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Contribution of Unmanned Autonomous Systems (UAS) for the Development of High-Tech, Intelligent Machines Capable of Traveling by Air, Land, or Sea without A Human Crew on Board

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Abstract

This article is focused on the contribution of unmanned autonomous systems that are based on the Hitech autonomous system. On the other hand, it also includes an intelligent machine that has the capacity to travel by sea, land, and air without humans. There are different kinds of autonomous robots, vehicles, drones, and warehouse and factory system that helps to provide smart service to individuals. Artificial intelligence plays a major role in the autonomous system and it is responsible for developing the smart system. unmanned aerial vehicle (UAV) that is also known as a drone and is generally used for mapping, wars, product deliveries as well as surveillance.

This study has also shone a light on the safe environment development that leads to providing a safe environment through proper surveillance in a large area within a limited time period. In this context, UAVs play a major role in monitoring environmental law enforcement, geographical mapping, and wildlife monitoring. Transportation systems one other advanced facilities provide extraordinary service to society. It can deliver emergency medical products such as medicine, equipment, and other package products. It has been seen that several kinds of transport and logistic markets use these drones to enhance their business and deliver products safely. Accordingly, this study has also discussed the limitations of the UAS system on land, sea, and air. It can be stated that it can be effective for society and future generations.

Keywords

Search And Rescue (SAR) drones, Unmanned Aerial Vehicle (UAV), Unmanned Autonomous Systems (UAS).

INTRODUCTION

Unmanned autonomous systems (UAS) are referred to as high-tech, intelligent machines which are traveling in air, land, and water without any human presence. Different autonomous robots, autonomous vehicles, autonomous drones, autonomous warehouses, and factory systems are some examples of unmanned autonomous systems. Artificial intelligence (AI) is used for completing the autonomous system which is providing better development to build intelligent machines, it is developed with the use of a human operator as an advantage. An unmanned aerial vehicle (UAV) which is normally known as a drone is also used for different surveillance, mapping, wars, product deliveries, and much more. The flight of UAVs may operate under remote control with the help of a human operator known as remotely-piloted aircraft (RPA) or it can be operated with autopilot assistance without any human intervention. An Unmanned Aircraft System includes not only the UAV/Drone but also it includes the person from the ground who is controlling the flight and the system in place that develops a connection in them. Different UAV robotic technologies are used to perform different operations in air, land, or sea with the help of a global positioning system (GPS) to locate and perform work properly. It is based on Newton's Third Law of motion where for every action there's an equal and opposite reaction. On A quadcopter the propellers push air downwards. This causes an opposite reaction which is called thrust that pushes the quadcopter upwards against gravity. In modern times UAS is used in various sectors as a leading technological advancement which is beneficial for providing different specified help in those sectors and makes the work easy for the people. Saving Time, Saving Lives, and Saving Money can be achieved with the help of drones which are able to perform different difficult tasks suitably. Manual, semi-automatic, and fully automatic are the types of control that can be seen in drones.

In this study, the different contributions which are done by the unmanned autonomous system the society, and the world are discussed. The proper understanding of different unmanned autonomous systems is also described in this article.

LITERATURE REVIEW

Contributions of UNMANNED AUTONOMOUS SYSTEMS (UAS) in AIR, LAND, OR SEA

Safe environmental development: Communication developed with drones is helping to provide a safe environment which is essential for lowering different hazardous situations, controlling areas, and different others.

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Drones are used for developing accurate locating of any places and providing proper survlleience for a large area within a short period of time [1]. Drones are also having hugely positive effects on animal conservation and habitat protection. UAVs are helping in wildlife monitoring, environmental law enforcement, and geographic mapping. Communicate about possible hazards, and notified different threatening conditions which can be developed in oil and gas refineries, flare stacks, and pipelines are done with the help of drones. Monitoring of gases and emissions in the air with the help of advanced sensors air quality of an area is improved. Detection of pollution more accurately can be possible with the help of UAVs.

