
Gyrocopter: an effective alternative of drone

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Abstract

While there are numerous advantages of using drones, there are several perceived challenges as well. A large number of drones are straight away rejected due to distortion of the center of mass from its axis. Drones generally used gyration sensors to maintain proper balance, which in turn make the drones heavy and eventually the effective time of flight gets reduced. In addition, gyration sensors been expensive, drones are not at all cost effective. This paper aims to model a device as an effective substitute to drone in reference to the principle of gyration. Because of the structural frame and high speed of rotation, they intend to have their own balance. The device does not use gyration sensors and use of only one propeller makes it lighter and cheaper than drones. Apart from other advantages and future scope, some limitations of the model are discussed as well.

Keywords: Gyroscope, gyration sensor, drone, propeller, servo motor

1. Introduction

The main purpose of this project is to find an effective solution to some of the common problems faced by drones. As the title of the paper "Gyrocopter: an effective alternative of drone" suggests that our model is an effective alternative to the following problems faced by drones:

1. Drone cannot find balance on its own. Most of the drone models are rejected due to the distortion of the centre of mass from the axis of the drone.
2. Drone uses gyration sensor to maintain its balance
3. Due to the excessive weight of the gyration sensor, drone has a short flight time. Gyrocopter is very light weighted device.
4. Gyration sensors are very expensive which in turn makes the drone expensive. Not only drone uses gyration sensor but also many other expensive part which makes drone even more expensive.

Gyration is the movement of an object to in a circle or spiral, or around a fixed point. If any object rotates with high radians per minute, it performs gyration. During gyration the axis of rotation automatically locates

collaterally with the centre of gravity of the object, thus that object finds high stability and does not tends to change its posture until the rotation/gyration stops.

Gyroscoper is a device that works on the principal of gyration. The model is made in reference of the famous model of gyroscope. Gyroscopes are models that tend to defy linear gravity. Due to their structural frame and their high speed of rotation they intend to find their own balance. The device checks the use of extra gyro sensor that is used in drones.

2. Construction

- Since Gyroscoper is cost effective, it uses minimal number of inexpensive materials. It can be constructed using the following materials :
 1. Three circular rings of almost same radius.
 2. One high speed propeller.
 3. Four servo motors.
 4. Four rectangular sheets of same dimensions.
 5. A circular plate.
- Construction of the model
 - The three circular rings are attached mutually perpendicular to each other. It is attached in such a way that, the diameters of two rings coincide with each other, and the diameter of the third ring is perpendicular to the diameter of the other two rings.
 - One high speed propeller is kept on middle of the frame, such that the centre of gravity lies on the axis of rotation.
 - Four servo motor are attached to the base of the propeller and are mutually perpendicular to each other.
 - One end of each of the four rectangular sheets is connected to each of the servo motor, and the other end is connected to the frame. Rectangular sheets can be rotated at certain acute angles. Attachment to the frame provides free rotation.
 - The main frame of the model represents a sphere. Just below the diameter of the sphere there is a cylindrical stand and underneath that there is a circular stand. That spherical frame stands straight with the help of these circular plates.

3. Working

The device is stationary when the propeller is stationary. The device stands erect with the help of a small flat disc attached to the bottom of the device. The rotation of the propeller helps the centre of gravity of the device to align with the axis of rotation. Due to the high rpm, the propeller thrusts the air downwards, which leads to the levitation of the Gyroscoper. Due to the light weight of the device, one propeller is enough to levitate the device. More the rpm of the propeller more is the levitating power. While the propeller helps in the vertical movement, there are two pairs of rectangular sheets which are mutually perpendicular to each other, allow the device to any desired direction. Each of the sheets is connected on both ends. The rectangular sheets are not only freely rotatable but also can be rotated at certain angles with the help of the

servo motor. These sheets help to move the device in the desired direction. The air gusted by the propeller is forced on the surface of the sheets. The device will be forced to move in the direction opposite to the direction in which the rectangular sheets are rotated (just like the sails of a ship). The device can be moved to any desired direction with the help of the four rectangular sheets. If two of the subsequent sheets are rotated simultaneously then the device will move in a direction between the major direction, such as north-east, north-west, south-east, south-west. Moreover, the frame work helps the device to maintain the balance irrespective of any movement of the device.

4. Advantage

- Due to their structural frame and high speed of rotation they intend to find their own balance.
- Gyroscopier doesn't use gyration sensor and it uses only one propeller which makes it lighter cheaper than drone.
- Due to the less weight than drones, Gyroscopier have longer flight time than normally used drones.
- The device is very small in size so it is easily portable and can pass through small gaps.

5. Disadvantage

- In spite of having many advantages, it has few disadvantages.
- The device faces difficulty while landing.
- It is easily affected by harsh weather condition due to its light weight.
- Training is usually required to fly them perfectly.
- The device can be used for illegal purposes like in terrorist activity, big robbery.
- Adding new components to upgrade the device is difficult as this will affect the balance of the device.

6. Practical use of Gyroscopier

- ❖ Military :- Gyroscopier can be used in military base camp as a survey lens instead of drones as they are cheaper and have longer flight time.
- ❖ Fire fighting :- This device is effective in putting out fire by spraying water or carbon dioxide and so it can be used in fire brigade.
- ❖ Agriculture :- Farmer can use this device to spread seeds, pesticides etc. This will reduce manual labour, increase the profit of the farmers and in turn increase the economy of our country.
- ❖ Source of entertainment :- Toy making company can use it as a toy for children above ten years of age. New features can be added to the device for making it more entertaining. By playing with this device, children can train their scientific mind.
- ❖ Delivery services :- It can use as a delivery device instead of a human. By using Gyroscopier, the company can increase its efficiency by saving both time and money

7. Conclusion

In near future we will turn this idea into real life project. We are working on the device to overcome the above mentioned problems .The improved device has a numerous scope in future. This device can be used in field of agriculture and defence. It can be used to delivery good and as a source of entertainment for children. In future this budget friendly device which works on the principle of gyration with a single propeller will surely be an effective alternative of the heavy and expensive drone.

REFERENCES

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