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Utilizing Drone Technology in Civil Engineering

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Abstract: *An attempt has been made in this project to use drone technology in the civil engineering. Drones as a tool that increase communication between construction participants, improves site safety, uses topographic measurements of large areas, with using principles of aerial photogrammetry is possible to create buildings aerial surveying, bridges, roads, highways, saves project time and costs, etc. The use of UAVs in the civil engineering can brings many benefits creating real-time aerial images from the building objects, overviews reveal assets and challenges, as well as the broad lay of the land, operators can share the imaging with personnel on site, in headquarters and with sub-contractors, planners can meet virtually to discuss project timing, Their benefits range from on-site safety to a level of project monitoring which wasn't previously possible. The purpose of this research is to assess the current status of employing UAVs and immersive technologies towards digitalizing the construction industry and highlighting the potential applications of these technologies, either individually or in combination and integration with each other. This project includes how basically aerial robotic technology has potential for use in wide variety of civil engineering applications. This project focuses on only applications of drones in civil infrastructure.*

Keywords: Drones, Unmanned Aerial Vehicle (UAV), Construction technology, Aerial Image

I. INTRODUCTION

1.1 GENERAL INTRODUCTION

Drones or Unmanned aerial vehicles (UAVs) are finding increased popularity within the construction and engineering fields. In engineering, large firms are putting them to use in risky and unconventional settings; likewise, in the construction industry, this technology has been well-received due to the unprecedented level of data mobility, visualization, access and efficiency it lends to projects. Furthermore, drone technology has been shown to reduce costs associated with poor communications from the field, reduce material theft from the jobsite and increase worker safety. The latter is significant, given the fact that construction continues to be one of the most dangerous industries. The presence of drones in construction means significant changes within the industry. Drones have already begun changing the way the construction industry operates, and those changes will have continued and lasting effects.

Building Information Modelling (BIM) was considered as a specialized tool for the industry just a decade ago and it is one of the main embodiments of digitalization. In addition to BIM, the adoption of more recent digital technologies such as Unmanned Aerial 3Vehicles (UAVs) and immersive technologies are becoming more popular in construction projects. In particular, technologies related to UAVs, also known as drones, flying robots or Unmanned Aerial Systems (UAS) have experienced an unusual growth and have become much more affordable. This makes many UAV-based applications possible for the automation of the construction process, such as information gathering (e.g., taking photos), surveying construction sites, monitoring construction progress, inspecting built infrastructure and evaluating usability in relation to the safety assessment of the construction site.

1.2 BACKGROUND

Construction is the second largest industry in India after agriculture. It generates huge employment in many ways. One serious problem is lack of manpower at working place. Engineers has been working hard to solve this problem. Use of modern technologies like IoT, automation, AI, CC, ML, BTC, BIM, 3D printing, robots, and drone/UAV can reduce load up to certain extent expecting with greater productivity and efficiency. Issues like security, risk assessment has to be considered equally. Better option among the above tools/ techniques/trends is adoption of DT/UAVs in construction to overcome effectively the problems raise for construction.

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1.3 MOTIVATION

As Artificial intelligence is increasing in each and every field like food industry, toursim, IT industry, Automobile industry. We though why can't we use it in Civil industry. This is the reason we found that what can help or which work can be performed by AI or sensing, so we choose this topic that with help of drones we can performed multiple works. Drones increase quality of work, reduce costs, safety risk, and also reduce time consuming process, etc.

1.4 STUDY AREA

We conducted our drone test flight on the Khandoba hills in dhayri, Pune. Did survey of the mountain with two drones Hexacopter and Quadcopter. With the help of drone we got the contours of the mountain , no. of tress in that particular area and slopes on the hill. All the images then processed in the mapping software Pix4d Mapper. The whole database gave us the 3D visualization of the mountain

1.5 Project Statement:

In this project we want to use drone for Increasing work efficiency and productivity, decreasing workload and production costs, improving accuracy, refining service and customer relations, and resolving security issues on a vast scale are a few of the top uses drones offer industries globally. Adoption of drone technology across industries leapt from the fad stage to the mega-trend stage fairly quickly as more and more businesses started to realize its potential, scope, and scale of global reach. Using drones for real time surveying, Monitoring and reducing the time of project.

Fig no. 1.1 : Picture of Drone with pilot

1.6 Aim

- Drones are an important technological asset in the area of civil engineering. Their use in the construction industry will only increase in time because they can efficiently collect data of a high standard, greatly minimizes risk to the safety of a project team.
- UAV's will also help to reduce the total cost of project.
- The leading engineering and surveying firm estimates a 60% cost saving using Esri's Drone2Map over conventional survey technics.
- Use of Drone and Artificial Intelligence is increasing rapidly in every sector and Civil is one of them and it will boost infrastructure.
- With help of UAV's the surveys could be carried out faster with accuracy.
- Disaster management is the sector of civil engineering which will get a boost with help of drones, while managing emergency situation and monitoring the real-time scenario.

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1.7 Objectives

This topic encompasses five objectives as follows:

1. Surveying

In the case of planning large-scale and complex construction projects, consultation of topographic maps is essential. Topographic maps may reveal construction design errors that are inappropriate for terrain. Although topographic maps are useful for construction projects, their production is often costly and time consuming.

2. Site Monitoring

For builders the data from drones can be collected frequently allowing easy integration into projects and tracking site progress precisely and with hardly any lag time. This allows construction companies to work more effectively in managing their time and resources while minimizing potential issues and delays.

3. Safety

It is not a secret that construction is a dangerous occupation, especially for field workers. According to OSHA, construction has been ranked as the most dangerous industry in the last decade . Some of these accidents may be attributed to the fast nature of construction and the quickly changing conditions on every job-site and in case of any emergency situation drones can help us monitor the situation better.

4. Ease of Work

Drones combined with infrared thermography sensors have been able to increase the quality assurance of a builder's product to the client. This technology allows drones to scan a building and create a 3D image of a building envelope to evaluate its energy efficiency and identify defects that may be present. These defects would most likely go unnoticed without the implementation of this technology.

