APPLICATION OF ARTIFICIAL INTELLIGENCE IN DRONES FOR THE ANALYSIS OF AGRICULTURAL LAND USE IN THE MINING LEASE

ABSTRACT

Artificial intelligence can be used to automate the control of drones, including their navigation and movement. This can be done using a variety of methods, including GPS tracking, computer vision, and machine learning algorithms. Drones offer a unique combination of resolution and spatial coverage which makes them invaluable for land survey & mapping. In addition, by using multiple ground-control points, they could achieve high geo-referenced accuracy for the Orthomosaic product. Combined with field observations, Drones offer a way to get a quick and accurate record of revealed land data and its land use.

Drone survey & mapping was carried out of mining lease near village Kanthariya, tehsil & district Chittorgarh for the analysis of agricultural land use in the mining lease of 64.75 hectares.

Keywords- *Mining, Agriculture, Environment, Innovation, Land Resources, Land Use, Artificial Intelligence, Drones, Photogrammetery, GIS, Exploration, Minerals, Conservation, Sustainability*

Introduction

Today, many industries are adopting technological advancements like drone technology, rather than conventional methods of surveying. Drones offer cost-effective, safe, and quick aerial surveys for data collection and are very useful for industries like agriculture, civil, Mining, which requires constant monitoring.

Agriculture and Mining operations, which are typically in remote locations and hard to access places, often make human accessibility difficult. This, in turn leads to either delay in decision making or sufficient information leading to loss to work & output efficiency.

As drone technology evolves, becomes more affordable and regulations get more defined, the use of drones in the industry sector is likely to increase manifold.

Surveyors and engineers can use the data captured from UAVs to make statements and forecasts about the development of region. Drones can provide valuable information about the condition of the above ground area, thus improving the Land Use planning.

Artificial Intelligence can be used to automate the control of drones, including their navigation and movement. This can be done using a variety of methods, including GPS tracking, computer vision, and machine learning algorithms.

