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Review Paper on PI DroneUsing Python

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ABSTRACT-The drone is commonly known by the Unmanned Aerial Vehicles (UAVs). In today's world drone is extensively used in every field, some of the common application of drone is now being used for the Precision Agriculture, Search and Rescue, Wildlife Monitoring, Entertainment and others fields. Every people of the world are nowadays interested in collision avoidance robots and autonomous machine. The drone brings a technology revolution in the global market. Potential of the drone is rising, whether in the field of survey or rescues. The mathematical and physics law application makes possible for us to fly drones. maybe one day we are capable to constructaccommodation for ourselves using drones. Before these, there is a need to design a drone which is capable to detects the obstacles using different sensors and camera and able to prevent it from obstacles.

Keywords: UAVs,GPS, Raspbian, Sensor, Linux, Python.

I. INTRODUCTION

As the whole world was facing a fatal pandemic situation, drone surveillance becomes an accommodating technology for mankind. Drones are becoming profuse evolve technology in today's aeronautics, as alike robotics. Every drone marketing company is focusing on AI (Artificial intelligent) or autonomous flights system, but still, it requires human interactions. It was mainly controlled by the remotes sensing technology, even with only hardware it is not possible to fly (UAVs) drone, we must necessitate of its software and programming. There are lots of alteration in the frame and construction of drones, but the vital components that every drone required are water resist motor frame, flight and motor controllers, motors, propellers, transmitter and receiver, and a battery or other alternative source of energy. Contemporary people are an enthusiast in the new application of drone, which is the small-scale delivery system. As taking this query soberly we are now focusing on obstacle-free drone using raspberry pi and python programming.

II. METHODOLOGIES

1. RASPBERRY PI

Raspberry is a low-cost computer which is capable to help the user to work in different applications. People use raspberry pi for learning basic programming skills, preparing hardware project and even for robotics. Its runs in Linux distribution but it has its supported operating system, Raspbian, it is an open-source platform. It also provides a GPIO (general purpose input /output) pins which allow a user to control different sensors external input hardware devices. There is a different model of raspberry pi available in the market and they get upgrades with its generation. For our project, we are using Raspberry pi 3 B+ with 1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE range.

2. ULTRASONIC SENSOR

The ultrasonic sensor is an electronic device which generates ultrasonic sounds wave to measure the distance of an object. It has two main segments emitter and detector. Emitter transmits the ultrasonic sound towards the target object and the detector receives the reflected sound and convert the sound into an electrical signal. These sensors are widely used in a robotic project for collision avoidance. Mainly, there are four pins attached in ultrasonic sensor VCC (positive terminal), Trigger (produces flicker sound), Echo (contracts imitation sound) and GND (negative terminal). Before starting measuring distance, we must require communicator for sending a trigger signal to the ultrasonic sensor. To calculate specific distance from the sensor, there is a mathematical formula Distance = ½ T x C (T = Time and C = the speed of sound). For our drone project, we are using the ultrasonic sensor model HC-SR04

3. PYTHON

Python is an open-source high-level platform-independent interpreted, interactive and object-oriented programming (OOPs) language or general-purpose programming language. Python is founded in "Germany" by "Guido van Rossum" in the 1980s. some extent, it was implemented in

December 1989. It is highly supervised language use to create a different application like a web application, desktop GUI application, web pages moreover. Python uses dynamic type system and automated memory management due to this reason it required a low amount cost of management and development. Python supported the use of different module and packages. Generally, a python program is written in the modular style it means it can be split the code into separate parts. It is an interpreted language which means run time processed language, it executed code line by line and also named as a scripting language. Pythons language is widely used in AI (Artificial Intelligent) and Data Science, its standard library supports a larger area of internet protocols like HTML, XML, FTF, JSON, IMAP and many others. Which makes python very easy and user-friendly.

4. GPS

GPS stands for Global Positioning System. This project was started in 1973 in the US (United States) and operated under the United State Space Force. The Official name of GPS is NAVSTAR (Navigation Satellite Timing and Ranging System). The GPS receivers work using 3 satellite signals for the location purpose. The Receiver converts signals into distance form and GPS device calculates the longitude and latitude. Under GPS Satellite, there is an atomic clock which is that much of accurate after 3 million years also there could be a sole chance of 1-sec error. Satellite always revolve in a static position and spread signals. In that signal, there is satellite time and location which signal helps our GPS devices to accumulate the exact time and location. In our drone project, we are using GPS to implement an Automated navigation system.