5. Reduce cost and time of projects.

Marketing is important in any industry. If your business is going to succeed, you need to stand out from competitors. There are a million different pathways companies can take when it comes to marketing, but one of the best benefits of drones in construction is that they provide high-quality marketing content at a modest cost.

II. LITERATURE REVIEW

Author- Pawan Kumar Mishra

Title :- A View of the Future: Drones in Construction Industry

Context :-

Construction industry is in the phase of revolution and it is adopting the technology to improve the productivity, quality and lowering the risk. Now the construction industry is moving from resistant and unresponsive mindset to adopting the innovations. The present construction industry is embracing the technology and genuinely begins to deliver differently. There is an aerial revolution happening across the globe. Drones have emerged as a highly viable technical tool with applications in numerous sectors, most notably, construction. Their benefits range from on-site safety to a level of project monitoring which wasn't previously possible. The construction industry is transforming itself by using Drones to achieve quality monitoring, controlling on projects, enhancing safety, real time reporting and easy access to large or difficult sites. This research paper is putting a view on Drones in construction industry, its present uses, Indian laws regulating Drones and the future of Drones in the construction industry.

Learnings :-

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 in addition to the tasks discussed earlier. Some of the "simpler" tasks

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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

Author- Juan Manuel, Davila Delgadoa, Lukumon Oyedele, Peter Demianc, Thomas Beach
Title :- A research agenda for augmented and virtual reality in architecture, engineering and construction
Context :-
This paper presents a study on the usage landscape of augmented reality (AR) and virtual reality (VR) in the architecture, engineering and construction sectors, and proposes a research agenda to address the existing gaps in required capabilities. A series of exploratory workshops and questionnaires were conducted with the participation of 54 experts from 36 organisations from industry and academia. Based on the data collected from the workshops, six AR and VR use-cases were defined: stakeholder engagement, design support, design review, construction support, operations and management support, and training. Three main research categories for a future research agenda have been proposed, i.e.: (1) engineering-grade devices, which encompasses research that enables robust devices that can be used in practice, e.g. the rough and complex conditions of construction sites; (2) workflow and data management; to effectively manage data and processes required by AR and VR technologies; and (3) new capabilities; which includes new research required that will add new features that are necessary for the specific construction industry demands.
Learnings
This paper presented a study on the current usage landscape of AR and VR in the construction industry. The research leveraged different methods to collect data, including qualitative and quantitative methods, and a literature review to come up with findings that are relevant for both academy and industry. The primary outcomes, as set by the study's objectives, are: (1) a definition of the use-cases in which AR and VR can be used, (2) a general indication of adoption levels in the industry and per use-case, and (3) a set of research topics necessary to meet the requirements for a successful AR and VR implementation.

Author- Faris Elghaish, Saeed Talebi, Mike Kagioglou
Title :- Towards Digitalisation in the construction industry with immersive and drone technologies
Context :-
Digital transformation in construction requires employing a wide range of various technologies. There is significant progress of research in adopting technologies such as Unmanned Aerial Vehicles (UAVs), also known as drones, and immersive technologies in the construction industry over the last two decades. The purpose of this research is to assess the current status of employing UAVs and immersive technologies towards digitalizing the construction industry and highlighting the potential applications of these technologies, either individually or in combination and integration with each other.
Learnings :-
This paper presents a critical evaluation of the digitalization tools that are employed to move towards digitalization in construction. Two main technologies were critically discussed in this research, namely, UAV technologies and immersive technologies. Each topic was analyzed individually to appraise the capabilities and weakness points, as well as, integrations between these technologies to provide various solutions were also evaluated. As such, this research can direct researchers, particularly, early researchers to find the extant gap in each area, as well as, recommended solutions that can be developed by integrating these technologies. 25 The analysis of extant literature review refers that there is a progress of implementing MR in integration with BIM to track project progress; employing drones to scan the construction sites and compare the captured images with 4D BIM to measure the progress. As such, there is a progress in integrating these technologies to enhance the delivery of construction projects, however, most of the researchers highlighted that the provided solutions need to be tested using large case studies to measure the scalability of provided solution

Author- Naveed Anwar, Muhammad Amir Izhar, Fawad Ahmed Najam
Title :- Construction Monitoring and Reporting using Drones and Unmanned Aerial Vehicles (UAVs)
Context :-

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The use of drones and Unmanned Aerial Vehicles (UAV) has been increased in recent years for surveying, facility management and other relevant fields. However, more recently, the technological progress in the design and navigation of low-weight and autonomous drones and UAVs have resulted in their more practical and cost-effective operation in the fields of architectural engineering and construction management and monitoring. This study presents a framework for the development of a fully automated smart construction monitoring and reporting system based on real-time data obtained from drones and UAVs. The data in terms of drone images from multiple locations and point clouds (from 3D scanning of construction site) can be used to construct a 3D model using the photogrammetry techniques. This so-called "drone model" can be compared to BIM model at various construction stages to monitor the construction progress. Beside construction scheduling and costing, this comparison can be expanded to include real-time recording, reporting, billing, verification and planning. Using the example of a case study construction project, the effective use of drone data is demonstrated in terms of smart construction monitoring and comparisons between drone model and BIM model.
Learnings :-
his paper presents the framework for the development of a fully automated smart construction monitoring and reporting system based on real-time data obtained from drones and UAVs. The technological progress in the design and navigation of low-weight and autonomous drones and UAVs can be efficiently used in a dynamic manner to result in a more practical and cost-effective operations in the fields of construction management and monitoring. In the presented approach, the data in terms of drone images from multiple locations and point clouds (from 3D scanning of construction site) can be used to construct 3D models using the photogrammetry techniques. These drone models can be compared to BIM model at various construction stages to monitor the construction progress. Beside construction scheduling and costing, this comparison can be expanded to include real-time recording, reporting, billing, verification and planning. Using the example of a case study construction project, the effective use of drone data is demonstrated in terms of smart construction monitoring and comparisons between drone model and BIM model.

