

IoT LAB PROJECT

1. SUBHANKAR BHATTACHARYYA
2. PRIYA JHA
3. SOUMI BANERJEE

Hybrid Drone/Drone on Wheels

February 09, 2019

Product Overview

Often the major problem with drones occur when it has to pass through small tunnels and holes without attracting much attention of the crowds . In such cases it seems that rolling is a better approach than flying . Though silent drones are already in full fledge , but their cost and reliability is not much .

Moreover flying objects becomes the center of attention which is not a great feature of spy drones hence comes our idea of drones.



Concept Model

Objective :-

To make a drone that can both fly as well as run on ground .

The main objective here is to make our drone as much stealth as possible and to adapt itself in all sorts of adverse environments such as travelling through small tunnels , holes etc. Also with certain amount of

effort and proper funding we hope to make it even run even on water . We will be using either arduino or raspberry pi as our project's main micro-controller system.

Why do we need this product??

Our whole product is basically based on military based usage but still it's usage can be in a far wide range of fields , now let's discuss some of them

- **MINING PITS** - Often engineers working in mining industries require to investigate mining fields and pits for safety and security of miners but can't scan those pits from outside just by using copters/drones since those places have too much of an eradicated structure and flying nor rolling through them is not a comfortable task since the bots have the high risk of often getting stuck at places.but what if we got the capabilities of both flying and rolling such that while rolling even if the bot gets stuck at some point we can take it out by controlled flying through them.
- **SPYING** - recording video footage anonymously from a distance is a role needed for different secret service organisations, and sting operations, but the amount of noise made by flying drones makes it almost undesirable for such purposes and even though silence drones are already in the market but its cost almost adds up to an unnecessary investment.Moreover an aerial bot is more prone to be seen by the enemies than ground bots.So, adding up the two,While our bot's aerial feature gives our bot mobility and speed , it's ground feature adds up to its stealth characteristics and camouflaging.
- **3-D IMAGING OF DESTROYED BUILDINGS** - Firstly, we do need to understand that disasters(both natural and man-made) happen all the time and civilians gets trapped in such chaotic disasters all the time.Hence an area inspection of destroyed buildings for safe entry and exit through such structure is of utmost importance in such situations.Though aerial drones proves to be quiet effective in such cases but the challenge lies when it has to pass through small openings under the door or when some pillar blocks it's way through.Rolling might then seem to be favourable option in such situations

Project Designing

Our whole project will be basically combination of two of the tutorials from our references using almost similar coding and algorithm technique.Relay switches and sensors would play a vital role in this project.

LDR will be used which would be linked to an LED through arduino board which will make the LED to glow in case of areas with Low light intensity. LDR will make sure to switch on the LED's automatically so that images of the camera won't be compromised even for few seconds or due to misjudge of the quality of image by the user.

IR sensors will make sure that the drone first touches the ground before switching the relays to hand over the controls of the transmitter to the ground wheels

Mode switch in transmitter will correspond to a relay circuit on the bot to switch between flying and rolling modes

REFERENCES

We have been researching about this project for a long time now and we have gone through all possible references we can find online as well as offline and here are some of the listings of our research sources:

- www.dronezon.com
- www.brokking.net
- Oreilly.Arduino.Cookbook.2nd.Edition.Dec.2011
- Make Drones Teach an Arduino to Fly by David McGriffy
- Your Multicopter Flight Controller - 3D
(YMFC-3D)(https://www.youtube.com/watch?v=2pHdO8m6T7c&t=141s&index=2&list=PLPthmMr7vKySs8WjFCb_QnYbfEX0Orocy)
- How to Make a Drone / UAV
(<https://www.robotshop.com/community/tutorials/show/how-to-make-a-drone-uav-less-on-3-propulsion>)
- Arduino DC Motor Control Tutorial - L298N | H-Bridge | PWM | Robot Car(https://www.youtube.com/redirect?event=video_description&v=I7IFsQ4tQU8&q=https%3A%2F%2Fhowtomechatronics.com%2Ftutorials%2Farduino%2Farduino-dc-motor-c)

[ontrol-tutorial-l298n-pwm-h-bridge%2F&redir_token=q2aasV02YNGPFrgxEEOE9-IT5zh8MTU00Tc0MjI0NUAxNTQ5NjU1ODQ1\)](https://www.youtube.com/watch?v=ontrol-tutorial-l298n-pwm-h-bridge%2F&redir_token=q2aasV02YNGPFrgxEEOE9-IT5zh8MTU00Tc0MjI0NUAxNTQ5NjU1ODQ1)

- Many more...

Product list and Pricing :

1. ARDUINO UNO/MEGA: RS 499
2. MPU 6050 GYRO/ACCELEROMETER:RS 235
3. 1000 KV MOTOR::RS 395
4. PROPELLERS: RS 226
5. 2200MAH LIPO BATTERY: RS 1780
6. LIPO BATTERY CHARGER:RS 549
7. INTEGRATED POWER DISTRIBUTION BOARD:RS 1120
8. RESISTORS
9. DIODE(1A):
10. LED
11. WIRES
12. L298N Driver : RS 2,399.00
13. 12V High Torque DC Motor : RS.2,327.00
14. DC Motor w/ Plastic Tire Wheel :RS.1300
15. BREADBOARD
16. FlySky FS I6 2.4 G 6Ch AFHDS RC Transmitter with A6 Receiver Left Hand : RS. 4,799.00
17. 30A ESC : RS.1200
18. LDR SENSOR : RS.400
19. IR SENSOR : RS.800(4 SENSORS)
20. JOYSTICK MODULE FOR ARDUINO:RS.200
21. 1CH RELAY SWITCH : RS.130
22. Continued with further modification of model...

Q&A

1.How will you account for the stability of drone?

Ans. While our auto-leveling program will ensure that our drone stays in its position while hovering , the balance of the drone while moving will be maintained by the gyro/accelerometer sensors and their corresponding readings fitted in the code.The code will be made available as soon as the project gets approved by the lab.

2.How will you manage the weight of drone?

Ans.Expected weight of the drone will be almost same as the weight of normal quadcopters except the weight of the extra motors for ground travelling.Hence to make the weight as less as possible we will be using only 2 motors for rotating 2 wheels at the middle while two lightweight swivel will balance the oppositetwo sides such that the CG of the drone is not disbalanced

3.What happens if the drone fails in mid-air?

Ans. The drone will then be running on a fail safe mechanism as described in the book “Make Drones Teach an Arduino to Fly by David McGriffy” under the topic of “failure mode and fault tolerances”

4.What will happen if the mode is changed in mid-air?

Ans.Even if the mode is changed in mid-air the relays won't transfer the control over ground motors until and unless the IR sensors fitted under the motor wheels senses the ground.In that case the control will be undertaken by the arduino's autonomous landing program.

5.How to account for the jerking caused while landing the drone?

Ans. To avoid jerking of the copter while landing it is adviced to switch the modes while still above the ground so that the autonomous program makes sure of a safe landing

6.How will you make the drone in a smooth swooping action which requires both aerial and ground motors to work simultaneously?

Ans.Drones are basically designed after real life helicopters hence landing a drone in an aeroplane fashion will be a bogus feature and won't be of any use at all.

CONCLUSION

All things considered the project we are going to undertake won't be much of an easy task, but then again one can never expect a technological breakthrough through some easy task. We will be needing a full length support and help from our mentors and teachers concerned to make this a success.Moreover we need them to realise and imagine the technology and its main objective.I always have this strong notion about technology that "Technology is only limited to how far one can imagine , our imagination is the greatest technology man-kind" . I hope our idea will be well liked by the concerned authorities...