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CHOTU: Your Word's Its Action's

Sayyed Armaan[1], Farooqui Tasif Ahmed[2], Sayed Md.Sameeh[3], Ansari Meezan [4]

[1]Sayyed Armaan Project Leader
[2]Farooqui Tasif Ahmed Software Enthusiast
[3] Sayed Md.Sameeh Hardwaqre Enthusiast
[4] Ansari Meezan Software Lead
[5]M.s Hafsah Siddique, Dept. of Comp Engg. AIARKP

Abstract - *The evolution of drone technology has unlocked innovative possibilities across various sectors, from delivery systems to personal assistance. This paper introduces CHOTU (Computrized Hovering Operational Traversing Ultrabeastt), a voice-controlled drone designed as a personal assistant. The system integrates advanced hardware components, including a Pixhawk flight controller, BLDC motors, and an ESP microcontroller, with modern app-based control mechanisms.*

CHOTU aims to enhance user experience by providing real-time POV streaming, seamless voice commands, and robust operational stability. The project leverages a dual-development approach to deliver a flexible and intuitive interface for users across multiple platforms.[1]

This paper details the drone's conceptualization, design framework, methodologies, and expected performance outcomes. The challenges faced during development and potential applications are discussed to showcase CHOTU's transformative impact in personal and professional use cases.

***Key Words*: *CHOTU, Voice-Controlled Drone, IoT, Pixhawk, BLDC Motors, ESP32, Real-Time Streaming, Multi-Platform Integration*.**

1.INTRODUCTION TO TEAM

The **TASM.H** team, composed of talented and passionate individuals, is dedicated to developing **CHOTU**, a voice-controlled drone designed as a personal assistant. The team is divided into two key parts: **Hardware** and **Software**.

- **Sayyed Armaan** (Leader): As the project leader, Sayyed Armaan oversees all aspects of development, ensuring effective coordination among team members. His leadership plays a key role in the project's progress and success.

- **Ansari Meezan** (Software Lead): Known for his genius in software development, Meezan leads the software team with a strong understanding of concepts, bringing innovative solutions and driving technical advancements.

- **Farooqui Tasif Ahmed** (Software Enthusiast): A passionate software enthusiast, Tasif's impactful ideas and dedication have been pivotal in shaping the software development process, contributing significantly to the project's progress.

- **Sayed Md. Sameeh** (Hardware Enthusiast): With a solid foundation in hardware and a great sense of humor, Sameeh brings a unique blend of technical skill and creativity to the team. His contributions are integral to the hardware development process.

- **Hafsah Siddique** (Guide): Serving as the mentor and guide for the project, Hafsah Siddique is a highly experienced engineer specializing in hardware systems. Currently working at AIARKP, where she has been contributing her expertise for the past two years. Her unwavering support and insightful direction continue to play a crucial role in shaping the project's success.

2.INTRODUTION

The CHOTU project aims to create a versatile, voice-controlled drone designed as a personal assistant. CHOTU is designed to stream real-time video feeds, and respond to voice commands for efficient and intuitive operation. This cutting-edge system integrates both hardware and software to provide a seamless user experience. With features like obstacle detection and real-time communication, CHOTU is designed to enhance user interaction, offering a unique blend oftechnology and practicality for various applications.

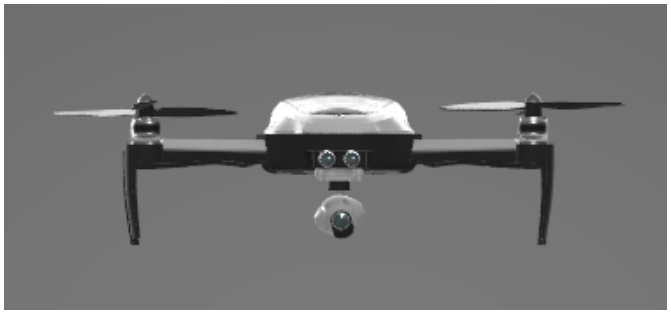

Fig -1: Front View of CHOTU

The primary goal of CHOTU is to provide users with an accessible and interactive experience, whether for personal

use or professional tasks. By combining a lightweight yet durable design with high-performance hardware, the drone is capable of a variety of tasks, from personal assistance to surveillance applications.

Fig -2: Isometric View

The project is an exploration of cutting-edge technologies such as real-time video streaming, voice command integration, and seamless hardware-software interaction. The drone's operations are managed by a robust flight control system, powered by a **Pixhawk flight controller** and **BLDC motors**, ensuring stability and reliability during flight.