Author- Sebastien Goessensa , Caitlin Muellerb , Pierre Latteura
Title :- Feasibility study for drone-based masonry construction of real-scale structures
Context :-
The additive manufacturing of real scale structures using UAVs (drones) is a new discipline with challenges as wide as the possibilities it opens up for the future. UAVs must not be seen as the only way of robotizing future construction sites, but in combination with other kinds of robots. This adequate combination is indeed likely to reduce the influence of factors that usually badly affect the quality and profitability of construction projects, such as human factors, execution slowness, insecurity, insufficient communication between the stakeholders, weather conditions, strikes, lack of skilled labor, etc. The aim of this research, carried out jointly by MIT and UCLouvain since 3 years, was to lay the necessary groundwork, still not explored elsewhere, in order to prove the feasibility of building real-scale structures, in particular masonry structures, with big custom-built drones. In particular, the objective was to investigate the drones precision, their behavior while transporting, handling and laying loads, but also to draw the first guidelines for the design of "Drone compatible" construction elements: their shape, the way they should be assembled together, how to minimize their weight, how to connect them together, how to ensure their stability
Learnings :-
The experiments were led with an experimented pilot and a remote control and proved that the geometry of the blocks had to allow a laying tolerance of 5 cm. However, developments have to be done, both for the flight controllers and for the propulsion systems, in order to improve their stabilization when transporting longer and heavier elements. Several systems were developed in order to allow an easy "plug and lay" of the concrete blocks, all of them equipped with electromagnets combined with embedded steel plates into the blocks. Although very efficient and low power consuming, this is however a limitation for a future industrialization process: steel plates will have to disappear and the lifting system probably adapted. Concerning the global guiding system, the solution that combines the total station with another one like UWB seems to be the one with the minimum disadvantages and worth developing. In this field, creative solutions are necessary to get rid of – or reduce at its minimum - the necessity to develop construction systems with too particular (and thus costly) geometry. Outdoor or wind tunnel tests should be performed to revaluate the range of the "drone

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compatible" character. Finally, depending on the construction system, developing ways to allow the UAV to cling to the existing structure before placing a new element seems to be another relevant field of investigation

Author :- Gayatri Mahajan
Title :- Applications of Drone Technology in Construction Industry
Context :-
Technology plays a pivotal role in shaping construction industry. Adoption of new trends, tools, software and technology would motivate to minimize problems that arise during use of drones in construction. The paper not only elaborates previous reviews on Drone Technology (DT) in Construction Industry (CI), but also explores extensive literature review on (1) classification of drones, construction software used with drone, (2) overview of utility of DT in construction and related industries (3) recent construction technology trends, tools and techniques accomplish with drone technology. This is basically a review paper. The aim of this paper is to study the potential of DT in construction industry, extended it to understand the following issues in better way(i) benefits and impacts of drone in CI, (ii) record disadvantage of drone in CI(iii) integration of BIM with DT at substantial length and volume (iv)extensive description and enumeration on applications and uses of drones in CI(v) use of drone at each stage of construction stage to monitor the progress of construction rightly from the purchase of land to close out the project(vi)lastly appended a note on the impact of COVID-19 on construction. This study (2012-2021) also discusses challenges, opportunities, limitations, and strategies for the adoption of drones in construction.
Learnings :-
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. Thirteen articles are accounted to study benefits of drone in construction industry. Increased productivity, accuracy and precision, cost reduction are some benefits. While studying the literature we recorded 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 make 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. Drone use would lower the costs of projects, increase productivity, create new jobs and add value to the construction sector. Drones can fly in inaccessible and hazardous areas and collect data easily. Drones provide real-time information, leading to significant improvement in surveying accuracy, and boosting overall efficiency in production and communication. Integration of BIM and drone technology plays a role in pre-, during, and post-construction process in terms of digital documentation.

Author :- Elena Ridolfi, Giulia Buffi, Sara Venturi, and Piergiorgio Manciola
Title :- Accuracy Analysis of a Dam Model from Drone Surveys
Context :-
This paper investigates the accuracy of models obtained by drone surveys. To this end, this work analyzes how the placement of ground control points (GCPs) used to georeference the dense point cloud of a dam affects the resulting three-dimensional (3D) model. Images of a double arch masonry dam upstream face are acquired from drone survey and used to build the 3D model of the dam for vulnerability analysis purposes. However, there still remained the issue of understanding the real impact of a correct GCPs location choice to properly georeference the images and thus, the model. To this end, a high number of GCPs configurations were investigated, building a series of dense point clouds. The accuracy of these resulting dense clouds was estimated comparing the coordinates of check points extracted from the model and their true coordinates measured via traditional topography. The paper aims at providing information about the optimal choice of GCPs placement not only for dams but also for all surveys of high-rise structures. The knowledge a priori of the effect of the GCPs number and location on the model accuracy can increase survey reliability and accuracy and speed up the survey set-up operations.

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Learnings :-

This work explores the effects of ground control point position and number on the accuracy of a dam dense point cloud, obtained by a drone survey. As GCP deployment is a time and money-consuming task, especially on large structures, this paper aims to provide principles for supporting the GCP deployment on high-rise buildings in order to speed up operations on site.

As expected, the results show that the model performs better when the density of markers is high. However, it is the combination of both GCP pattern and GCP density that determines the gain in accuracy. Results highlight that the error values show a higher variability along the elevation than along any other direction because of the high-rise characteristics of the dam. Therefore, GCPs should be placed at different elevations to increase the accuracy of the resulting dense point cloud. Moreover, where the structure is characterized by discontinuities such as spillway gates, it is necessary to place GCPs in the proximity of the openings to gain in accuracy. In addition, the presence of a balustrade, water, sky and uniform texture increases the RMS error of the images. In order to increase the accuracy of the georeferenced model special attention should be paid to the marker placement, in particular near the spillways, balustrade and hydrostatic level.

