

Task 1

Report

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UAV:

UAV stands for unmanned aerial vehicle or unscrewed aerial vehicle. It is commonly known as drone. It is an aircraft without a human pilot on board. The flight of UAVs may operate under remote control under by a human operator or some other technique such as autopilot assistance.

UAVs are originally used for mission which are too dull, dirty or dangerous for humans. The application of UAVs are aerial photography, product deliveries, agriculture, policing and surveillance, infrastructure inspections etc.

Types of UAV

UAV's can be classified on different basis like :

Classification according to size

1. Very small UAV
2. Small UAV
3. Medium UAV
4. Large UAV

1. Very small UAV:

The UAVs whose dimensions ranging from the size of a large insect to 30-50 cm long are called very small UAV. These are very small in size. They are very light weighted. They are usually used for spying and biological warfare.

2. Small UAV:

The UAVs whose dimensions ranging from the size of a large insect to 30-50 cm long are called very small UAV. They are based on the fixed wing model. These are launched by human hand.

3. Medium UAV:

The medium UAV are too heavy for a human. These are still smaller than light aircraft. It can carry load of 100-200 kg. Some examples of medium UAV are Israel-US Hunter and UK watch keeper.

4. Large UAV:

Large UAVs are bigger than Medium UAVs. These are mainly used for the combat operation by the army.

Classification according to Range and Endurance

5. Very low cost ,close range UAVs
6. Close range UAVs
7. Short Range UAVs
8. Mid-range UAVs
9. Endurance UAVs

1. Very low cost ,close range UAVs:

The UAV that has the range under 5 km are came under this category. The endurance time of this category UAVs are about 20 to 45 minutes. This class is close to model airplanes.

2. Close Range UAVs:

The UAV that has the range under 50 km are came under this category. The endurance time of this category UAVs are about 1 TO 6 hour. It is mainly used for reconnaissance and surveillance tasks.

3. Short range UAVs:

The UAV that has the range under 150 km are came under this category. The endurance time of this category UAVs are about 8 to 12 hour. This is also used for reconnaissance and surveillance tasks.

4. Mid-Range UAVs:

The UAV that has the range above 150 km and below 650 km are came under this category. This is also used for reconnaissance and surveillance tasks as well as for gathering meteorological data.

5. Endurance UAVs:

The UAV that has the range of 300 km and have a endurance of 36 hours are came under this category. . This is also used for reconnaissance and surveillance tasks

Advantages of UAVs:

Some of the advantages of UAVs are:

1. Quality Aerial Imaging:

Drones are very good for taking high quality aerial photographs and videos. It can be used to collect high amount of image data. These high resolution data can be used for many purposes like making 3 D model for maps which can be helpful in many ways like rescue operations etc.

2. Precision

AS UAVs consist of GPS it can be programmed precisely for maneuvered accurately to particular locations. This can be helpful in verity of situations. This is very helpful in precision agriculture.

3. Easily Deployable

Advances in control technology make most drones deployed and operated with minimal experience. UAV also have greater range of operators than aircrafts. UAV are having ability to fly lower and in more directions.

4. Security

One of the main advantages of drones are security. With the license, operators can use UAVs to provide security and surveillance to private companies, sporting companies, and other venues. It can be also used for gathering valuable data during natural disasters.

Disadvantages of UAVs:

Some of the disadvantages of UAVs are:

1. Legislative Uncertainty:

The use of UAVs are relatively new, legislature is still catching up. FAA(Federal Aviation Administration) has established certain rules for small UAVs but still there are ambiguities. There are a lot of conflicts and confusions regarding the use of UAVs.

2. Safety:

This is the primary concern of using UAVs. We have to worried about some issues like mid air collision. It must be programmed with “sense and avoid” capabilities that can match the concept of manned aircraft.

3. Privacy:

One of the most important concern from public about UAVs are its privacy. Drones can collect data and images without the attention of anyone.

Limitations of UAVS

Some of the limitations of UAVs are as follows:

1. Low operation Speed
2. Vulnerable to hackers
3. Privacy issues
4. Collateral Damage
5. Causes Unemployment
6. Battery Life
7. Weather changes
8. Cost

Aerial Inspection

Aerial Inspection is a process of inspecting various image data collected with the help of different types of UAVs/Drones and sensors at different places for better analysis and working of that field. Aerial inspection can provide information on many things not visible from ground.

How Aerial Inspection is used

In aerial inspection we get high resolution images from UAVs. We use these images as our data for measuring the particular area. Here the UAVs camera can be used as a inspector eye. Visual data is collected by the UAV and then reviewed in detail by inspector. Not every UAVs inspection are visual. Any kind of sensor which can be fitted to the UAVs can be used for the inspection. Now we can perform many deep learning algorithms to find out the details of the visual data.

Uses of aerial inspection

Aerial Inspection is used in different fields such as:

1. Mining
2. Geographical Survey's
3. Self-Driving Cars
4. Agriculture
5. Large-Scale Area
6. Project Surveillance

Industrial application for aerial inspection:

Industrial application of aerial inspection can be seen in many industries such as:

1. Mining
2. Infrastructure
3. Railways
4. Highways and roads
5. Agriculture
6. Power plant
7. Transport
8. Military

UAVs are revolutionizing the inspection industry. Industries can perform inspections from a safe distance without using expensive ladders is a priceless win. Large areas can be covered in less time as earlier which includes complicated inspections.

Advantages and importance of aerial inspection

Following are the advantages of aerial inspection

1. Faster inspection time

UAV based inspection will take very little time as compared to a human.

2. Real cost saving

Using UAV for huge area is always beneficial than appointing a human to perform the same task Drones are reusable and hence cost is worth it.

3. More detailed survey

We can get in detail information about the area we are inspecting than the information a human can provide. Due to computer vision, minor details that could be ignored by a human eye would be captured as well.

4. Safety

In places where there is a risk of serious hazard to human, if we are to use aerial inspection the risk will be overcome.

5. Greater coverage

Drones can have aerial view, which allows them to have wide coverage.

Disadvantages of aerial inspection:

1. Privacy violation

Due to thermal sensors, cameras and other sensors, drones can get private data of citizens, which violates their privacy.

2. Public safety

Drones need to have sensors that alert the users about the possible collision it could have while roaming amid the public.

3. Threat to nature

Drones are vulnerable to wild animal attacks. In that it could crash on a tree in the forest or collide with any defenseless wild animal.

4. Unclear legislation

The rules about usage of drone are still not clear and hence, usage of drone is limited.

Available software for Aerial Inspection:

- ArcGIS
- Agisoft PhotoScan
- Recap
- Mapware
- Pix4Dmapper
- Drone Deploy
- Micmac
- MATLAB

Drawbacks of existing tools and software:

- Less resources to learn
- Some are not even open-source
- Easy to hack
- Knowledge and skills