

Various Applications of UAVs in Civil Engineering: A Review

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Abstract: As the construction industry challenges are growing there is need of an innovative technology to overcome challenges in the construction industry. The technology which can reduce the time to accomplish work, improve work quality, improve safety, and be more user friendly, economical including real-time monitoring, providing wireless coverage. overcome this challenges Unmanned Aerial system were introduced, UAVs is a device like aircraft without a human pilot on board Unmanned aerial system has a series of application in construction site. (UAVs) provide bird's eye view for monitoring site personnel and provide live data. This paper focuses on various applications of UAVs in construction as well the Challenges faced UAVs in monitoring the construction activities.

Keywords: Real-Time Monitoring, Inspection, Applications, Unmanned aerial systems, Construction industry

I. Introduction

Unmanned vehicles have completely changed the scenario of surveying earlier survey used to be done by chain tape heavy instrument. But as the surveying technology developed UAVs came into existence. UAVs prove worth with their industrial application they have a various application such as monitoring difficult construction site, it also improve safety and provide real-time images from the field. Surveying with UAVs is economical and provide ease in surveying.

II. Literature Review

1. Mukesh K., Prakash S

UAV- Unmanned Aerial Vehicle also known as Drone is an autonomously controlled aircraft without pilot. It's major applications are Military, commercial cargo transport, 3D mapping, marine offshore and sea level, search and rescue operation, pollution monitoring, and many more. They have used COTS Radio controlled model airplane kit as test platform, which minimizes assembly time. They choose "Fuji Imvac BT43EI gasoline/oil engine" power plant for project. The use of minicomputer named FitPC2 was chosen as consisting a rugged, light and small form factor. Microsoft Windows XP Embedded-onboard operating system. The UAV was developed around a central Plug-and-Play software infrastructure, the Reaction Architecture. After all installation and completion of model the tested their UAV and which was an ultimately helpful version of innovation, this was then used for: Professional aerial surveying, Commercial and motion picture filmmaking [1]

2. Mark C. Tatum, Junshan Liu:

One of the great results of innovative technologies was UAS- Unmanned Aircraft System also known as Drone, which is more reliable, economical and controllable. According to them military use and research had been the major element in advancing the technologies of UAS. The introduction of Lithium Polymer (LiPo) batteries provided another advance by providing more voltage and amperage per cell than previous technologies. The advancement of GPS technology has allowed both military and civilian UAS's to be navigated via satellite data link. Industrial applications for UASs are the second most popular category. Some of these applications include: inspection of critical linear infrastructure such as oil and gas pipelines or electrical transmission lines, etc... Here they have mentioned all detail study about applications of UAS in today's challenging world. This review presents the information found by analyzing this paper on current application prospects of UAS which is being implemented on construction site, and future uses also being considered.

The following applications were observed as superiors:

- Aerial Photography
- Surveying
- Inspections
- Safety/Security Monitoring

This was the method the use:

An online survey was used along with information collected from a database in the public domain of the Federal Aviation Administration's website. The survey was a questionnaire designed and distributed through Survey Monkey to four hundred (400) individuals in the construction industry within the US. No personal information was collected that would reveal the individual respondent.

The second group of questions in the survey was collected data about the usages of UAVs by construction companies. Sixty one percent (61%) affirmed that their companies do use UASs; thirty nine percent (39%) said that their companies do not use UAS. "Of the four hundred (400) surveys distributed, one hundred sixty seven (167) valid responses were recorded resulting in a 42% response rate".

Construction companies are interested in the following areas for the development of future uses of UASs:

Automation

Automated structural assembly

Automated parts/material delivery

FAA data revealed that only 8% of the more than two thousand companies explicitly describe their UAS missions as being construction related. They concluded that according to the overall research, 52% - 42% of the response they got was in the favour of the UAS, and other mentioned some issues to deal with this device. But like the other innovative technology this was also one of the most useful helping hands to engineers for time saving and excessively doing work with accuracy and also to monitor construction site security [2].

