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AI Based Drone for Agriculture Application

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Abstract: *Quadcopter are drone also known as unmanned aerial vehicles that can be controlled remotely, Quadcopters have uses in various fields. The components required in building the quadcopter are its frame, Pixhawk light controller, Brushless Dc motors, Propellers, High definition (HD) camera, Global Positioning System, Telemetry module. Aerial security means performing security-aimed monitoring and surveillance operations with the help of airborne vehicles. These kinds of activities suggest that humans officers (security organizations, law enforcement, police etc.) would be able to remotely monitor and view video and data acquired from drones while planning and evaluating their operations. The spectrum of applications where drones are used for security purposes in vast: scouting and reporting emergencies, monitoring accidents and crimes, surveillance of a certain landscape area, operating in highly busy and pedestrians as well as their tracking from up in the sky, and so on. The project will serve as a bridge to connect actual happening in areas that cannot be navigated easily by security personnel of corporate institution as the drone will be used to hover and record and analyses the event as they streams in, also due to its capability of flying over different altitudes the drone can generally be used on areas with rugged terrains or over water bodies for a time dependent on its power capacity*

Keywords: Drone, Unmanned Aerial Vehicle, Agricultural use

I. INTRODUCTION

[1] Agriculture, being the backbone of economies worldwide, constantly seeks innovative solutions to address challenges such as increasing demand for food, limited natural resources, and the impacts of climate change. In recent years, the convergence of Artificial Intelligence (AI) and drone technology has emerged as a transformative force in the agricultural sector, offering unprecedented opportunities for precision farming and sustainable agricultural practices.[2]This can include observations from a distance by means of electronic equipment (such as CCTV cameras), or interception of electronically transmitted information (such as internet traffic or phone calls); and it can include simple, relatively no- or low-technology methods such as human intelligance agents and interception and aerial surveillance where drones are applied to realy information anfd gather the required data. Drones relay on a combination of hardware and software components to achieve successful takeoff, flight and landing. Drones are often equipped with rotors or fixed wings, sensors, navigation systems and gyroscopes (for stability), and are operated by ground control stations.

II. LITERATURE SURVEY

The literature review encompasses a diverse array of studies and projects addressing various aspects of accessibility and technology for individuals with visual impairments. Mohd Javaid research paper aims to cultivate healthier crops, manage pests, monitor soil and growing conditions, analyze data for farmers, and enhance other management activities of the food supply chain [1]. Jorge Pasoda paper gives information about the interest in the Agriculture sector consists of Traits or features of system that vary in space and time [2]. Similarly, Ketan Pawar paper we have learned the dynamics of the quadcopter. Quadcopter operates within Two frames of reference [3]. Paras Khandelwal Gives the direct application of Artifial Intelligence or Machine Intelligence across the farming sector could act to be epitome of shift in how farming is practised today [4].Ngozi Clara Eli Chukwu give the Application of ArtifiacialIntelligence has been evident in the Agriculture sector recently. The sector faces numerous challenges in order to maximise its yields including improper Soil treatment, disease and pest infestation, big data requirement, low output and knowledge gap between farmers and technology [5]. A.Samba Siva use the tiny Camera and angular shape bee and microcontroller we

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tend to develop an image of the unmanned aerial vehicle [6]. Shivangi Sharma and Kriti Verma finds crop varieties, irrigation, soil detection, crop Scouting, weeding, and crop establishing in agriculture industry all benefits from Artificial Intelligence [7].

III. PROPOSED METHOD

Developing an AI-based drone for agricultural applications involves combining various technologies to create a system capable of efficiently monitoring crops, assessing their health, and performing tasks such as spraying pesticides or fertilizers. Here's a proposed method for creating such a drone:

- **Hardware Selection**: Choose or design a drone platform capable of carrying the necessary payload (sensors, cameras, actuators, etc.) while being agile enough to navigate through fields. Select high-quality cameras, multispectral or hyperspectral sensors, and other relevant hardware for capturing detailed images and data about the crops.
- **AI and Computer Vision**: Implement computer vision algorithms to process images captured by the drone. These algorithms can detect various features such as crop health, weed infestations, nutrient deficiencies, and pest damage.
- Utilize deep learning techniques, such as convolutional neural networks (CNNs), to train the AI models on large datasets of annotated agricultural images to accurately recognize different crop conditions.
- **Data Analysis and Interpretation**: Develop algorithms for analyzing the data collected by the drone and interpreting it in a meaningful way for farmers. This may involve identifying areas of concern within the crops, such as pest outbreaks or nutrient deficiencies, and providing actionable insights.
- **Autonomous Navigation**: Implement autonomous navigation algorithms to enable the drone to fly pre-defined routes over the fields while avoiding obstacles and maintaining a safe distance from crops. Incorporate GPS and other positioning systems to ensure accurate navigation and precise positioning of the drone during operations.
- **Integration with Farm Management Systems**: Integrate the AI-based drone system with existing farm management software to streamline data sharing and decision-making processes. Ensure compatibility with common farm management platforms and protocols for seamless integration into existing workflows.
- **Task Execution**: Equip the drone with actuators and dispensing systems for performing tasks such as spraying pesticides, applying fertilizers, or even harvesting certain crops autonomously based on AI analysis. Ensure precise control of these actuators to minimize waste and ensure optimal application of inputs.
- **Testing and Validation**: Conduct rigorous testing of the AI-based drone system in various agricultural environments to validate its performance under different conditions. Iterate on the design and algorithms based on feedback from field trials to continuously improve the system's accuracy and reliability.
- **Regulatory Compliance and Safety**: Ensure compliance with relevant regulations and safety standards for operating drones in agricultural settings.