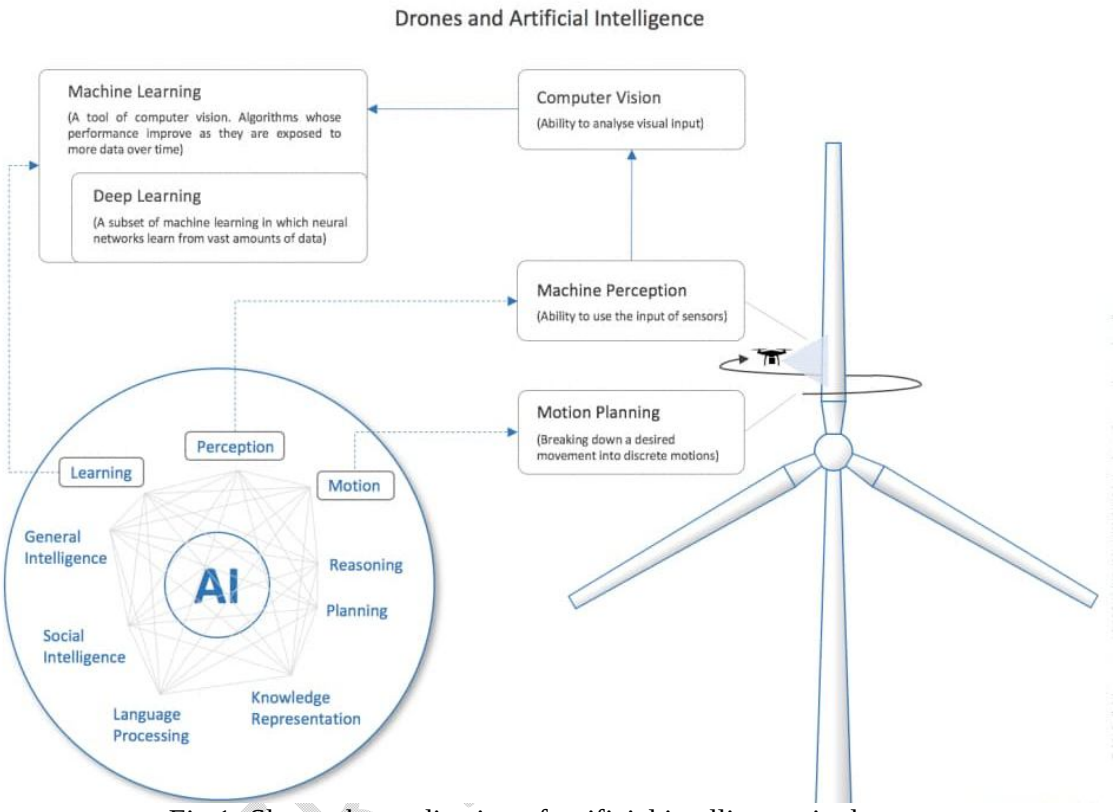


Fig 1- Shows the application of artificial intelligence in drones

Artificial intelligence gives machines the ability to interact in an intelligent way. This is why the fusion between drones and artificial intelligence represents the response to many needs in aerial imagery and provides new headlines in the future of aerial technology for different sectors like Energy, Construction, Security, Agriculture. In this research we have utilize application of artificial intelligence in drone for analysis of agricultural Land use in Mining Lease.

Material and Methods

Scope of Work

Survey of mining leases was done using UAV and providing accurate output in desired formats for the analysis of Land Agriculture Land use in the Mining lease.

Field Work

Drone survey & mapping was carried out of mining lease near village Kanthariya, tehsil & district Chittorgarh for the analysis of agricultural land use in the mining lease of 64.75 hectares.

Data capturing within mining leases and up to 100m from its boundary using drone instrument. Data capturing for Mining Lease will be done to create 3-dimensional models. The scope area surveyed and flying path is created with kml in the software applications. The data capturing is carried out by flying drone on around 100 meters (Maximum) above ground only. The Ground control points are marked for accuracy through DGPS.

