Survey on a Model to Deploy Drone based on Cloud

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Abstract - *In the field of wireless communication and networking, a new standard named the Internet of Things (IoT) has gained more and more attention in the academia and industry. Internet of Things add a new aspect to the world of information and communication by embedding transceivers into gadgets by enabling new means of communication between people and things. Aim is to develop a drone based on cloud using Internet of things. The system design uses Automation Flight Control algorithm written in Python as a default programming environment. The algorithm for Automation Flight Control implemented on low processing power chip Raspberry pi 3. Here Raspberry Pi operates as major platform for process and to control interfaced modules. The hardware modules interfaced to Raspberry pi are Wi-Fi Router,drone(UAV), Pixhawk2.4.8(32 Bit) Flight Controller.*

***Key Words*: Drone, Global Positioning System (GPS) module, router, Flight Control, Raspberry pi 3.**

1.INTRODUCTION

The project eliminates the use of Radio frequency(RF) transmitter and receiver since the range is limited to about 20KHz to 300GHz which can travel to only about 5km . By using Internet of Things (IoT) the drone can be controlled and accessed anywhere without any range limits. The Global Positioning System (GPS) module is used to track the drone. The Pixhawk 2.4.8 (32 bits) acts as the flight controller. The communication between the drone and the cloud is achieved with the help of the router.

2. LITERATURE SURVEY

Rob A. Holman [1] has developed a small unmanned aerial vehicle (UAV) quadcopter to collect long-dwell imagery of the nearshore from which important measurements can be made at low cost and with flexibility. UAVs are considered to replace the fixed camera systems. The author extends the existing topographic imaging approaches that rely on having plentiful ground control spread across the image, to the nearshore case where the bulk of the image is water with no control point and vehicle metadata must be used. The UAV autopilot was found to be capable of excellent station-keeping with the positional errors of 0.20 and 0.53 m (horizontal and vertical) and the viewing angle errors of 0.25° (tilt and roll) and 0.38° (azimuth).The ground position of imaged objects could be found with 0.21-m accuracy.

Li Da Xu [2] has reviewed the recent researches on IoT from the industrial perspective. He has discussed the fundamental technologies which can be used in IoT. Next, they have introduced some key industrial applications of IoT. The research challenges and future trends associated with IoT has been analysed. This paper differs from other IoT survey papers. There was a focus on industrial IoT applications. The challenges were also highlighted. They have also listed the future use of the work.

Young-Cheol Choi [3] has presented a a nonlinear control scheme along with its simulation and experimental results for a quadrotor .It is being controlled by using a backstepping-like feedback linearization method to control and stabilize the quadrotor. He has proposed a new nonlinear controller to track the position and to stabilize the attitude of quadrotor. The designed controller was implemented into the quadrotor system. Quadrotor dynamics has been derived by using the Euler–Lagrangian approach and all physical parameters in dynamics, which are obtained experimentally based on the related theory, are considered In applying the nonlinear control algorithm into the quadrotor.

Zachary T. Dydek [4] has analysed the application of direct and indirect model reference adaptive control to a lightweight lowcost quadrotor unmanned aerial vehicle platform. They have augmented a baseline trajectory tracking controller by an adaptive controller. They presented the design of the adaptive controller. It was followed by a comparison of flight test results using the existing linear and augmented adaptive controllers. They have also presented its application to a quadrotor UAV. They have brought into notice that the approach that is described does not exclude the application of robust control and also the gain scheduling techniques.

Slawomir Grzonka [5] has enabled a small-sized quadrotor system to autonomously operate in indoor environments. To achieve this, they have systematically extended and adapted techniques that have been successfully applied on ground robots. They have described all algorithms and presented a broad set of experiments, which illustrates that they enable a quadrotor robot to reliably and autonomously navigate in indoor environments. They have presented a navigation system for autonomous indoor flying utilizing an open-hardware quadrotor platform. They have provided a wide range of experiments andsome videos that highlights the effectiveness of their system. In future work, they have planned to add a time of flight camera into their system.

They believed that this technology can be effectively integrated and will allow them to relax the assumptions that the vehicle moves over a piecewise planar surface.

Shweta Gupte [6] has surveyed for a certain kind of UAV called quadrotor or quadcopter. Also, she analyzed that Quadrotor can accurately and efficiently perform tasks that would be of high risk for a human pilot to perform. She encompasses the different model-dependent and model independent control techniques and their comparison. They have summarized the various localization and navigation techniques. There has also been an investigation on the the potential applications of quadrotors and their role in multi-agent systems. The elements of the quadrotor UAV such as different sensors, applications and their advantages are surveyed.

George Mois [7] has analysed that the Internet of Things (IoT), the cloud computing model, and cyber-physical systems, provide support for the transmission and management of huge amounts of data regarding the trends observed in environmental parameters. They have also analysed three different IoT-based wireless sensors for environmental and ambient monitoring: one employing User Datagram Protocol (UDP)-based Wi-Fi communication,one communicating through Wi-Fi and Hypertext Transfer Protocol (HTTP), and a third one using Bluetooth Smart..They analysed that the feasibility of the three developed systems for implementing monitoring applications, taking into account their energy autonomy, ease of use, solution complexity,and Internet connectivity facility and revealed that they make good candidates for IoT-based solutions. The analysis of the three implementations revealed the fact that Wi-Fi andBLE are two technologies suited for monitoring applicationsthat can successfully compete with the widely used ZigBeeprotocol.