Author :- Dražen Cvitanić

Title :- Drone applications in transportation

Context :-

Drones, which are increasingly used into civilian applications, are mostly networked enabling remote programming [1]. The possibilities of using a drone in improving and facilitating transport problems are multiple. Drones can be used in everyday life; for example, when delivering medicines, equipment and online orders of consumer goods. They can further be used in the planning, designing and monitoring of transport and other infrastructure. It is also possible to use drones in the field of traffic engineering to record traffic flow parameters (such as traffic volume and intensity, density, speed), as well as for scientific purposes, for example, the development and calibration of analytical macroscopic and microsimulation traffic flow models. For all of these purposes, the benefits of a drone are in saving time and money, improving the reliability of data measurement, and increasing the data recording security. This article provides an overview of existing drone applications in the delivery of goods and the planning, design and monitoring of transport infrastructure, as well as an overview of the possibilities of drone applications in the professional and scientific traffic and transportation engineering problems

Learnings :-

UAVs are increasingly used in civil engineering and transportation applications. They are used for cargo transportation of goods and medicine supply, for planning, designing and monitoring transportation infrastructure projects as well as in traffic data collection and analysis. For all of these purposes, the benefits of using drones instead classic equipment are in saving time and money, improving the reliability of data measurement and increasing data recording security.

III. METHODOLOGY

The methodology chosen for this case study is qualitative in nature. Exploratory research has been implemented due to the fact that the subject requires opinions, views and perceptions from various industry professionals to determine the effectiveness of implementing drones on multiple construction projects. By utilizing this approach to data collection, various benefits and challenges of applying this emerging technology may be properly evaluated and analysed.

We collaborate with the company named as ‘Droneium Ariel Solutions’ which offers Aerial mapping in the way of Orthorectified images, NDVI, Digital Elevation Model (DEM), Digital Surface Model (DSM) all with the help of high spec fleet of drones with ability to operate and process. They are going to help us with the drone and other needful equipment’s. Though with the help of drones there are many available applications which we already described but, in this case study we are going to run a test flight for surveying and getting a topographical data of the place with the use of drone and Aerial mapping software.

The main focus during this project is to identify the aspects of drone implementation in regards to surveying, schedule, team communication, owner satisfaction, and cost savings.

By utilizing this methodology, the aims of this case study are to:

- Provide a better understanding of the process a company must experience to fully apply drone technology to its

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projects

- Analyse the benefits and challenges of using drones on jobsites for a specific company
- Offer a real-life narrative of drone usage as a guide for other companies who are considering adopting this technology into their organizations
- Demonstrate how drones can have a positive impact on the overall flow of a construction project.

3.1 TYPES OF DRONES

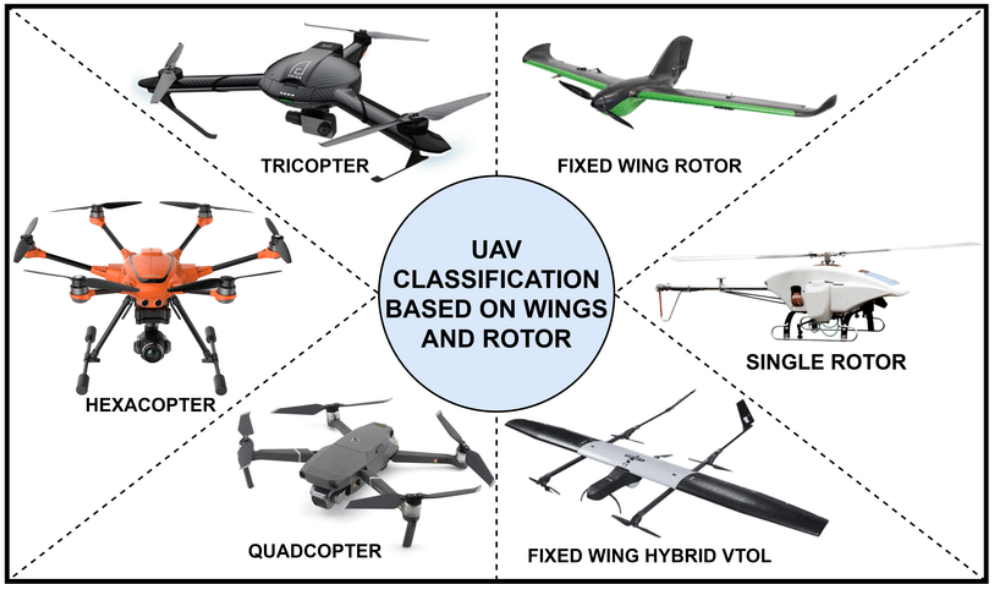

Fig no. 1.2 : Type of drones

Drones are revolutionising aspects of nearly every sort of profession but an area where they are having a particularly strong impact is in the construction industry. Drones are able to help make a load of improvements in construction for example, increased accuracy in reporting, volumetric analysis, identifying hazards and improving security, and cutting costs by increasing the efficiency of their work. In this article I'm going to go over the types of drones used in construction, while drones are used for, and the important types of data that construction companies can get from drone applications.

The types of drones used in construction are typically multirotor drones that can carry a camera, lidar module, or infrared camera. They are used to survey land, monitor construction assets, provide progress updates, and have even been used to deliver resources to remote parts of a construction site. Fixed-wing drones are also used to cover large areas to collect survey images.

