



EVOLUTION AND TECHNOLOGICAL ADVANCEMENTS IN DRONE PHOTOGRAPHY

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Abstract: *Developments and modifications play a vital role in the technological advancements. Since last few years the unmanned aerial vehicles or drones have been a hot topic considering photography. Drones are known for capturing the bird's eye view of the world, which graces the view of our planet from higher altitudes. Drones can be described as the latest development in aerial photography field because it was long ago that airborne cameras captured appealing images which covered the areas like measuring the scale of natural disaster, getting a glimpse of the unknown lands etc. The scope of drones has widened from capturing an aerial view image to complete cinematography. Drones provides the better angles for much delight of a photographer to shoot with and also capture the unexplored areas.*

Keywords: *Unmanned aerial vehicle (UAV), airborne, DJI, Drone, panorama, Gimbal, Mavic, fps, TESLA*

Introduction

Drones have become an essential gear in a photographer's kit in today's era. This image capturing device is an unmanned aerial vehicle which mostly is operated by the radio controllers combined with the smartphones. Technological advancements have always contributed for a hassle free process of aerial photography with the use of these UAV's and to make human life even more comfortable.

This paper highlights the evolution of aerial photography and the advancements of Drone in photography and cinematography along with its scope in the near future.

History

It was not long after the invention of commercial photography that cameras were floated into the sky by valiant group of photographers. They used sky balloons, rockets and even kites. As per P. Amad's 2012 research on ariel photography, published in the journal History of Photography, Gaspar Félix Tournachon, is credited with taking the first successful aerial photograph in 1858 from a hot air balloon tethered 262 feet over Petit-Bicêtre, just outside Paris.¹ Later, the method of these aerial panoramas was perfected by using the large format cameras strapped to the kites along with the curved film plates. Few years after the first aircraft's flight by Wright Brothers, Pilot powered aircraft was used for the first time to capture the aerial images. Since then it is just the exponential growth in the aerial photography sector with technological innovations.

Working of Drone

Operating a drone seems no more complex than playing a video game with a remote control joystick pad and an equipped GPS system, But behind this smooth operation there is the involvement of complex technologies which include an accelerometer, a gyroscope, motors and a lot of software innovations that create a user friendly interface. The most important parts in the working of the drone are the rotors, which are used for propulsion and control. A rotor can be assumed as a fan, because the working of the two is almost same. The blades attached to the rotor push the air downwards, as the forces act in pairs, this means that when the rotor pushes the air down the air pushes the rotor upwards. This is the basic that we study as lift. It depends on the spin of the rotor, greater the spin higher will be the lift and vice versa. Drones are capable of hovering, climbing or descending, this process requires application of few basic laws of physics. While hovering the net thrust of all the four rotors which tends to push up the drone must match the gravitational force pulling it down. To climb or move up, the thrust of all four motors needs to be increased such that there is a non-zero upward force which is greater than the weight of the drone. But now when the thrust is decreased, the forces acting on the drone will be weight, thrust and the inclusion of air drag. This is the reason why greater thrusters are required for hovering the machine.

There are two more basics in the working of drone. It's not just ascending, descending or hovering that a drone does but also it is important for a drone to rotate and move along a path (straight or backwards).

Now to rotate the drone the concept of angular momentum and torque is used. The angular momentum is calculated by multiplying the angular velocity by the moment of inertia. The angular momentum depends on the spin of the rotors. So if the drone is to be rotated to its right, the angular velocity of the top left rotor is decreased this would cause a positive angular momentum and the drone would rotate clockwise. Similar concepts can be used for counter clockwise, sideways and forward movements.

Drone in Photography

DJI, Yuneec, UVify, Hubsan, Parrot etc. are a few manufactures who have contributed to drone photography by creating technologies that human brain could just imagine. DJI is one of the top most drone manufacturing companies, they have developed the signature series of drones which are often imitated for their designs. The DJI drone series includes the giant Phantom, Mavic, spark and tello drones which are further classified into various other sub categories.