5. BLDC MOTOR/ ESC CONTROLLER

The BLDC stands for Brushless DC motor which is created of two major parts, stator and a rotor. The stator is rolled up with coils and rotator is a permanent magnetic with 2 or more poles depend upon motor strength. In BLDC rotation is obtained by changing the direction of the magnetic fields produced by the surrounding permanent coils. These types of motor do not contain brushes which make these motor to use in a flammable environment. The purpose behind using this motor is because of reliability, affordable maintenance, less noise, speed control and low cost. The BLDC motor requires an ESC or electronic speed Controller. The ESC controller has and A metal-oxide-semiconductor field-effect transistor (MOSFETs) which is used for switching pulse and amplifying of signals. An ESC helps to control the flow or speed by initiating the relevant MOSFETs to generate the rotating the magnetic field so that motor rotates, it also performs anti-rotation of a motor and dynamic brake.

6. RASPBAIN

Raspbian is an officially provided free and open-source operating system for all Raspberry Pi family since 2015 by Raspberry Pi Foundation. Raspbian was created by Peter Green and Mike Thompson in 2012, originally as an independent project. Raspbian already has plenty of pre-installed software for education, programming and many other purposes. It supports Python, Java and Scratch, etc. Raspbian can install it with NOOBS installer. Its name has been changed to Raspberry Pi OS for both 64bit and 32bit versions. Since recent 64bit versions no longer use the Raspbian core which was previously used on 32bit Pi OS.

7. LIPO BATTERY

Lithium-ion polymer abbreviated as Lipo, which is a rechargeable lithium-ion battery. Which uses a polymer electrolyte instead of a liquid electrolyte. This electrolyte is formed of highly conductive semisolid (gel) polymer. LiPo batteries provide higher specific energy than other lithium battery and also are lighter in weight which makes it more suitable for building small aircraft. When liquid electrolyte provides a conductive medium between a positive electrode and a negative electrode, intercalation and de-intercalation of lithium ions from a positive electrode and a negative electrode, takes place. Thus, this intercalation and de-intercalation of lithium ions are it's working principle.

III. LITERATURE SURVEY

[1] G. M. Hoffmann, D. G. Rajnarayan, S. L. Waslander, D. Dostal, J. S. Jang, and C. J. Tomlin, "The Stanford testbed of autonomous rotorcraft for multi agent control (STARMAC)," Proc. of the 23rd Digital Avionics System Conference, vol. 2, pp. 12-E, 2004.

This paper outlines the design and development of a miniature autonomous waypoint tracker flight control system, and the creation of a multi-vehicle platform for experimentation and validation of multi-agent control algorithms. This testbed development paves the way for real-world implementation of recent work in the fields of autonomous collision and obstacle avoidance, task assignment formation flight, using both centralized and decentralized techniques.

[2] M. Bhaskaranand and J. D. Gibson, "Lowcomplexityvideo encoding for UAV reconnaissance and surveillance," Proc. of the IEEE Military Communications Conference, pp. 1633-1638, 2011.

This, investigate a low-complexity encoder with global motion compensation and spectral entropy-based bit allocation, but without block ME. Further showed that the proposed encoder achieves better quality at lower bit rates with lower quality variation than that of the H.264 encoder with ME block size restricted to 8×8 for videos typical of UAV flyovers. Compared to the H.264 encoder with 8×8 ME blocks, the proposed encoder requires fewer computations and memory accesses.

[3] P. Doherty and P. Rudol, "A UAV search and rescue scenario with human body detection and geolocalization," Australasian Joint Conference on Artificial Intelligence, pp. 1-13, 2007.

This paper is a relative study of developing an Unmanned Arieal Vehicles (UAVs) for rescue operation, which can identify the injured one out of crowds and try to provide a medical aid to the identified one.

[4] Jangwon Lee, Jingya Wang, David Crandall, Selma Šabanović, Geoffrey Fox, "Real-Time Cloud-Based Object Detection for Unmanned Aerial Vehicles", Robotic Computing (IRC) IEEE International Conference on, pp. 36-43, 2017.

Object detection based on CNNs (Convolutional Neural Networks) is extremely computationally demanding, typically requiring high-end Graphics Processing Units (GPUs) that require too much power and weight, especially for a lightweight and low-cost drone. In this paper they propose moving the computation to an off-board computing cloud, while keeping low level object detection and short-term navigation onboard. We apply Faster Regions with CNNs (R-CNNs), a state-of-the-art algorithm, to detect not one or two but hundreds of object types in near real-time.