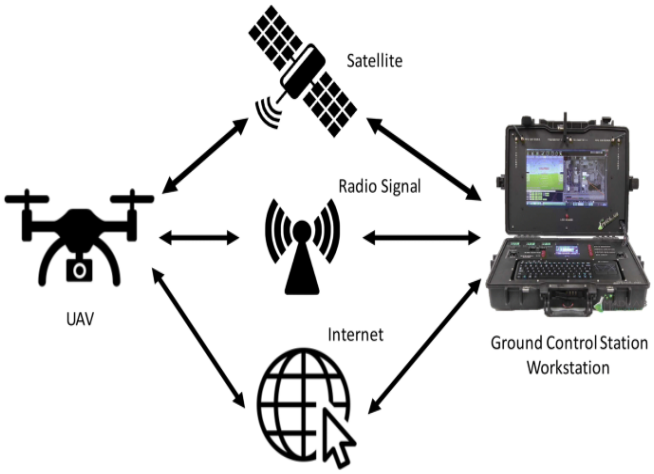

Figure 1: UAV Communicational system
(Source: 2)

The entire communication system of unmanned autonomous systems (UAS) is developed with the help of the internet, radio signalling, and satellite signalling systems [2]. The complete system can be controlled with the help of a ground control station which is able to develop a proper communicational system. With the help of end device (ED)-secured communication, a pilot can easily control the UAV devices without any information about the networking architectures, Internet protocol version, and network address translation types.

Transportation: Drones are developing a new future with the help of different transporting systems which are beneficial for ensuring growth in society. The deliveries of emergency medical equipment, medicines, and other packages are easily done with the help of unmanned autonomous systems [3]. The traffic conditions become lesser in the air which is able to ensure fast delivery and with the help of a navigation system, it is possible to provide accurate delivery of different products. The inspection can be easily done with drones in different risky areas such as highways and bridges, this is ended any manual inspection of these areas and bring growth. Providing proper aid and relief by flying in emergency supplies like water, food, and medicines is helping to save lives in various hazardous conditions with the help of drones.

Figure 2: Transportation Drones
(Source: 4)

Logistics and Transportation markets are enhanced with the help of different transportation drones which can transport different packages from one place to another safely and accurately. Warehousing, Infrastructure, and Shipping are easily developed productivity with the help of different drone devices. The drone Logistics and Transportation market will be going worth 29.06 billion USD within 2027 which is predicted according to the new market research report [4].

Agriculture: Nearly 80% of commercial UAS are used for the agricultural sector [8]. The agricultural sectors are getting developed with the help of UAS services which are helping to promote an effective way to increase the production of different crops, monitor any issues developed in the field, solved irrigation problems, spread pesticides in the fields, and much more [5]. These improvements developed with UAS are useful for increasing production and the ability to develop accuracy in monitoring agricultural developments.

Figure 3: Agricultural drones
(Source: 5)

The monitoring of livestock also can be easily achieved with the help of drones. The optimal use of planning land and water can be done with the help of agricultural drones which can ensure the growth of productivity for different agricultural products. Precision agriculture can be easily

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developed with the help of different drones which are able to reduce the labour time and assist farmers to maximize their revenue generation.

Military: Unmanned autonomous systems (UAS) are used for different vital military operations. With the help of navigational systems and thermal detection, various surveillance operations are completed by militaries across the globe [6].

Figure 4: The Military Drones
(Source: 6)

All major military powers are developing drones for battlefield surveillance UAVs to extend the view of the ground and naval forces and also to enhancing the reach and accuracy of their supporting fire. These factors of drones can easily ensure the support system on the battlefield which is able to develop the chance of winning in the war without losing the life of any soldiers. The remotely controlled UAS can be developed in small sizes and shapes so that it can easily merge with different environments are beneficial for providing surveillance and others. Different modified drones which are developed for the military are providing visible differences in war, surveillance, and other situations.