By following these steps and continuously refining the system through testing and feedback, it's possible to develop an AI-based drone that effectively assists farmers in managing their crops more efficiently and sustainably.

Implement fail-safe mechanisms and redundancy features to mitigate risks of accidents or malfunctions during operation.

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Block Diagram

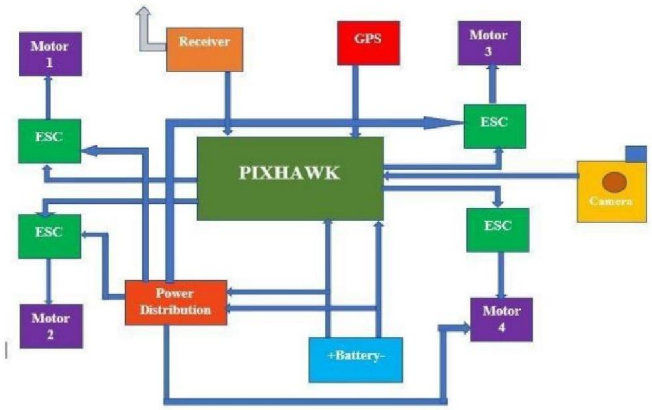

Fig 1 Flow Chart

IV. IMPLEMENTATION

Flight Controller: A drone's transmitter, also known as the remote control or controller, is the device used by the pilot to control and navigate the drone. It sends commands wirelessly to the receiver, which is located on the drone itself.

Fig 2 Flight Controller

Li-Po Battery: A lithium-polymer battery (LiPo) is a rechargeable battery that, in the case of true LiPo, uses solid polymer for the electrolyte and lithium for one of the electrodes. Commercially available LiPo are hybrids: gel polymer or liquid electrolyte in a pouch format, more accurately termed a lithium-ion polymer battery.

Fig3 Li-Po Battery

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Electronic Speed Controller: An Electronic Speed Controller (ESC) is a purpose-built device designed for controlling the speed of an electric motor. Using a specialised combination of hardware and firmware, ESCs drive motors to a commanded speed. They maintain motor speed under various circumstances, such as the dynamic load of a propeller.

Fig 4 ESC

Propellers: Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow, which results in a pressure difference between the top and bottom surfaces of the propeller.

Fig 5 Propellers

F450 Drone Frame: F450 quadcopter frame is a 450mm quad frame built from quality materials. The mainframe is glass fiber while the arms are constructed from ultra-durable polyamide nylon. This version of the F450 features integrated PCB connections for direct soldering of your ESCs

Fig 6: F450 Drone Frame

V. FUTURE SCOPE

The future scope for AI-based drones in agriculture is promising, with ongoing advancements poised to revolutionize farming practices. These drones will increasingly leverage AI algorithms to not only capture data but also autonomously analyze it, providing farmers with real-time insights into crop health, soil conditions, and pest infestations. Integration with precision agriculture techniques will enable targeted interventions, optimizing resource usage and minimizing environmental impact. Furthermore, as AI and drone technologies continue to mature, we can anticipate enhanced capabilities such as collaborative swarm intelligence, enabling fleets of drones to work together

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seamlessly across large agricultural landscapes. Overall, AI-based drones represent a pivotal tool in the future of agriculture, offering unparalleled efficiency, sustainability, and productivity for farmers worldwide.

VI. CONCLUSION

The integration of Artificial Intelligence (AI) with drone technology has ushered in a new era in agriculture, redefining how farmers monitor, manage, and enhance their crops. Through the development and implementation of AI-based drones, agricultural practices have become more efficient, precise, and sustainable. This report has explored the various aspects of creating AI powered drones tailored for agricultural applications, highlighting the significant impact such technology has on the agricultural sector. AI-based drones have emerged as indispensable tools in modern agriculture. Their ability to provide precise, real-time insights revolutionizes farming practices, making them more efficient, sustainable, and profitable..

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