus to produce solutions and to manage complex problems, it has limited capability in finding new answers and insights. The future of wireless network will be undoubtedly rely on AI. In, the authors have provided a panned overview of the range of wireless communication problems and issues that can be efficiently addressed using AI while delivering detailed examples for the use-case scenarios.

The network operators have access to the large amounts of data, especially from the network and the subscribers. Systematic exploitation of the big data dramatically help in the making system smart, intelligent, and facilitates efficient as well as cost-effective operations and optimization. We envision data-driven next-generation wireless network, where the network operators employ advanced data analytics, machine learning and artificial intelligence. We discuss in the data sources and strong drivers from adoption to the data analytics, and the role of machine learning, artificial intelligence in making the system intelligent regarding to being self-aware, self adaptive, proactive and prescriptive.

DESIGN OF FUTURE UAV-RELAY TACTICAL DATA LINK FOR RELIABLE UAV CONTROL AND SITUATIONAL AWARENESS METHOD [4]

Authors: Hoki Baek and Jaesung Lim

In a mountainous terrain, a network can be divided into several parts because of communication disconnection. A communication disconnection can result in failure to share positions and statuses between the participants of military operations. As a result, situational awareness cannot be achieved, and the military operations cannot be effectively performed. Herein, we employ a tactical UAV as the relay node to resolve the communication disconnection problem. We also consider a two-hop network in which all platforms are directly connected to the UAV. A frequency-hopping waveform of Link-SAC requires large bandwidth. Thus, we are faced with the spectrum allocation problem because of the scarcity of spectrum.

USAP-MA was proposed to reduce the delay. However, both USAP and USAP-MA do not provide a detailed description of the network join operation and time slot allocation. ASAP can support both network join and timeslot allocation using the first time slot of the frame. A node can reserve an idle time slot, except the first time slot. However, in the absence of idle time slots in a frame, the frame size is doubled to make an idle time slot in the middle of the frame. Although the frame length can be dynamically increased to cope with higher traffic, it cannot be subsequently reduced. Applying the ARPS to Link-SAC is very easy. Link-SAC must be able to deploy four reference nodes and four UAVs, and allocate eight time slots for broadcasting and relaying the reference node positions. In addition, Link-SAC has the advantage of any node being a reference node for the ground nodes if it knows its position.

DRONE-BASED HIGHWAY-VANET AND DAS SERVICE METHOD [5]

Authors: Hafez Seliem, Reza Shahidi, Mohamed H.Ahmed

An optimal infrastructure-RSU placement model for hybrid VANET sensor. It applies the centre particle swarm optimization approach after it formulates the problem as an integer linear-programming optimization problem. In addition, presents an analysis for the total delay of broadcasting alert messages in VANETs along a highway such that alert messages can be transmitted to the nearest RSU within a given delay bound. The derived a closed form expression from the expected value of the total delay of broadcasting alert messages based on the distance between RSUs.

Proposes a routing protocol that use infrastructure drones from boosting VANET communications to achieve a minimum vehicle-to-drone packet delivery delay. This paper proposes a closed-form expression for the probability distribution of the vehicle-to-drone packet delivery delay on a two-way highway. In addition, based on the closed-form expression, we can calculate the minimum drone density (maximum separation distance between two adjacent drones) that stochastically limits of the worst case of the vehicle-to drone packet delivery delay. Moreover, this project proposes a drones-active service (DAS) that is added to the location service in a VANET. This service dynamically and periodically obtains the required number of active drones based on the current highway connectivity state by the obtaining maximum distance between each two adjacent drones while satisfying the probabilistic constraint for vehicle-to-drone packet delivery delay. Our analysis focuses on the two-way highway VANET networks with low vehicular density.

III. SYSTEM REQUIREMENT

Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda distribution that allows you to launch applications and easily manage conda packages, environments, and channels without using command-line commands. Navigator can search for packages on Anaconda Cloud or in a local Anaconda Repository. It is available for Windows, macOS, and Linux.