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3.2 DATA ACQUISITION

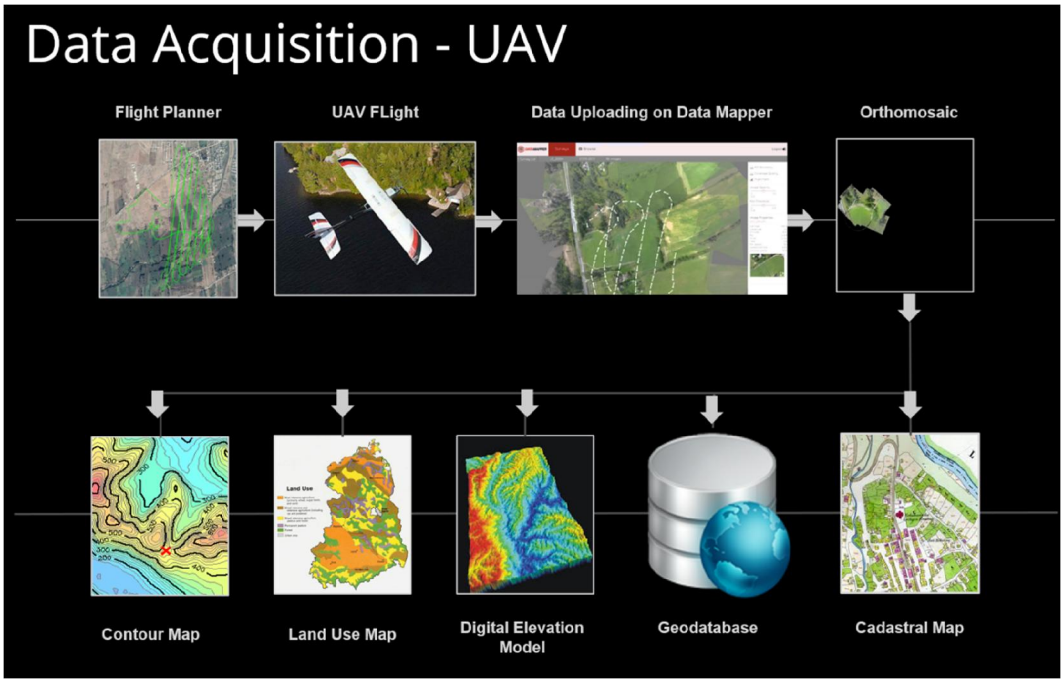

Fig no. 1.3 : Data Acquisition flowchart

Above flowchart explains

1. Flight planner :- Pre-planning on the site of surveying, estimating the layouts, time required for flying , area to be covered and checking of drone cameras and battery.
2. UAV Flight :- An unmanned aerial vehicle (UAV) is aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift and can carry a lethal or nonlethal payload.
3. Data uploading and Data mapper :- After landing, we transfer the data collected from the drone and upload it into the software and divide it according to the layouts.
4. Orthomosaic :- An orthophoto, sometimes referred to as an orthophotograph or an orthoimage, is an aerial photo that has been corrected for lens distortion, camera tilt, perspective, and topographic relief, which is changes in the elevation of the earth's surface.
5. Cadastral map :- A cadastral map (shortened to cadastre or cadaster) is a comprehensive land recording of the real estate or real property 's metes-and-bounds of a country.
6. Geodata Base :- The geodatabase is the native data structure for ArcGIS and is the primary data format used for editing and data management
7. Digital Elevation Model :- A Digital Elevation Model (DEM) is a representation of the bare ground (bare earth) topographic surface of the Earth excluding trees, buildings, and any other surface objects. DEMs are created from a variety of sources.
8. Land use map :- land map based on the Land Survey showing the zoning and land classification of any existing uses on all parcels of land within the Survey Area.
9. Contour Map :- a topographic map on which the shape of the land surface is shown by contour lines, the relative spacing of the lines indicating the relative slope of the surface.

3.3 Drone Mapping Software used is : - Pix4D Mapper

The leading photogrammetry software for professional drone mapping. PIX4Dmapper is the photogrammetry software of choice for thousands of professionals, it has proven to be flexible, powerful, and precise. Get a range of outputs including 3D point clouds, digital surface models, orthomosaics, 3D textured models, and thermal imagery.

- Capture : Capture a range of pictures, such as RGB, thermal or multispectral images.

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- Digitise : Pix4Dmapper turns your images into digital spatial models and maps. You can then process your projects using the cloud or the desktop photogrammetry platform.
- Control : Assess and improve the quality of your project, with information about the generated results, calibration details and more.
- Measure and Inspect : Measure distances, areas and volumes and learn more about profile data, as well as perform virtual inspections.
- Collaborate and Share : Securely share project data and insights with your team, clients and suppliers.
- Survey-grade Results : Obtain results with sub-centimetre accuracy - 1-2 pixel GSD in X, Y directions, and 1-3 pixel GSD in the Z direction

