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# Autonomous Drone for Shadowing and Monitoring

**M**.Aswini[1], J.Joselin Jeya Sheela[2], S.Rosaline[3], M.Velmurugan[4]

R.M.K. Engineering College, Department of ECE [1,2,3] CEO of Mirror Technologies Pvt Ltd[4]

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***Abstract:***

A Drone is useful in monitoring and collecting data in a specific region through its vertical flight mechanism. Technological advancements have lead to economical and highly functional characteristics of low power microcontrollers, that eased the development of own drone by general public. Main focus is to modify and improve an existing drone kit in obtaining stable flight, collecting and storing GPS data, performing auto commands, such as auto-landing. Aero Quad drone kit, consisting of batteries , transmitter, receiver, frame, Motors, sensor boards, electronic speed controllers, Arduino Mega development board, a GPS module, a Micro SD card adapter and aeroquad software are hardware and software built of proposed model. Mission planner software is customized to interface the machinery with Quadcopter kit. Customized PID test benches give proper stabilization on each axis. The model is developed to be stable, capable of determining its GPS location , store and log data. Finally the proposed drone design yields stable and maneuverable model.

***Keywords:*** *Aero quad quadcopter, Arduino Mega, GPS, PID controller.*

## I. INTRODUCTION

Certain tasks like search and rescue mission, inspection of high structures that are very dangerous and costly for humans are performed easily using vehicles like Drones. Even on occasions like parties and large events professional Quadcopter can be seen caturing events for promotional or supervision purposes. Moving a mass with physical collaboration and interaction features of commercially available drone is main intrest of the paper.To facilitate a communication among drone and their sourroundings is needed.As a first step an indoor scenario providing position feedback was chosen for collaborating the aerial robots. Beginning with position control, additional controller gears for 8.625 propeller shafts, Reprogrammable motor controller, electronic motor controller with water resistance capabilities are implemented to achieve a stable system A generalized approach is chosen where it is possible to encourage reuse of this research's outcome and deliverables.

Drone is an highly developed open-source autopilot system for multicopters, helicopters, and other rotor vehicles. It provides a wide variety of flight modes from fully manual to fully autonomous.

## II. RELATEDWORKS

Sandeeep Khajure, Vaibhav Surwade, Vivek Badak, [1],formulated a design using metal rod for drone frame.But there is a possibility of increased pulsation in that design. Due to the pulsation, the drone often gets unreliable, hence metal rods were replaced with plastic material and open source software is used in the work done by Nuryono .Sravan Kumar N et al. [2], used a physically controlled quadcopter using the RC transmitter and receiver is discussed. The drone is non automatic and the flight controller parameters are obtained in trial and error method in his design. Anurag Singh Rajpoot et al. [3] developed drone with arduino UNO board as the controller. But arduino board usage proves to be less effective for real time control of quadcopter. Hence the quadcopter needs tuned PID parameters. Moreover the flight characteristics of quadcopter is not satisfactory.

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## III. COMPONENT SPECIFICATION

The following are the electronic assistance provided for the proposed model:1GHz 32 bit ARM Cortex A8 processor with 800MHz video DSP TMS320DMC64x,3 axis accelerometer ±50mgprecision, Linux2.6.32 1Gbit DDR2 RAM at 200MHz 3 axis gyroscope 2000°/second precision, ,3 axis magnetometer 6°precision, Ultrasound sensors for ground altitude measurement ,Pressure sensor ±10 Paprecision, and 60 fps vertical QVGA camera for ground speed measurement all together provide automatic stabilization and precision control features.

The mechanical specifications for the model are as follows: 3 cell 1,000 mAH LiPo rechargeable battery; High pitch propeller for great maneuverability, 4 brushless in runner motors with micro ball bearing and rare earth magnets, 14.5 watt & 28,500 rpm when hovering, Self-lubricating bronze bearings, tempered steel prop shafts, Low noise Nylatron Foam to isolate the inertial center from the engine's vibrational disturbance, Expanded polypropylene hull, Carbon fiber tubes, High grade 30% fiber charged nylon plastic parts.

## IV. PROPOSED MODEL

Fig 1. shows the block connection of proposed system. The model consist of transmitter-receiver section. Initially APM 2.8 is turned on by Arm and Disarm modes in the controller. In Arm option the Drone is on flight mode turning on the APM 2.8, for disarm the whole circuit is switched off. Then GPS gets the current location of Drone by using mission planner software and predefined path is set using way points.Then the APM 2.8 subtracts the location of current point (taken from the GPS) from the waypoint which is given by the Mission Planner software. Based on the output of the subtracted position, the drone is moved in desired direction receiving control from all the four ESCs. Also controller feeds input to the ESC thus contolling the speed of the motor.

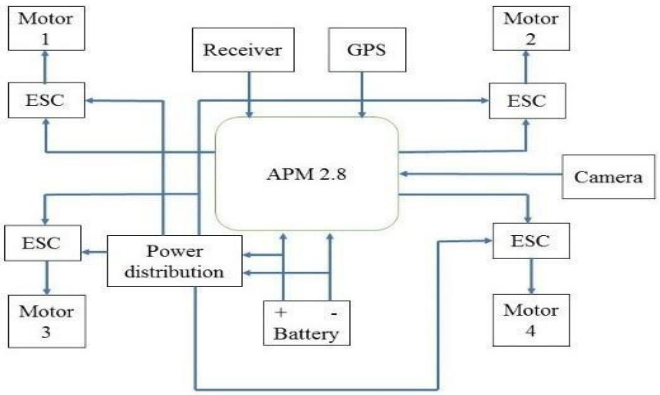


Fig 1. Block connection of Drone

Then fitting the drone with a mobile camera controlled by ground station is performed. Brushless motor, is used because they provide high torque. The aircraft is designed to have adequate payload capability stabilization and localization capability. Image acquisition process is done by attaching a camera to outer panel of drone.