In order to run, many scientific packages depend on specific versions of other packages. Data scientists often use multiple versions of many packages and use multiple environments to separate these different versions.

The command-line program conda is both a package manager and an environment manager. This helps data scientists ensure that each version of each package has all the dependencies it requires and works correctly.

Navigator is an easy, point-and-click way to work with packages and environments without needing to type conda commands in a terminal window. You can use it to find the packages you want, install them in an environment, run the packages, and update them – all inside Navigator.

Anaconda is that the installation program utilized by Fedora, Red Hat Enterprise Linux and a few other distributions. During installation, a target computer's hardware is identified and configured and also the appropriate file systems for the system's architecture are created. Finally, anaconda allows the user to put in the software software on the target computer. Anaconda also can upgrade existing installations of earlier versions of the identical distribution. After the installation is complete, you'll be able to reboot into your installed system and continue doing customization using the initial setup program. Anaconda could be a fairly sophisticated installer. It supports installation from local and remote sources like CDs and DVDs, images stored on a tough drive, NFS, HTTP, and FTP. Installation may be scripted with starting motor to produce a totally unattended installation that may be duplicated on various machines. It also can be run over VNC on headless machines. a spread of advanced storage devices including LVM, RAID, iSCSI, and multipath are supported from the partitioning program. Anaconda provides advanced debugging features like remote logging, access to the python interactive debugger, and remote saving of exception dumps.

The simplest way is with Spyder. From the Navigator Home tab, click Spyder, and write and execute your code.

You can also use Jupyter Notebooks the same way. Jupyter Notebooks are an increasingly popular system that combine your code, descriptive text, output, images, and interactive interfaces into a single notebook file that is edited, viewed, and used in a web browser.

TensorFlow is a multipurpose open source software library for numerical computation using data flow graphs. It has been designed with deep learning in mind

but it is applicable to a much wider range of problems. TensorFlow can be used from many programming languages.

IV. WORK FLOW

The fast development of computer science in recent years, AI and machine learning areas are growing significantly. In the past, there are many difficult problem which is hard to be solved but now can be solved by the machine learning based method. In communication area, is machine learning based on method is also applied in the many important topics. For example, the possible applications and challenges of adopting machine learning is addressed for next generation communications. In a method using genetic algorithm based feature selection and machine learning based data detection for detecting covert cyber deception assaults in smart grid communication is proposed. In the modulation recognition problem for cognitive radio (CR) communications is solved by machine learning based method. In a method using unsupervised machine learning method to cluster low power nodes and decide fog nodes is proposed.

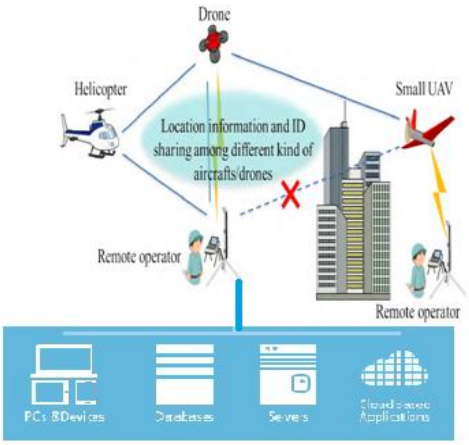

Fig. 1. Architecture Diagram

In, machine learning based method to collect images from surveillance cameras for recognizing blockage locations is proposed. In, the machine learning based method is used to solve pre coding problem in massive multiple-input-multiple-output (MIMO) systems. However, AI or machine learning based methods are still seldom used to solve problems in drone communication area.

V. MODULE DESCRIPTION

A. DRONE DATA COMMUNICATION

The use of non-military frequencies and civil communication technologies are rapidly gaining precedence for exploiting Drone for communication in civilian areas, and network planners and engineers are mainly concentrating on accommodating Drone network communication through the already limited frequency pool. While researchers are mainly focused on solving the frequency reuse issues in Drone networks, in order to fully leverage the capabilities of the Drone, it is important to adopt is efficient methods from planning their trajectories and cooperative paths.