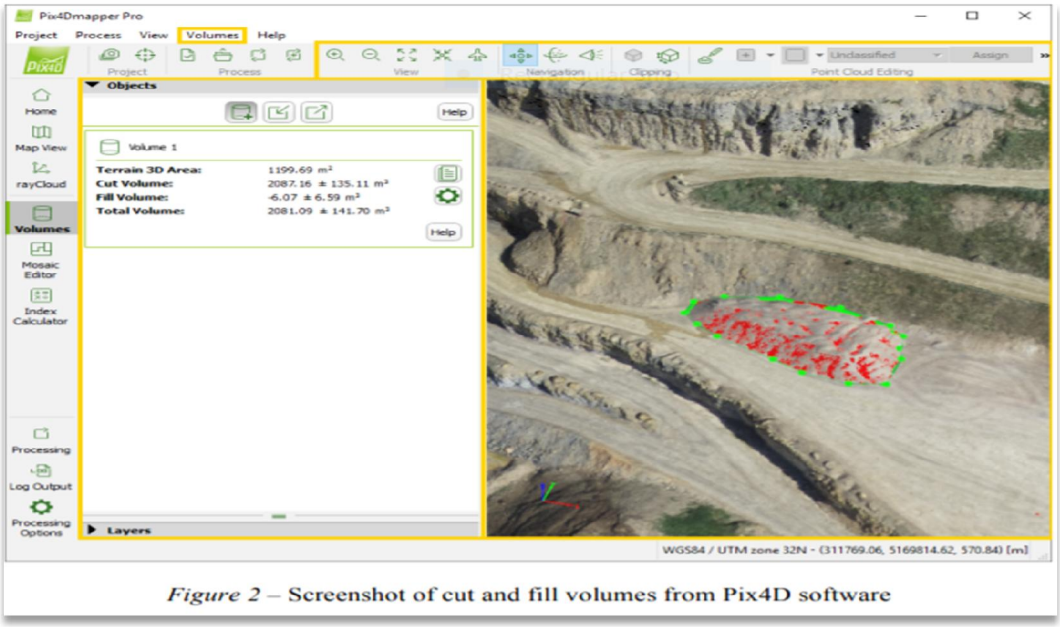

Fig no. 1.4 : Screenshot of Pix4d Software screen

3.4 CASE STUDY No. 1

MINING SITE

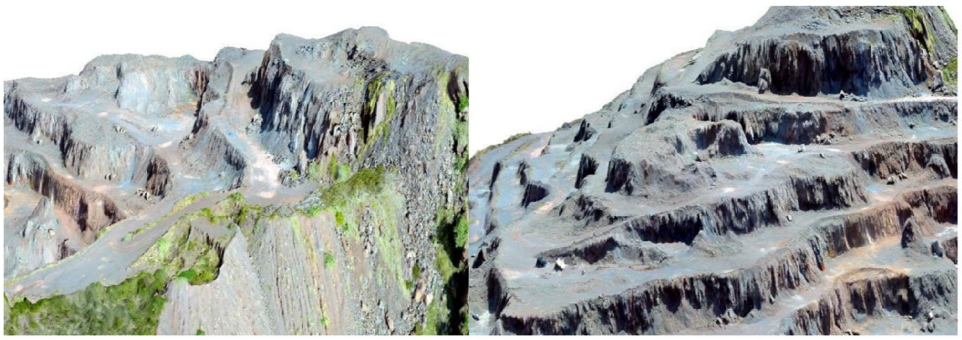

Fig no. 1.5 : 3D Visualization

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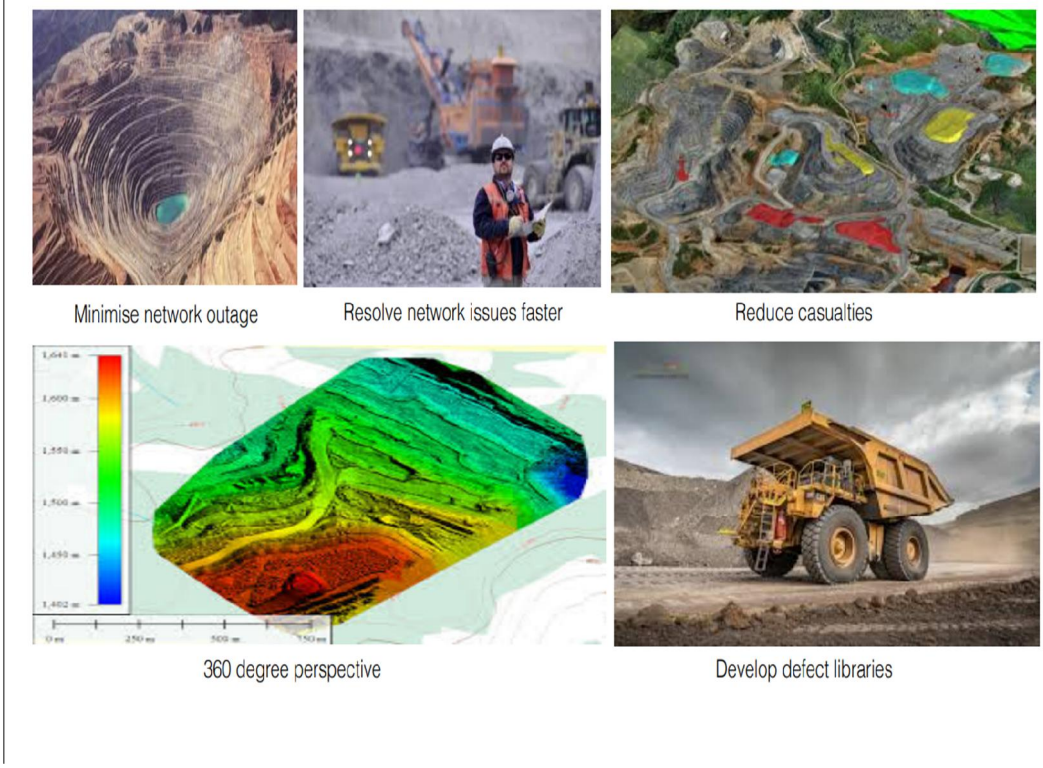