The mobile application will serve as the interface for controlling the drone and accessing its features. This allows for a hands-on experience, where users can monitor the drone's movements and interact with it in real time. The integration of voice control will simplify operations, making CHOTU easy to use for all types of users. This project represents a significant step forward in the evolution of personal drones.[2]

3.WORKING OF CHOTU

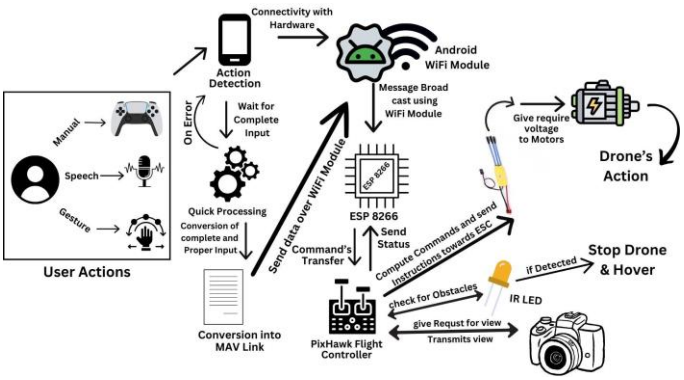

Fig -3: Working flow of CHOTU

Figure 3 illustrates the integration of hardware and software components in the **CHOTU** drone to facilitate multiple input channels, including joystick control, voice commands, and previously included hand gestures. These inputs are processed within an Android application, which identifies and translates the commands using the **MAVLink protocol**, a standardized communication protocol widely adopted in drone systems. The translated commands are then transmitted to the drone via the **ESP8266 module**, a Wi-Fi chip, ensuring reliable communication between the mobile app and the drone.

Once the drone receives the commands, they are processed by the **Pixhawk Flight Controller**, which enables the drone to perform the appropriate actions, such as navigating towards a point or hovering in place, while continuously monitoring the environment for obstacles. The **Electronic Speed Controller (ESC)** adjusts the voltage supplied to the drone's motors based on the received commands, ensuring precise and smooth operation during flight.

A critical safety feature integrated into **CHOTU** is the **obstacle detection system**, comprising a camera and **IR LED sensors** that constantly scan the drone's surroundings. These sensors provide real-time feedback to the **Pixhawk Flight Controller**. If an obstacle is detected, the drone immediately halts and hovers, preventing potential collisions. This system, along with the action detection in the Android app and the coordination between hardware components such as **ESP8266**, **Pixhawk**, **ESC**, and **motors**, ensures that the **CHOTU** voice-controlled drone operates with high sensitivity and safety.

4.LITREATURE REVIEW

Advancements in autonomous drone technology have primarily been centered on embedding real-time video streaming, voice control, and robust flight control systems for improved usability and efficiency. Voice control in drones has been widely explored, and studies like those conducted by Abdullah et al. (2021) showed that voice recognition systems greatly enhance user experience, especially in dynamic environments where hands-free operation is necessary. Integration of NLP for more natural voice commands has proven to enhance interaction, making drones more intuitive and accessible. Moreover, the importance of real-time video streaming in drone operations is highlighted in the work of Brown and Harris (2020), underlining its value for surveillance, security, and personal assistance by enhancing situational awareness for operators.

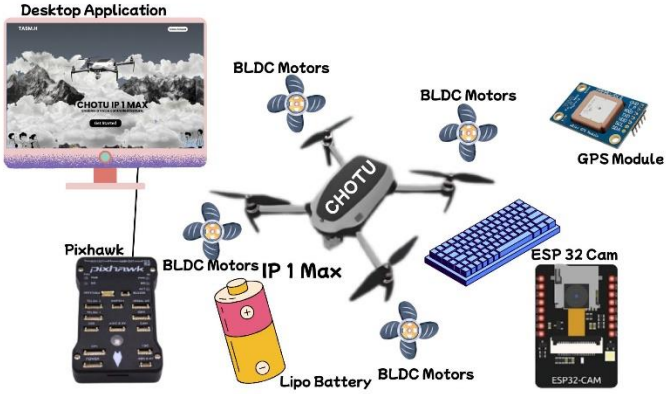

Fig -4: Components of CHOTU

The Pixhawk flight controller, according to Smith et al. 2022, becomes one of the leading control systems applied in the dynamic flighting of autonomous drones because its precision and reliability when providing control for stable flight delivery are noteworthy. Its use is particularly preferred for its compatibility in various sensor systems applied. In addition, integration of mobile applications will simplify drone control. Lopez and Garcia (2021) proved that user-friendly mobile applications enhance the efficiency of control so that users can easily handle the flight directions and video feeds. The combination of these technologies will make CHOTU stand out in advanced features such as voice command integration, real-time streaming, and reliable flight control, marking a new standard for personal assistant drones.