3. R. El Meouchea, I. Hijazib, PA Ponceta, M. Abunemeha, M. Rezouga:

Every Construction needs the perfect survey done on the site to estimate the plan and other basic needs. Survey being a time consuming element is the most important function to get the perfect and desired output. Now-a-days UAV-Unmanned Aerial Vehicle is the most admired Innovation which is widespread and operational for several applications like: - quarry monitoring, archeological site surveys, forest management and 3D modeling for buildings, for instance. A comparative study was conducted between the two plans to evaluate the accuracy of the UAV technique compared to the basic one. Yet now there was an era of 2D mapping and self-surveying techniques but, with the development of smart cities and BIM technologies, it will become easy to create a 3D model for terrain utilizing UAVs and exporting it to 3D Geographic Information System (GIS). According to (Küng, 2011), the developments of UAVs in

Recent years are along with Structure from Motion (SfM) software and computer vision enhanced the production of photogrammetry. Etampes is located to the south of Paris .It took approx. four hours for them with UAV to complete the survey with a 3D map.

*The discovered that France was the one to set the limits of UAV flight.

*Image acquisition process: - most complex part which can influence the results and it is not also possible to retake all the process due to climatic change, so it is recommended to calibrate the camera before the flight.

* Ground control points acquisition process: this can be bestly precised with low hights of flight and ground control points. They had taken 5 crosses for precised reference.

* Photo scan/Pix4D software: 181 photos were sorted out of total excluding blur and outer areas. Then all the adjustment is done and then the file with coordinates is imported so that GNSS receiver or traverse can get a known reference. Then once the markers are placed and coordinates are got the 2 image matching in processed to generate fence cloud point.

* Vectorization in AutoCAD/Pix4D:

The plan was vectorized by mapping the points obtained from the feild by using total station. But some errors can be found. As the points are determined manually and the model can present some minute errors. These were all the process they had done and the compared the manual survey outcomes with UAV program outcomes.

By this study the came with the conclusion that there should be some Innovation of developing landmarks which can converse with Drones to get the accuracy in work. Which will ultimately fulfill the aim of working land survey with flight at simultaneous to get the accuracy in work. They were satisfied with their result but to improve more in this technology they recommend for some innovative landmark in this industry to get this work done with more precised manner. [3]

4. Ibrahim Mosly

Conducted this study to find application and issue of the UAS in the construction industry. Ibrahim says the use of UAS in construction is a new concept and the industry and stakeholders are still discovering its application the basic application of UAS are monitoring of construction site aerial photography site surveying safety inspection other application which were not briefly described were site security quantity take off and estimation in the field of architectural engineering. UAS has become a research topic for 3d mapping .comming

on to issue most common issue are weather constraints, property damage, battery life and limited time flight, privacy concern requirement of extra person to operate, low-quality images do not function well at extreme temperature it was concluded that overall UAS has 9 application and 10 issues as per identified by construction industry. There is a need for future research on UAS so that it has more application than its limitations [4].

5. M Perez

In his paper discussed that traditional air survey is expensive as well as limited to accuracy. The comparison between the traditional air survey and uas system acting as a photogrammetric sensor is been done in this paper. The aerial images taken with Nanometric cameras mounted require low-cost photogrammetric software which can be used to accurate orthoimages. The UAV photogrammetry method used in this work can fill the gap between terrestrial survey technique and classical aircraft photogrammetry. The cost of uas imaginary is less than the satellite manned aircraft images. In his conclusion, he proposed a future idea to use another target point instead of natural points obtained by the UAVs using a certain angle. [5]

6. Piotr Kardasz

In his paper drones and possibility of their using says that uas have various input elements. A drone is powered using batteries the minimum flight time is 15 minutes. Uas have many drawbacks at site. The paper basically focuses on the limitation of drone at sight like the battery life , performance in difficult weather condition, performance at high altitude, the paper deals with appropriate design of uas according to their application, it is concluded from the paper that there is need of power development for uas so that their productivity could be increased.

III. Conclusion

The introduction of UAS in construction technology has been worth for many industries. UAS has series of application in civilengineering. Moreover surveying with UAS is fast and results are accurate as well it is economical. Still there is need of more research on UAS as there are many limitations of UAS, so that it could survey with more precision, Uas is the future of Geoinformatics.

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