Research and development:

The drones are able to reach various places which are beyond the reach of humans and gained valuable data from those places. High-resolution topographic images gained from drones are beneficial for developing proper research and development. Thermal imaging, building inspection, and various research work can be easily and accurately developed with the help of a UAV system. Different marine and space research excavations are easily conducted with the help of drones. Various space research is successfully possible with the help of different satellite drones which are able to identify various new objects in space. The drones can float in a zero-gravity environment and are able to be operated from the earth are useful for various developments in space. Drones can also reach different dangerous places which are unable to visit humans are beneficial for providing essential information about research and gaining growth in society [11]. Forecasting different natural disasters can be easily developed with the help of drones. The collection of different test samples also can be possible with the help of drones which are created for visionary development in the future. With the help of different modern developments drones are able to complete different historical research which is providing various improvements in society and gaining growth by acquiring different knowledge.

Rescue operations: Search and rescue (SAR) drones are helping to find out any issues with the fast access of different aerial data for a large area map and are able to search the entire area and pinpointed the possible places where the person can be trapped**.** Emergency responders with the help of drones can save the lives of various people in different disasters. People are facing situations of earthquakes, heavy rain, fire, and other issues where drone systems are vastly used. This life-saving system is used for ensuring the safety of humans and animals in serious conditions by locating accurately from an aerial view. Ground wilderness search and rescue includes the use of search and rescue canines, urban search and rescue within the city or in an urban environment, and air-sea rescue over the water [7]. These are the types of search and rescue operations that can be performed with the help of unmanned autonomous systems. Any lost, distressed, sick, or injured persons can be rescued from different remote or difficult-to-access areas such as mountains, deserts, forests, and seas helping to complete proper search and rescue operations with the help of unmanned autonomous systems. Improved responses to natural disasters can be easily achieved with drones which are helping the affected people.

Figure 5: Search and Rescue operations developed by drones
(Source: 7)

Miscellaneous fields of development with drones: The unmanned autonomous systems can be used for various personal purposes by taking photographs, videography, and other essentials which are beneficial for completing any documentary videos or can be used for any other purposes. In times of different pandemic situations like COVID-19, drones are used to solve various issues which can create realistic solutions to different problems [12]. The monitoring of different contaminated places, providing different essential supplies and medicinal help, and spraying virus-killing liquids are easily done with drones. In the field of construction, production, and other various places drones are used which are providing some effective development in

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these areas. Delivering vaccines, and medication, collecting blood and other samples, and diagnostic kits are possible with drones.

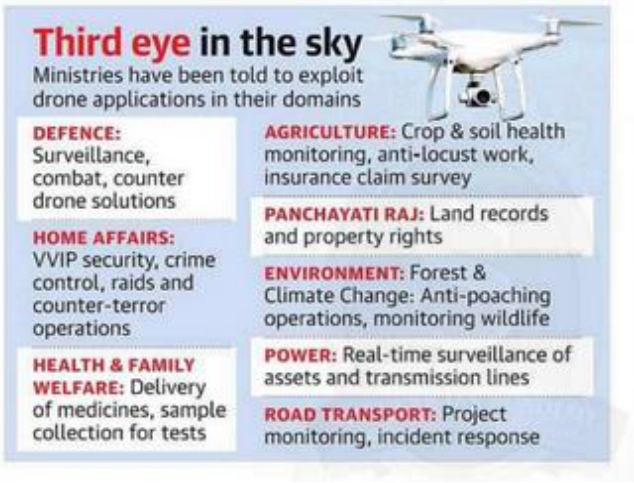

Figure 6: Benefits of drones
(Source: 13)

Drones are considered the third eye in the sky due to their various works in different sectors [13]. Different new opportunities are developed with the help of drones which are providing an effective way in wider areas.

Limitations of Unmanned Autonomous Systems (UAS) In Air, Land, Or Sea

As mentioned previously, it has been seen that the UAS system can able to raise the complex and also hamper privacy also. Technical disaster is one of the basic issues of the advanced system. Sometimes it is difficult to fix the issues quickly, and sometimes service provider organizations and other sectors may face some difficulties. On the other hand, from several studies, it has been seen that this technological facility is able to provide high data security though it can be hacked by unethical hackers. At that time, all data can be hacked and unauthorized persons can use the data for several purposes [15]. From this above discussion,, it has been seen that nowadays the defence sector uses drones to avoid the risk from their enemies. Hacking is the major factor that can reveal all the confidential data in a single click and it can be responsible for raising the risk to the entire nation.