## V. RESULTS AND DISCUSSION

The Fig.2 below shows the main "heads-up display (hud)" view of the mission planner ground station. Once you have associated to a vehicle this screen will display the telemetry sent by ardupilot. Flight data showing altitude, velocity , distance to destination point, yag angel, roll angel, pitch angle, ground speed and velocity can be visualized.


Fig 2.GPS location in mission planner

In figure 3. Shown below,a mission planning example is illustrated with drone takingoff automatically at a altitude of 20 meters; then reaching WP 2 ath altitude of 100 meters on the way,then waits 10 seconds,and proceeds to to WP 3 (descending to 50 meters altitude on the way), before launch. Since the evasion altitude is 100 meters, the

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return to launch will be at 100 meters. The drone lands after reaching the launch position. The mission assumes that the launch position is set at the home, the waypoint and other activities can be entered using the drop down menu to select the command we want.

Fig 3.Mission planning example

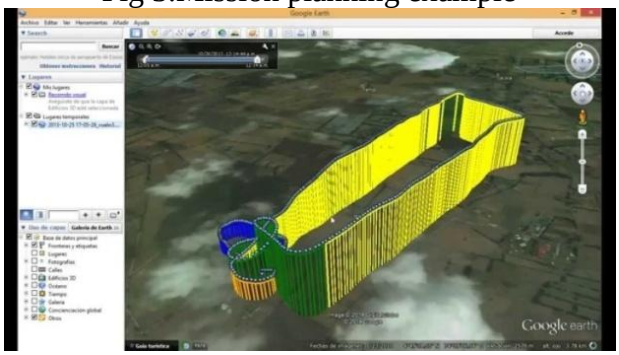

Fig 4.Flight data on Google Earth

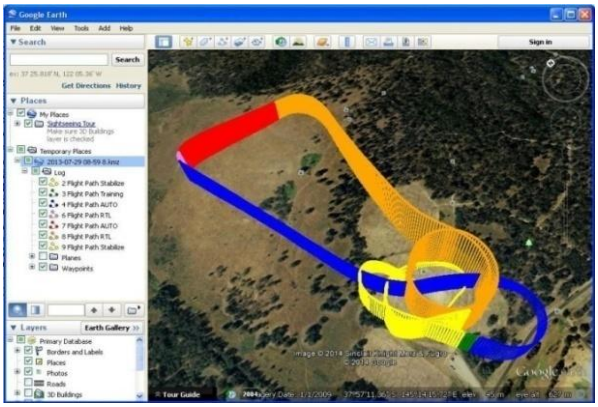

Fig 5.Flight data on Google Earth

The Flight data on Google earth can be viewed by downloading log files from the mission planner, which serves as more convenient way to analyse flight data. Fig 4. and fig 5. Shows the flight data on Google earth.

Fig 6. Autonomous drone assembly

Fig 7.Autonomous Drone during test Flight

The complete assembly of autonomous drone with all Components connected together can be viewed in Fig 6. The drone is test run and checked for operation. The successful test flight of drone can be viewed in Fig 7.

## VI. CONCLUSION AND FUTURE ENHANCEMENT

Advantages of UAV against manned aircraft are numerous, in future UAV may replace manned combat aircraft with more research and technological advances. The work efficiency and tolerance capacity of the drones have surpassed all expectations that its applications are countless. India has released its own drones to support military and space navigation applications. We can use our autonomous drone attached with camera for surveillance purposes.

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**Authors Profile**

**M. Aswini,** persued bachelors degree in Electronics and Communication Engineering from Anna University in the year 2006 and Master's Degree from Anna University in the year 2008 with specialization in Communication System. She is currently an Assistant professor in Electronics and Communication Engineering at R.M.K. Engineering College, affiliated to AnnaUniversity Chennai.

**J.Joselin Jeya Sheela,** received her Bachelor's degree in Electronics and communication Engineering from Anna University in the year 2005 and Master's degree in Communication system from Anna University in the year 2009, she is currently an Assistant Professor in the Department of Electronics and Communication Engineering, R.M.KEngineering College, affiliated to Anna University, Chennai.

**S.Rosaline,** received her Bachelor's degree in Electronics and communication engineering from Anna University in the year 2005 and Master's degree in VLSI Design from Anna University in the year 2008, she is currently an Assistant Professor in the Department of Electronics and Communication Engineering, R.M.K Engineering College, affiliated to Anna University, Chennai

**S.M.Velmurugan,** received his Bachelor's degree in Electronics and Instrumentation Engineering from Thiagarajar College of Engineering in the year of 2005 , Having 13+ Years of Experience in the field of Embedded Product Development , currently working as CEO of Mirror Technologies Pvt Ltd , Learn Bench India and Mirror Institute For Embedded Technology (MIET) at Chennai.