Jongho Park [8] has studied that the quadrotor moves around the obstacle to map the overall shape of the obstacle while avoiding collisions. The quadrotor also performs vertical maneuvers if the image plane of the vision system cannot cover the entire obstacle. A real-time guidance algorithm formapping an unknown obstacle using a quadrotor isproposed based on a depth map generated by a stereovision system.The depth map generated by the stereo vision system is utilized to detect and map the obstacle.Obstacle data points are extracted and expressed in a tangent-plane coordinate system for mapping. Horizontal guidance commands are generated to allow the quadrotor to move around the obstacle and to prevent the quadrotor from experiencing a collision.

Kenneth D. Sebesta [9] has analysed that the AEKF presents several advantages in state estimation, as it combines good filtering properties with an increased sensitivity to large perturbations.. Implementation of AEKF on the UAV's inertial navigation system (INS). The authors think that the AEKF is a practical observer,both in performance and in computational requirements. The authors have demonstrated real-time INS performance on a quadcopter UAV. The two interesting possibilities are the following: 1) estimating the quadcopter's center of gravity and 2) estimating the wind perturbation [33]. The authors have stated that both of these play a heavy role in the control of any UAV, and, particularly in the case of the wind, are not practically measurable in the field.

Robert Sowah [10] has derived a rotational energy harvester using brushless direct current (BLDC) generator to harvest ambient energy for quadcopter in order to prolong its flight duration. For a quadcopter its endurance is essential in order to achieve operational goals such as scientific research, security, surveillance and reconnaissance. They mentioned thatone of the major challenges faced during their research was withthe implementation of the system design. Some of thecomponents used in the design includes: SMD electronic components, 3s LiPo battery, Arduino Microcontroller, Copper clad PCB board, Propellers, High-speed BLDC motor and Bluetooth module.

Haoping Wang [11] has developed a model-free–based terminal sliding-mode control (MFTSMC) strategy is to control the attitude and position of a quadrotor whose model includes parameter variations, Uncertainties, and external disturbances. The proposed MFTSMC combines a model-free control approach with a sliding-mode. They presented a survey considering the advantages and disadvantages of quadrotor control methods. The model-based quadrotor control methods have been divided into two major groups: linear-model–based and nonlinear-model–based control methods. They have dealt with the design and analysis of an MFTSMC for quadrotor attitude and position control. The simulation results demonstrate that MFTSMC overperforms the PID, backstepping, sliding-mode, and iPD controls in terms of the rise time, steady-state error, robustness, and disturbance rejection.

Hailing Zhou [12] proposed an efficient road detection and tracking framework in UAV videos. To accurately extract a specified road region during the initialization stage a graph-cut–based detection approach is given and in the middle of tracking process, to automatically track road areas homography-based road-tracking scheme was developed. The results indicate the effectiveness of their proposed framework, with the precision of 98.4% and processing 34 frames per second for 1046 × 595 videos on average.The author has a novel approach for road detection andtracking in UAV videos has been proposed. Fast road detection and tracking is achieved in their proposed method. Efficiency and effectiveness of the proposed tracking technique are demonstrated in their experiments.

Dan Gonzales [13] has analysed that Cloud-Trust is used to assess the security level of four multi-tenant IaaS cloud architectures equipped with alternative cloud security controls. Results show the probability of CCS penetration (high value data compromise) is high if a minimal set of security controls are implemented. They have demonstrated how Cloud-Trust can assess the security status of IaaS CCSs and IaaS CSP service offerings, and be used to estimate probabilities of APT infiltration and detection. These quantify two key high level security metrics: IaaS CCS confidentiality and integrity. Cloud-Trust can also quantify the value of specific CCS security controls (including optional security features offered by leading commercial CSPs).

Ben Kehoe [14] has analysed that Microsoft Word documents can be sent over the Internet, but Google Docs differs in that the document and software does not reside locally. Using remote server farms with shared processors and memory the data and code is stored in the Cloud. Because of this there is no need to worry about maintenance, outages, and software or hardware updates. Cloud provides economies of scale and facilitates sharing of data across applications and users.

Alex Wallar [15] has studied a reactive motion-planning approach for persistent surveillance of risk-sensitive areas by a team of unmanned aerial vehicles (UAVs). The Planner for Autonomous Risk-sensitive Coverage maximizes the area covered by sensors mounted on each UAV. It provides persistent surveillance. It maintains high sensor data quality; and reduces detection risk. To achieve these PARCov is designed and to keep track of the regions that have been surveyed and the times they were last surveyed.

3. CONCLUSIONS

In this paper, we analysed the recent researches on development and utilization on Internet of Things in Drone. Based on this, the following conclusions are obtained.

A number of studies have been conducted to eliminate the use of transmitter and receiver and bring in existence the implementation of IoT. The drone based on cloud has several applications. Internet of Things is known to be the future technology. This paper is a review on the enhancement of the Internet of Things on drones.

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