On the other hand, the dance technology helps to increase the urban noise, and sometimes it may not work properly and that affects the service as well. Various studies have also shown that these kinds of technological facilities increase environmental waste and environmental situations sometimes make barriers to the working process such as poor climate, and poor networking can make an impact on the service [16]. In this context, drones and advanced technological systems can be threats to nature. On the other hand, unclear legislation is one of the major limitations of this service and it also hampers public privacy. These technologies can be abused by the individual or particular target group. At last, it can be said that to prevent these kinds of factors, the organization and authorities who use the UAS system for their benefit, need to implement a strong data security system and regular monitoring process.

METHODOLOGY

Every research study follows a specific pattern to get the desired outcome from the study and in a single word, this process is known as methodology. The whole research study follows the rule of methodology that consists and is divided into several parts such as research philosophy, research approach, design, and many more. On the other hand, one of the significant parts of research is data collection, processing, or analysis. This study has followed a specific design to get an accurate structure of the study. Research philosophy is one of the basic things that should follow by every researcher, and it is generally based on the assumption as well [9]. On the basis of knowledge and assumptions, researchers select the philosophy for their study. There are several research philosophies, though this paper has followed positivist philosophy as per the assumption and knowledge. In that case, an inductive approach has been chosen for the study and it has the capability to provide an accurate, and general conclusion for the study and it also makes an effective impact on the study as well. From various studies, it has been seen that researchers always prefer to use the deductive approach in their work. It can be said that the application of this approach is more complex than others and it can be used to examine the hypothesis. Particularly, this paper does not need any kind of hypotheses examination for the study. That is why this study has selected this approach for giving the actual value of the work. After that study design plays an essential role in the whole study and it provides a suitable framework for the research method. Similarly, in a research process, there are various kinds of research designs that can be used in the research study. Researchers prefer to use the design of research as per the base of the study. The case study design is one of the best solutions for this particular research study and this design requires data from various sources. The secondary qualitative method helps to activate all the benefits of the research study and it also assists to gain skills in Unmanned autonomous systems or UAS [10]. From various studies, it has been seen that unmanned autonomous systems also can develop intelligent and hi-tech machines. Accordingly, it has been seen that these kinds of machines are more capable of traveling by land, air, or sea without an onboard human crew. At the same time, it can be stated that, for data finding and analysing, secondary qualitative methods are easier than others. It is not more time and effort consuming which is why anybody is able to do research by using this process. It gives the permission to donate all the time and effort to the research work. On the other hand, the secondary qualitative process provides permission to know about the contribution of unmanned autonomous systems and the limitations of these systems. For every research, the study budget creates the biggest barrier to conducting a research study. Human involvement is another thing that raises the budget of a

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research paper. Apart from that, those process is not able to provide authentic or equivalent data that make a major negative impact on the whole study and its outcomes. The secondary qualitative process has not had these kinds of issues and this process does not allow human involvement in the work and does not require the contribution of money for data-extracting purposes. At last, it can be stated that the selected method is more justified and appropriate for the study and it provides the scope for future researchers to gain more knowledge on it and avoid the difficulties for research.

DISCUSSION

From this study, it can be observed that in the modern era, unmanned autonomous systems are the innovation that leads to providing smart service to society. It has been seen that these kinds of robots help to raise business opportunities and also expand the area of business. UAS is a combination of high-tech and intelligent machines that can provide several kinds of smart facilities and there are various kinds of autonomous robots such as autonomous vehicles, autonomous drones, autonomous warehouses, and factories. In that case, artificial intelligence plays an essential role in UAS systems and it can also perform different kinds of operations on land, air, and water without the presence of humans [14]. This leads to saving money, living as well as time in different kinds of tasks, and on the other hand, it also can able to perform difficult tasks with drones. Accordingly, this study has focused on the contributions of the UAS and it can be stated that these systems improve the communication process and can able to prevent hazardous situations. Generally, drones use to locate the place and also provide proper surveillance of the large area in a much short time. UAV helps to monitor wildlife and observe different endangered species of birds and animals, geographic mapping and exploring new areas in the world, and environmental law enforcement which are beneficial for reducing the pollution level in the world and creating a visible difference. In other words, drones help to check the emissions and amount of gas present in the air through high-quality sensors and chips.