[5] Shishir Ganesh S(UG Student, K. S. Institute of Technology,), Umashankar M(Associate Professor, Mechanical Engineering, K. S. Institute of Technology),"Vertical Takeoff and Landing (VTOL) aircraft using Tiltrotor Mechanism", International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE) ISSN: 2349-7947 Volume: 5 Issue: 2

This paper proves for a fact that "Vertical Takeoff And Landing (VTOL) Aircraft Using Tilt Rotor Mechanism" can fly with good stability in multirotor mode as well as when the rotors are tilted, which profoundly increases manoeuvrability than the previous designs of multirotors.

[6] T. Tomic, K. Schmid, P. Lutz, A. Domel, M. Kassecker, E. Mair, I. L. Grixa, F. Ruess, M. Suppa, and D. Burschka, "Toward a fully autonomous UAV: research platform for indoor and outdoor urban search and rescue," Robotics & Automation Magazine, IEEE, vol. 19, no. 3, pp. 46-56, 2012.

In this article, they present an autonomous aircraft whose system components are structured into groups to encapsulate their functionality and interfaces, using both laser and stereo vision odometry to enable seamless indoor and outdoor navigation. The odometry is fused with an inertial measurement unit in an extended Kalman filter. Navigation is supported by a module that recognizes known objects in the environment.

[7] T. Vladimir, D.-H. Kim, Y.-G. Ha, and D. Jeon, "Fast multi-line detection and tracking with CUDA for vision-based UAV autopilot," Proc. of the 8th International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing, pp. 96-101, 2014.

This paper presents feasible image processing system for vision based intelligent vehicle. The proposed techniques for multi-line tracking are Hough transform, Kalman filter and clustering with GPUs. Integration of these methods has advantages to reduce the computational load by prediction of next state during the tracking and being robust for noise and rapid change of line's position. Hough transform used for extraction of lines while the Kalman filter predicts future state.

[8] J. Chudoba, M. Saska, T. Baca, and L. Preucil, "Localization and stabilization of micro aerial vehicles based on visual features tracking," Proc. of the International Conference on Unmanned Aircraft Systems, pp. 611-616, 2014.

This article presents a method for long-term autonomous micro-aerial vehicle (MAV) localization and position stabilization. The proposed method extends MAV proprietary stabilization based on inertial sensor or optical flow processing, without use of an external positioning system. The method extracts visual features from the images captured by a down looking camera mounted under the MAV and matching these to previously observed features.

[9] T. Muskardin, G. Balmer, S. Wlach, K. Kondak, M. Laiacker, and A. Ollero, "Landing of a fixed-wing uav on a mobile ground vehicle," IEEE Int. Conf. Robot. Autom. (ICRA), pp. 12371242, May 2016. [15] J. Gleason, A. V. Nefian, X. Bouyssounousse, T. Fong, and G. Bebis, "Vehicle detection from aerial imagery," Proc. of IEEE

International Conference on Robotics and Automation, pp. 2065-2070, 2011.

This paper focus on eliminating the need of landing gear by landing on a mobile ground vehicle. Which increase the payload capacity, but also simplify landings in crosswind conditions and thus increase the operational availability. A system with a small UAV and a car-mounted landing platform is prepared as a technology demonstrator. Different aspects of the landing problem are studied in simulations and real experiments and algorithms for the cooperative control of both vehicles are proposed. Simulations as well as experiments with the real car and a simulated UAV show the feasibility of such landings.

[10] F. Arifin, R. Arifandi Daniel, and D. Widiyanto, "Autonomous detection and tracking of an object autonomously using AR. drone quadrotor," Journal of Computer Science and Information, vol. 7, no. 1, pp. 11-17, 2014.

In this research, the developed algorithm is able to detect and track an object with certain shape and color. Then the algorithm is successfully implemented on AR.Drone quadcopter for detection and tracking.

[11] Isaiah Brand (Brown University), Josh Roy(Brown University), Aaron Ray(Brown University), John Oberlin(Brown University), Stefanie Tellex(Brown University)," Pi Drone: An Autonomous Educational Drone using Raspberry Pi and Python", 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

They create an autonomous aircraft capable of using a downward facing RGB camera and infrared distance sensor to visually localize and maintain position. The Pi Drone runs Python and the Robotics Operating System (ROS) framework on an onboard Raspberry Pi, providing an accessible and inexpensive platform. They can use any web and SSH capable computer as a base station and programming platform.

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