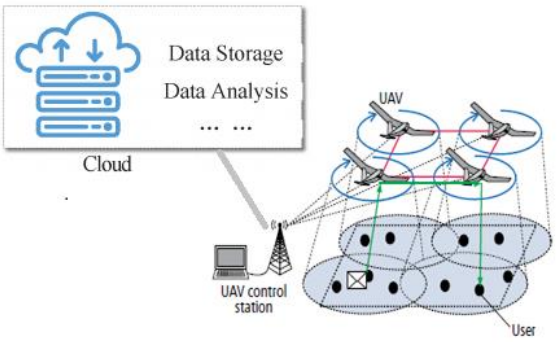

Fig. 2. Considered communication network constructed using of UAV

B. REMOTE SENSING

And that is to urge anyone involved in a remote sensing project involving drones to the act responsibly. in this recent technological, commercial and marketing developments mean that anyone with a small amount. The classification, design methods and challenges has been discussed in appropriately and at the end of suit to urban applications. We found that the evolution of drone based remote sensing is efficient to solve an urban issues nowadays simultaneously ensure the sustainability and resiliency of urban areas. Sensing & Monitoring a variety of Drone-based smart city applications have been reported in the literature.

C. IMAGE SEGMENTATION

The results measurements for Drone are used from the buildings occupancy permissions following the State government are building rules. In this automated system is would replace physical inspections and manual reports and significantly reduce costs and improve the efficiency. As an important component this pilot study, visualization to the building information were represented / displayed on the web application in an interactive mode. This added value of UAV technology is automated system in comparison of with traditional ways provides geospatial information and can be considered as an essential Earth Observation indicator which has the potential to lead to the next generation Urban Information Services and in the Smart cities development. The considerable potential use of these indicators in urban planning and development offers an opportunity in a appropriate decision making in day to day from urban planning measures.

D. IMAGES AND GPS

Analyze to the images, are measure the focal length of the image, and then calibrate from the distortion image by the image focal length. After analyzing to the calibrated of image, we would be obtain the coarse-grained coordinate position of the target. Then we use the GPS data and inertial sensors carried on UAVs to estimate the real-time altitude of UAVs, and use the laser range finder to measure the distance between UAVs and the target.

E. DATA PROCESSING AND VISUALIZATION

The Drone collected raw RGB images were inserted to the processing platform which uses photogrammetric image processing algorithms with 90% overlapping, low altitude and high resolution RGB imagery. The mesh can contain artifacts, especially around the edges of the project where there will have been less image overlap.

Fig. 3. Data processing and visualization

The mesh is useful for show the building sites looked like and it can be rotated and viewed from any angle; however, it should be not taken to be the visual truth and it is not a substitute for analyzing the underlying images that created it. UAV/Drone significant role in various geospatial applications as it conveys plentiful information which can be used for different types of analysis.

VI. CONCLUSION

Remote sensing with UAVs for the purpose of intensive forest monitoring can accumulate large amounts of data that require adequate storage capacity and high-performance computing. The possibility to the link acquired for UAV remote sensing data to terrestrial measurements and observations as well as satellite data is of interest. With an understanding of the concept of Big Data in terms of the volume and complexity of data acquired through UAV remote sensing, robust processing and machine learning can be created in order to the insure the future is integrity and utility of such data. Furthermore, the use of a cloud computing can be provide high-performance of computing capabilities eliminating the necessity to invest in costly hardware. This paper presented a design method devoted to support the UAVs design process, highlighting particularities of this type of CPS. The proposed method extends the proposed approach in order to provide a complete guide to aircrafts design from model to their construction, also considering the management project activities. In other words, it allows systematizing the integrated UAV design process. By the use of the proposed method, designers can properly represent the UAV mission characteristics and to design an aircraft that is able to perform the proposed mission.

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