Fig no. 1.6 : Mining Aerial images

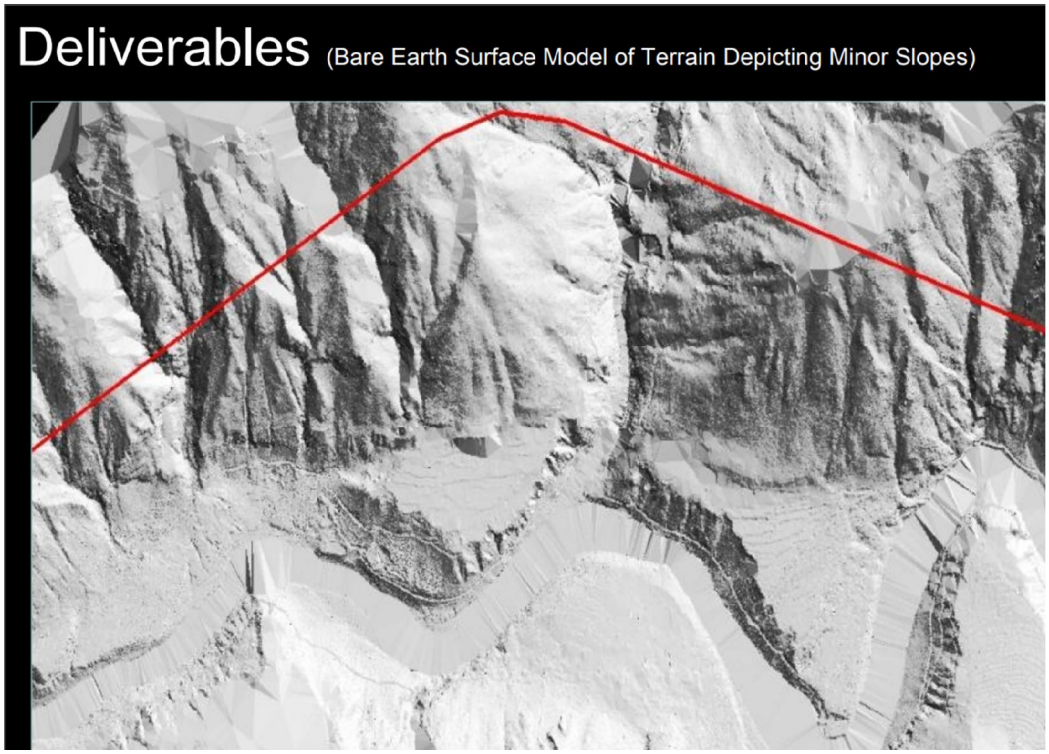

Fig no. 1.7 : Terrain slopes of mountain

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Simplification

These are the Virtual images of the Mining site in Shahdol, Madhya Pradesh. Which is located 683 kms from Indore, MP. The images concludes 3D Visualisation, Cross section (Volumetric analysis), Slope detection map. This Project was carried out by Droneium Aerial Solutions, Pune. This case study helped us to understand the overall practical use of drones with the software mapping and getting the result in ample amount of time. Below are the Applications.

Mine site planning :-

Change the way you optimize resources while you lay down the larger vision for a mine site. Get visual data that elevates your design, preparation and extractions. By getting 3D Visualisations

Site Monitoring and Maintenance :-

Introduce efficiency into everyday site monitoring and maintenance using superior data projections. From 3D point clouds to orthomosaic maps, our integrated systems are designed to enhance everyday mining operations.

Mapping and Surveying :-

Achieve more positional accuracy while you gather aerial view data on discrete points across your entire mining project area.

Progress Tracking :-

Access the advantage of on-point data capture and subsequent analyses, reducing human error and improving course correction.

Inspection :-

Increase your situational awareness with live maps and accurate data capture. Get improved access to every part of the site without endangering life or losing time.

3.5 CASE STUDY No. 2

SOLAR CITY

Fig no. 1.8 : Drone View of Site

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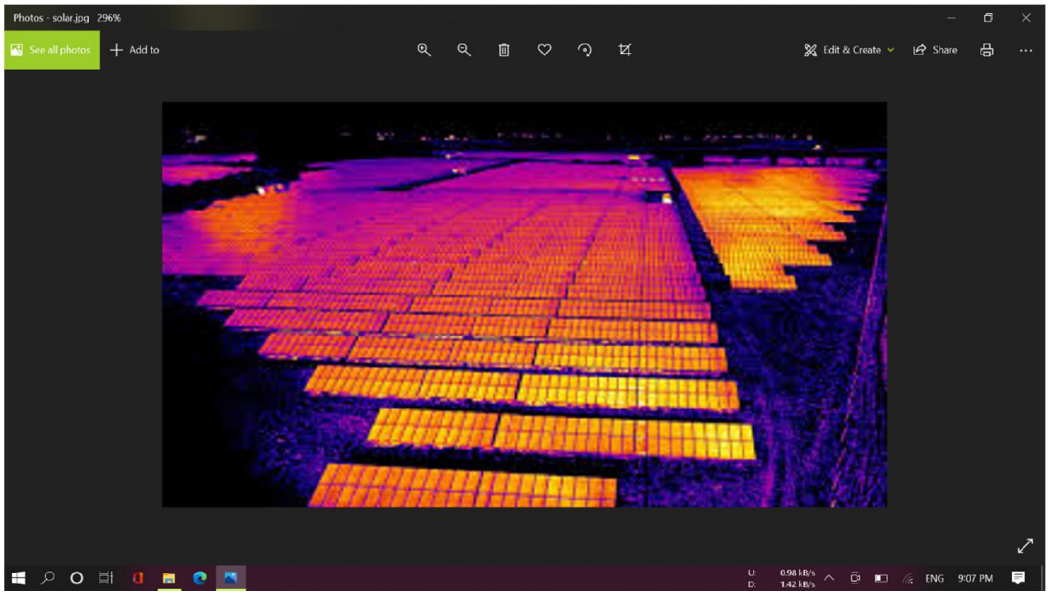