Drone used for Survey

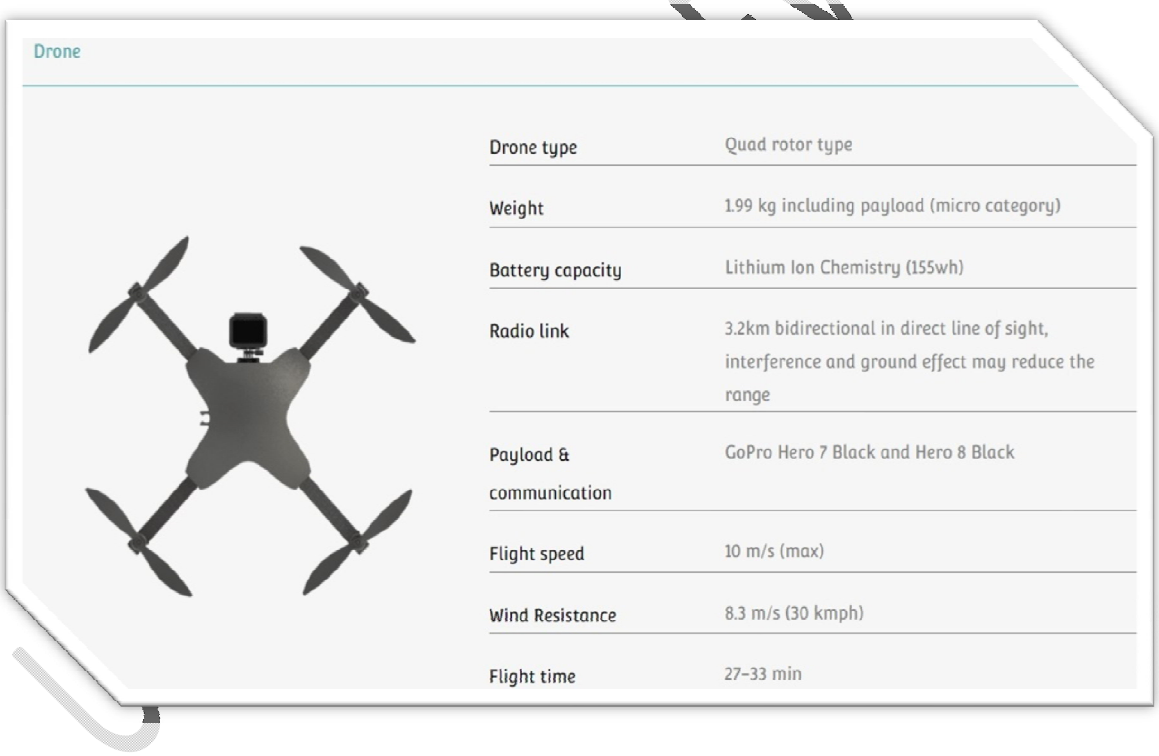


Fig. 2- Technical Description of Drone used for Survey & Mapping

Defining Drone Survey Flying Path

A drone flight plan is a predetermined combination of instructions, including coordinates, speed, altitude, direction, heading, gimbal actions, camera actions, and more that serve the purpose of guiding a drone in accomplishing a flight, and carrying out a particular mission:

1. Flight path: determined most using a series of longitudes/latitudes and altitudes (waypoints) that automatically navigates the aircraft.
2. Speed: you may want a lower, consistent speed throughout the flight plan, ideal for mapping, or you may want to zoom to specific waypoints to perform specific tasks, such as ‘hover’ or ‘360.’
3. Heading: the drone does not have to face in the direction it is moving; for example, you may want to orient it toward a Point of Interest (POI) which can be set in some flight applications.
4. Gimbal actions: depending on whether you are mapping, inspecting, filming, live broadcasting, etc., you may want to automate gimbal actions or retain manual control.
5. Camera actions: video/image and choosing the right camera settings for your purpose.
6. Situational behavior: Set action to Return-to-Home or Hover, set the proper return altitude, and be aware of all obstacles that could be present between you and the drone’s flight path

Fig. 3- Drone flying path of the Study area Mining lease

Processing & Orthomosaic

The photogrammetery software "surveyaan" is used to process the photographs obtain from the Drone.

Orthophotos is used to measure the actual distances of the geographical landscapes. This is because it creates an almost exact representation of the Earth's surface when done with critical adjustments. And a collection of such photographs stitched together with geometric rectification to form a map of a certain area is called an orthomosaic map. Maps like these are very detailed in nature and consist of an actual representation of the area. Orthophotos are captured with the help of a powerful aerial surveying drone.

Fig. 4- Processed Image or Orthomosaic of the mining lease

Digital Surface Model (DSM) is also created which represents the elevation or terrain of the survey area as well as above-ground features like buildings, towers, houses, vegetation, and other infrastructure. DSMs are 2D representations of a 3D image that uses different colors or shades to highlight different elevation values.

A **point cloud** is a set of data points in space that typically represent a 3D shape or object. Each point in this cloud corresponds to the X, Y, and Z positions of a single data point that was collected or generated during the survey. Point clouds can be edited, scaled up or down, or colorized depending on your needs.

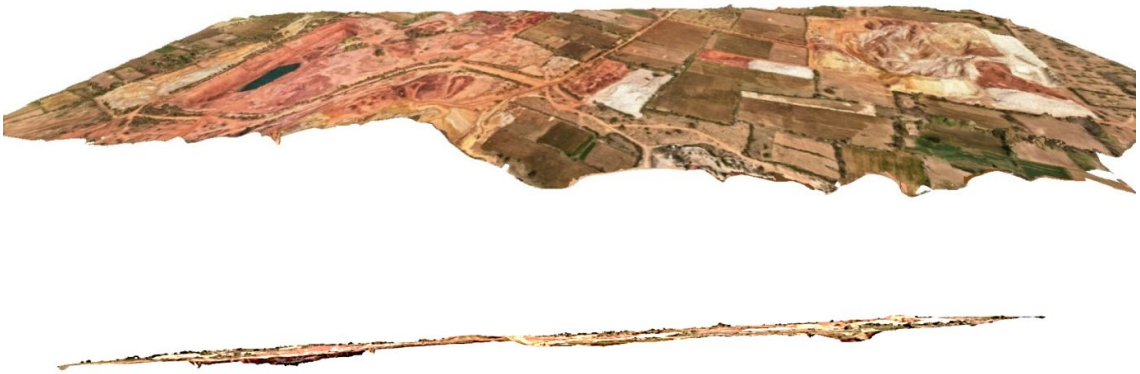


Fig. 5- 3d model, digital surface model of the mining lease

The surveyaan processing software is used for measurement and analysis of the Agricultural land use in the mining lease.