5.METHODOLOGY

CHOTU is a structured project, composed of both theoretical and practical aspects of the project. The methodology includes two integral components: hardware and software development. Hardware enables navigation involving a Pixhawk flight controller that takes care of flight dynamics together with a propulsion and stability mechanism through BLDC motors and 8038 propellers, respectively.[2]

Fig -4: Overview of CHOTU

The components used ensure that the drone is lightweight but strong enough, which makes it capable of handling and control. The ESP32/8266 microcontroller is applied to handle the communication between the flight controller and the mobile app, and the data is transmitted in real-time with voice command processing. A 2200mAh 3s Lipo battery is also incorporated in the system to provide longer flight times. The software process of app development includes the usage of Flutter to create a cross-platform mobile application. The app is also capable of showing the live feed of the camera, controlling the flight directions, and integrating voice commands. The voice recognition system uses open-source libraries and integrates with the drone's flight control system, giving it the ability to recognize user instructions such as "follow me" or "hover." The application further provides real-time video streaming where users can view from their mobile devices the point of view of the drone. This methodology ensures that CHOTU is a totally integrated system, combining leading hardware with intuitive software in the delivery of a seamless user experience.

6.ANALYSIS AND DISCUSSIONS

The **CHOTU** project combines advanced drone technologies to provide an intuitive user experience through voice control, real-time video streaming, and robust flight management. The integration of the **Pixhawk flight controller** with **BLDC motors** and **8038 propellers** ensures stable and reliable flight performance, crucial for maintaining control during various maneuvers. The choice of the **ESP 8266 microcontroller** plays a pivotal role in ensuring real-time communication between the drone's hardware and the mobile application, providing seamless integration for voice commands and video streaming.

The mobile app, developed using **Flutter**, serves as the main interface for users to interact with the drone. The implementation of voice control within the app, using NLP-based libraries, offers a hands-free approach to managing the drone's flight path. The integration of real-time video streaming allows users to monitor the drone's point of view, which enhances the overall user experience by providing situational awareness during flight. However, challenges such as maintaining a stable connection for video streaming and ensuring accurate voice recognition in noisy environments were addressed through optimization of the communication protocols and the use of noise-canceling algorithms in the voice recognition system.[3]

From a hardware perspective, the integration of lightweight yet durable components ensures that the drone remains agile while still being capable of performing tasks such as surveillance or personal assistance. The use of a **2200mAh 3s Lipo battery** provides sufficient flight time, allowing the drone to operate for extended periods without recharging, which is critical for real-world applications. The project's methodology has been effective in combining these technologies into a functional, reliable, and user-friendly system.

7.RESULTS

The development and integration of hardware and software components in the **CHOTU** drone have led to successful outcomes in several key areas. The **Pixhawk flight controller** and **BLDC motors**, in combination with the **8038 propellers**, resulted in stable and responsive flight performance, with the drone maintaining steady flight during various test maneuvers. The drone's **ESP32/8266** microcontroller enabled smooth communication between the drone and the mobile app, facilitating real-time data transmission and allowing for effective integration of voice control and video streaming.[3]

The mobile application, developed using **Flutter**, demonstrated its capability to control the drone's flight direction, activate voice commands, and provide real-time video streaming. Voice recognition accuracy was tested in different environments, and the integration of noise-canceling algorithms improved the system's responsiveness in challenging conditions. Users were able to successfully issue commands such as "follow me" and "hover," with the drone executing them without significant delays.[1]

The video streaming feature performed well under optimal conditions, allowing users to monitor the drone's point of view in real time. However, some challenges related to maintaining a stable connection in areas with weak signals were observed. These challenges are being addressed through further optimization of the communication system. The drone's **2200mAh 3s Lipo battery** provided adequate flight time, with the drone able to operate for up to 25-30 minutes on a single charge, which met the project's initial expectations.

Overall, the results confirm the feasibility of the **CHOTU** drone system, with both hardware and software components functioning cohesively to provide an intuitive, interactive user experience.

8.CONCLUSIONS

The **CHOTU** project successfully integrates voice-controlled operation, real-time video streaming, and stable flight dynamics to create a user-friendly personal assistant drone. By leveraging the **Pixhawk flight controller**, **BLDC motors**, and **ESP32/8266 microcontroller**, the drone achieves reliable performance in various conditions. The mobile app, developed using **Flutter**, facilitates intuitive control of the drone, enhanced by voice commands and live video feeds, offering a seamless user experience.

The results demonstrate that **CHOTU** has the potential to revolutionize the personal assistant drone market, with applications in surveillance, personal assistance, and other industries. While some challenges remain, particularly in optimizing video streaming and communication stability, the project has shown promising results, laying the foundation for future improvements and development.

In conclusion, **CHOTU** represents a significant step in the evolution of drone technology, combining cutting-edge hardware and software to deliver a versatile, interactive solution for users.

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