Fig no. 1.9 : Thermal Scanning of Solar panel

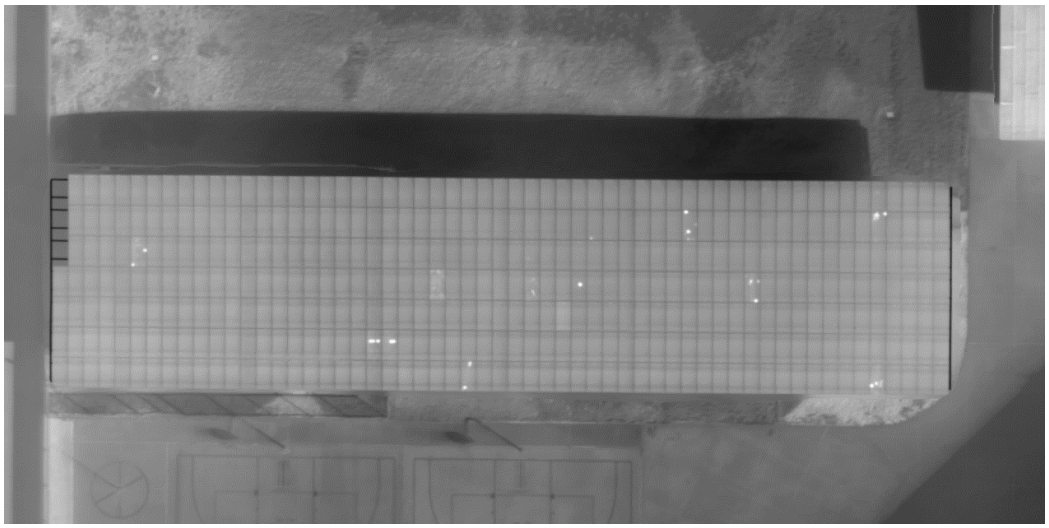

Fig no. 1.10 : Hotspots showing Failure in Solar panels

Simplification :-

This case study includes Solar Power located in Charanka, Gujarat. It has the capacity of 4.2 MW. It is one of the Solar photovoltaic power plant in Gujarat. It is spread across 5,384 acres of land. This project was carried out by Gujarat Government. The virtual images concludes aerial view of the Solar panels, Thermal Scanning and Hotspots. Drones are useful in Solar farms because there are typically large installation of solar panels and are difficult to inspect by ground based technicians.

1. Aerial View :-

With the help of Unmanned Aerial Vehicle, Flight was conducted and the Surveillance was carried out over the solar field in which we get aerial view of the Solar park.

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2.Thermal Sensing :-

A drone equipped with Thermal camera inspects the solar farm with higher speed and accuracy. This shows diode failures, coating and fogging issues and junction box heating. The gathered is analysed to detect faults and streamline workflows in significantly less time.

3.Hotspots Images :-

The Hotspots images are useful in spotting major site issues, such as vegetation management, poor drainage, and soil erosion underneath the racking. It also shows the damages on the solar panels. With the help of this data the fault detection is faster, accurate and time saving.

IV. OBSERVATIONS/ FINDINGS

4.1 Land Surveying

Drones are rapidly replacing traditional land-based surveillance methods. There are a range of ground control units which provide centimetre level accuracy during land surveying.

The birds eye view that is generated from drone technology eliminates a lot of the human error associated with the process of land surveying and importantly captures the data in a significantly smaller amount of time than sending out a person or team to map out an area.

A fixed wing drone which is more like an aeroplane can cover a huge amount of distance in a small amount of time whilst also capturing high resolution images of the area below. The high resolution images can be changed into 3D models which allows the construction team to identify any preconstruction issues and mistakes which improves the efficiency of the project before it has even started and saves the company a lot of money.

4.2 Monitoring assets

Because nearly every drone is fitted with a camera it makes perfect sense that they could be used to quickly and efficiently monitor assets during your construction. Whether that is volumetric analysis of stockpiles of essential materials or keeping track of where your equipment is on-site. Drone technology has an easy way to do a load of technical things!

4.3 Volumetric analysis

Construction sites are full of stockpiles of rule materials which can be used for surfacing roads, laying foundations or other activities. Sometimes, it can be difficult to keep track of how much of a certain material you have on sites and how much you have used to inform ordering more.

Drone technology is able to quickly capture an image of the site from a range of different angles and quickly perform volumetric analysis on your stockpiles of essential materials to let you know how many tons are in your possession. This gives you a quick and simple way of determining whether or not you have enough of your stockpile to finish the task.

4.4 Equipment tracking

Construction sites contain a lot of equipment which needs to be efficiently transported around the site to avoid lengthy delays in mission-critical tasks. Typically, a site manager or project manager has to keep track of each bit of equipment is and where it needs to go next. This leads to a huge potential for human error to impact the progress and costs involved in the project.

By using a drone, the same person can quickly do a fly over of the construction site and finds out if there is anything out of place with the equipment. It also allows them to recognise if any of the equipment that is rented is still on-site which can prevent expensive accidental extension charges to the rental agreement.

4.5 Improving security

Construction sites are full of valuable equipment. Drones are able to quickly check the construction site for people who should not be there whilst also acting as a deterrent for would-be thieves. Drones are very loud and can be used to intimidate and scare people into moving on.

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Prevention is better than a cure-all since a recent study by Capterra shows that less than 25% of stolen construction site equipment is ever returned.

4.6 Identifying hazards

A birds eye view is a fantastic place to quickly identify any unseen hazards. Safety should be the number one priority on a construction site and having a quick way to fly over the entire site and check that everything is in order for the safety of your employees is imperative.

Having this unique angle on your construction site will certainly give you the ability to identify hazards quicker and easier than simply walking around the construction site. It is also likely to pick up hazards that you have never identified before.

4.7 Progress reports

During construction projects clients want regular updates to make sure that key performance indicators and milestones are met. Drones are a perfect way to capture images of the work site to share with the clients.

Drones are able to not only capture the grand features but also provide an up close and detailed view of high construction sites such as high-rise buildings and antennas. Using drone footage and photographs will give your project that extra level of professionalism to build confidence with the client.

4.8 Delivering resources

Lastly, drones are able to deliver resources to remote parts of the construction site. There are plenty of drones which are able to carry things and the technology can even deliver up to 12 kg payload over a relatively large distance. This is a great option if your work site is hard to navigate or certain environmental conditions – like wet roads – inhibit delivery of mission-critical items.

V. CONCLUSION

1. In case of Surveying, Use of Drones for resulted with high accuracy and time saving. They are able to effectively collect data of high standard and are an important technological asset in the area of civil engineering.
2. In case of Site Monitoring, Drones equipped with Thermal scanning, Hotspots, laser scanners are valuable tool while monitoring sites. Provides instant data, aerial view and works more effectively minimizing delays.
3. In case of Safety, Drones reduces risks on the construction sites. They are able to reach the places where it is hard for a field worker to reach in such scenario's drones are life savers.
4. In case of Ease of Work, Drones with thermal scanning and many more features provides accurate data which when uploaded in software gives perfect 3D view, and allows user to create a virtual scenario for the client, which results in ease of work.
5. In case of Reduce cost and time of project, The leading engineering and surveying firm estimates a 60% cost saving using Esri's Drone2Map over conventional survey technics, Drones capabilities enables to save costs, time, risk which automatically led to more confidence and to complete project in time and save costs.

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