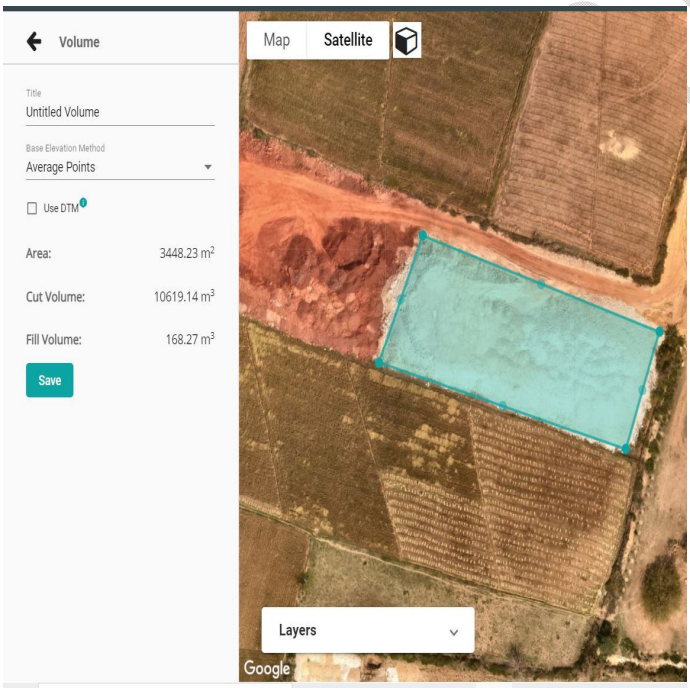
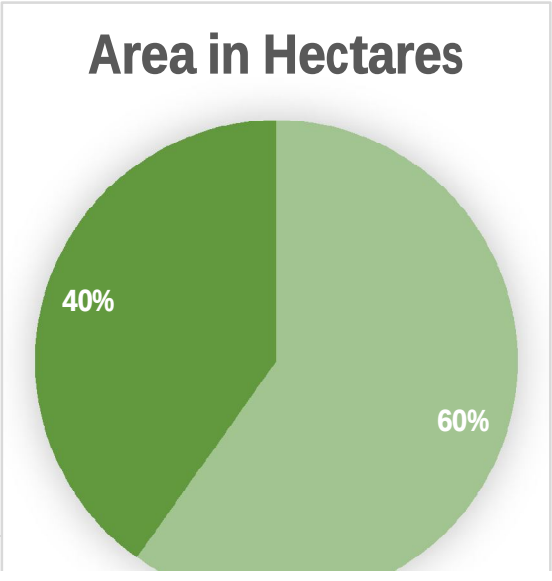


Fig. 6- Measurement tool used for Analysis

Land Use Analysis of the Mining Lease



Particulars	Area in Hectares
Pits & Quarry	13.6620
Storing Mineral	19.0650
Dumps	0.4576
Road	1.5546
Plantation on fresh ground	4.000
Sub Total	**38.7392**
Agriculture Land	**26.0108**
Total Mining Lease Area	**64.750**

Table-1 -Shows the Land use analysis of agricultural land in mining lease with its graphical representation

Conclusion

1. Artificial intelligence is used to automate the control of drones, including their navigation and movement.
2. At the time of the Drone survey & mapping in the are described above DGPS was used to mark ground control points and 4 GCP were marked, by using multiple ground-control points, they could achieve high geo-referenced accuracy for the Orthomosaic product.
3. Through photogrammetry software the Orthomosaic produced has shown the complete details of the area and by using Cad software we were able to define area-specific activities.
4. By Drone we got the analysis with more accuracy and authenticity within the time & cost-effectively.

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