It can also be observed that drones also make a positive impact on the transportation system and this system also rapidly increased the sophistication in society and various kinds of business sectors. Drones are currently used in various advertisements and other essential developments which are providing cost-effective, attractive, and effective growth. A competitive advantage can be gained with the help of drones which ensure better development in the field of business. AI (artificial intelligence) in aviation is used to perform the betterment to provide a visible difference in air travel [17]. Convenience and safety are increased with drone systems as they can help to navigate the aircraft in various difficult situations such as fogging and much more. The drones are also able to develop strong communication with ATM (Air Traffic Management) and ATC (Air Traffic Control) which are able to ensure the safety of the people. Pollution is easily controlled with the help of drones as different areas of forest and others are mapped with the devices and get an accurate understanding of deforestation or fewer trees and other issues [18]. These issues solved with drones are helping to ensure a change in the pollution levels of the country. In the development of modern agricultural growth, the contribution of Unmanned Autonomous Systems (UAS) is commendable. With the help of high-tech, intelligent machines such as drones easy and progressive growth are developed by spreading pesticides, proper monitoring, and solving the irrigational issues by spreading an adequate amount of water [19]. Drones are used for various research purposes and can be conducted in various dangerous places which are unable to access by humans physically. Drones are also used for space explorations and are able to identify different valuable materials from space and others. In the field of delivery, logistic, and retail drones are securing a change in the system which are developed for the completion of delivery. As a part of last-mile delivery the drones accurately and timely delivered all the packages which are helpful for the consumers as they can get the product on time. Drone delivery systems are adopted by companies due to their reliability, and cost-efficiency which are providing more profitability. The accuracy of the delivery system is ensuring consumer satisfaction and is able to gain more customers for the companies. Rescue operations are ensured with the help of drones and they can easily help for saving the lives of many people in hazardous conditions. Different situational issues in the war are easily solved with the help of drones which are also ensured an advantage [20]. Military covert operations are easily executed with the help of drones which are also ensured less death in wars. The limitations of drones are they can be costly and the battery of the drones is less which cannot able to produce growth in the long run. It is also can be easily hackable which are creating an issue for the reliability of the drones.

CONCLUSION

From the above-mentioned study, it can be concluded that an unmanned autonomous system is one of the innovative combinations based on Hi-tech and intelligent machines. At the current time, individual and business organizations are using various kinds of robotic systems. There are several kinds of autonomous drones, vehicles, warehouses, and factories. All of these improve the thinking process of individuals and also bring modernization to society. In the UAS system, artificial intelligence helps to travel the system in air, land, and water as well. Those advanced technological machines consist of high-resolution cameras, high-quality chips, sensors, and gadgets that help to send accurate information to other sources and also act like a human. The high-resolution cameras help to detect the original destination and the high-capacity sensor helps to transfer the data also. These kinds of technology also use for monitoring world life and the risk of species. On the other hand, UAS has the capacity to detect the upcoming risk of environments such

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as climate, air, and many more. This study has also shed light on the robot transportation system that can deliver things to their destination. Through traveling with the object, nobody can open the parcel and it will be at its accurate destination with a security code and software. In covid situation, this system helps individuals by delivering emergency medicine and medical instrument. After that many companies use this technology to deliver their things to a specific destination. Through this technological way companies are able to enhance transportation and logistics service. This study has also shed light on agriculture and this service helps to solve the issues of irrigation, and pesticide issues. Accordingly, this service enhances production and develops the field atmosphere as well. Défense service uses this facility for their action and rescue operations also. This paper also shines a light on the limitation of Unmanned autonomous systems on land air and sea. The secondary qualitative process helps to get some outstanding information for this study and this process is budget friendly and effortless which helps to finish the project properly. At last, it can be stated that unmanned autonomous system is a blessing for the society and upcoming generation.

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