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Application of Drone Technology in Construction Industry

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Abstract: *There are various fields in which Drone Technology is becoming significant. Surveying and Mapping, Construction Industry, Inspection and Surveillance, Military and Agriculture are the various areas where drone technology playing an important role of reducing time for this tedious work. Drone technology is the most effective among those technologies which helps in efficient project management by addressing the challenges in a construction project like surveying, monitoring activities, safety of labours, quality and cost control and getting timely on-site progress reports.*

Keywords: *Drone Technology, Structural audit, Structural stability.*

I. INTRODUCTION

The world is continuously deploying new technologies in Construction Industry (CI) for the speed, accuracy and safety in the construction projects. Advanced modern technologies are entering CI for the faster execution of projects. At the same time to cope-up with execution speed, monitoring methods are also getting modernized. Thus, the drones have come into picture; they do not contribute for the actual execution but make a huge contribution in faster monitoring of the projects which help in faster decision making leading to lower the time lag in the projects too. Drones can be used right from the stage of land purchase till the post construction stage of the project. They are used from pre-construction; construction to post-construction stage of the engagement of conventional methods for site survey, contour mapping, site progress monitoring, construction quality management, etc. can be questionable, whereas drones can perform the same jobs with almost no risk and more accuracy and with lesser manpower too.

II. LITERATURE VIEW

1) *Gayatri Mhahjan(2021) : Applications of Drone Technology in Construction Industry: A Study 2012-2021.*

The building construction process is discussed from start to finish. Mostly they are design, and planning; procurement, Pre-construction; construction, post- construction and close-out. Drones/UAV provides construction stakeholders with expansive, accurate, and precise spatial data. Land surveying, inspection, monitoring any issue, track progress, deploying labor, material waste, annotating maps and images, calculating material types and stockpile volume for inventory and increasing safety. Some limitation and challenges for the use of drones in construction and civil engineering. The common challenges are: (1) safety challenges (2) project delays, and (3) difficulty/danger of mapping and surveying. The ever improving capabilities and affordability of drones makes it possible to reduce delays, reworks, and safety issues to drive better project performance. Limitations are drone cost, rules and regulation of flight, skill operators, flight time and weather condition.

2) *Pawan Kumar (2019) : A view of the Future: Drones in construction Industry*

In the past few years, drones have become one of the most compelling construction trends. The industry has experienced a 239% growth in drone use year over year, higher than any other commercial sector. Their aerial vantage point and data Collecting abilities make them a viable tool, offering benefits that range from on- site safety to remote monitoring. In Particular, the benefits of drone technology have revolutionized the entire project lifecycle. Newer drones can be equipped With tools to perform common construction tasks, Some of the “simpler” tasks. include: tightening bolts and screws, moving and placing large sheets of metal, carrying spools of wire, laying pipes, taking photos and capturing video, working in spaces too small for humans As the industry grows and construction Projects become more complex; drones in construction will continue to skyrocket.

3) *Ameena M Ansary (2022) : 3D Mapping and Surveying using Unmanned Aerial Vehicle.*

Surveying is one of the important aspects of any civil engineering project, traditional survey and inspection methods involve a lot of labor and time, also the equipment used is heavy and requires specialist knowledge. But with the help of UAVs (Unmanned Aerial Vehicles) the time and effort for surveying or inspecting large areas and structures will reduce exponentially.

This is achieved with the help of sensors such as Cameras, Lidars, Sonars, and thermal cameras etc. that are attached to the UAV. Since most UAVs fly with the help of GPS satellites, coordinates of these places will be easily obtained. Software like Drone deploy, Pix4D, Precision Mapper etc. help in creating accurate and usable survey data. With the help of such systems 3D models of land and assets can be made. UAV technology is the next big thing in the world of Survey.

III.OBJECTIVE OF STUDY

- 1) To study the various applications of drone technology – Area measurement, Contour survey.
- 2) To study the results of survey obtained by traditional method and Drone method and comparing the results.
- 3) To study the inaccessible area.
- 4) To identify the visual defects in any structure.

IV.METHODOLOGY

- 1) One terrain surface will be selected for the survey; Survey will be conducted using the traditional methods of survey like Auto level, Plane table, Chain survey, theodolite, total station, etc. Then the Survey of same terrain using drone will be conducted using software like Drone Deploy, DJI GO and PIX4D capture, etc. Then comparison will be done on the basis of Time, Manpower and cost required for the survey and the accuracy achieved. A visit was done to know the application of DGPS and drones.
- 2) Area of college will be mapped and then measured using geodetic coordinate system of drone. It takes the measurements between objects within the model and compares them to their real- world positioning relative to Earth. Also height of building will be measured.
- 3) One terrain which is inaccessible where humans can't go physically, also can't go with the heavy equipment of the traditional survey, there the survey using drones will be conducted. Survey including the reduced levels and contour measurements.
- 4) The defects in the any building structure will be captured using drones. The defects in the Bridge structure, high rise buildings can be easily found out by using drones where it is difficult for the human to go physically and check the defects.

V. OBSERVATION

Figure 1:Time Comparison

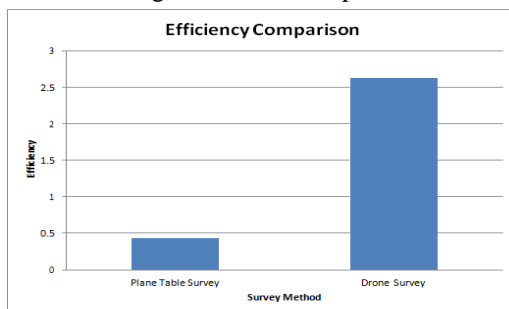


Figure 2 : Efficiency Comparison

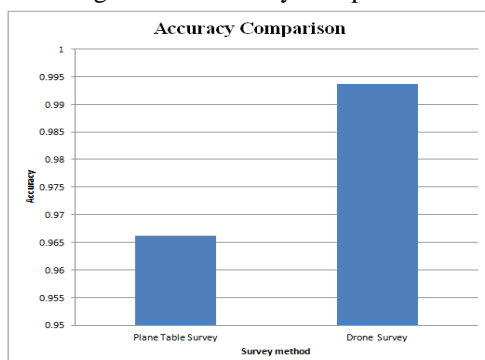
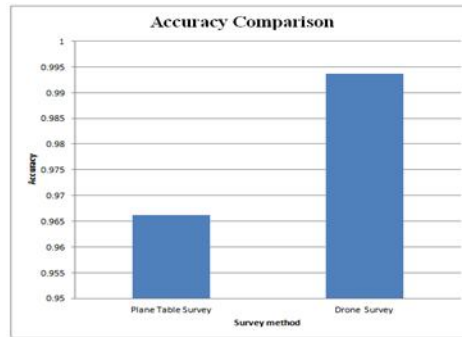


Figure 3 : Accuracy Comparison



A. Structural Defects

A visual defect survey often provides a partial assessment of the structure's current state and aids in determining its serviceability. As a result, it must be done before any structural rehabilitation or alteration of a structure may be done.

1) Case Study 1: Elevated Storage Reservoir



Figure 4: Cracks in slab of ESR



Figure 5 : Exposed and reinforcement at bottom of bracing



Figure 6 : Cracks in bracing

2) Case Study 2: Residential Building



Figure 7: Cracks in chajja



Figure 8: Exposed reinforcement

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