Drones have completely changed the trends in photography and have influenced the other relative techniques with the creativity of the photographer. Drones can even reach points and capture images with such angles which is impossible by using regular cameras. They capture the aerial footages of landscapes, events, architectural sites etc. which previously was a very tiring task as it needed helicopter, crane or a small plane.

The drone cameras are supported by a powered gimbal which is responsible for the smooth footage that we get even after the vibrations from propellers. The reduction of size of the high resolution cameras has not compromised on the clarity and resolution of images because of powerful software technology and advanced hardware. The powerful lithium ion batteries allow the drone to take flights which can last 20 minutes or more.²

Some drone cameras shoot at 30 frames per second (fps) while others will shoot at 60 fps, So the photographers do not need to compromise on the frame rates too. Hence it can be said that the drone cameras are miniature of the high end professional cameras

Even if the drone is not inbuilt with a professional cameras, it is possible to add a go pro to the body of the drone which gives amazing aerial photography results.

The use of aerial shots has increased since the compact drones were launched. These have also become an important aspect in many events, institutions and also for local authorities, for Photography as well as security surveillance. The use of drones for photography and cinematography has majorly contributed to the Weddings and Sports events. The most important factor about the use of drones in aerial photography is the reduction of risk factor in capturing the elevated shots or the aerial shots which was pretty high earlier. Earlier it was necessary for the photographers to

been a specific altitude to capture the certain required shot, Now advancement of technology with drone, aerial photography is done with much ease by using the Remote controller which can be even operated with the smartphones.

As far as camera assembly is concerned, the camera is attached to a 3-axis gimbal so these drones are not only used to capture the aerial shots, they can also be used as a camera attached to a gimbal and handheld for a perfect cinematic shoot experience.

Advancements in drone technology

Auto piloting and auto capturing techniques have made drone pilots as a optional elements in aerial photography. Companies like TESLA have introduced the concept of Artificial Intelligence technology which has improved the safety and making the process hassle free for the user. The A.I technology has included the collision avoidance possible along with object tracking and automated quick shot capturing.

Another drone manufacturer Skydio has developed a 45 Megapixel totally Artificial Intelligence brain camera which is capable to detect the object and then capture it without involving any human element. Drones have nearly conquered big cinematography market with the introduction of 6k and 8k video technology.

The most interesting innovation in recent times has been the “DJI Mavic Mini”. A drone which is as small as a smartphone (for instance the iPhone 11 pro max). But this tiny piece of technology packs in loads of features and high end camera specifications. This drone caught the attention of the customers not because just of these features, viz. its light weight that delights one for aerial photography. It weighs 249 grams and as per the drone aviation rules, in USA, UK, Europe and China any aircraft over 250g (8.8oz) is subject to a compulsory registration scheme, So this compiles that DJI Mavic mini is a completely legal drone and it does not require any registrations.³



Title graphic Image Source: Dronezon

Now a days it is often seen that the drones are also used to give a cinematic look to the videos and enhance the beauty of the events by adding confetti or Flower(mostly rose petals) dropping devices to the drone. The drone along with dropping them captures the cinematic shots of the event so it gives a picture perfect frame for the photographer to capture.

As the demand for drones is increasing there has been an increase in the competition amongst the brands to manufacture the drones equipped with newer technology keeping the cost effectiveness in mind. So this has led to a significant drop in prices of drones compared to the initial days of its launch.

Conclusion

Drones are an important technological innovation and this technology is all set to grow into a large commercial industry in future. Drones are capable enough to become an important asset to the society provided they are used judiciously.

Drones have proved to be photographers' go-to gear since the introduction of the professional camera equipped drones. It has changed the trends of photography and cinematography widening its scope, capturing the unexplored places and providing new dimension in photography. The introduction of drones to photography has also led to a development of newer genre for photographers and cinematographers. Drones have made our planet look even more beautiful with the fisheye camera technology combined with the aerial photography. Drone photography is set to become the largest photography trend in the near future as its utility is increasing exponentially.

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