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Hand Gesture Controlled Drone

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ABSTRACT: The hand gesture-controlled drone system is a reliable and efficient solution that helps people fly the drone without the use of hands in simple words we will be able to control the drone using hand gesture. The project is designed using an Arduino UNO microcontroller, which consists the coding which is required for the project. The system consists a range of electronic components, including Drone, Arduino Uno, electrical wires, Potentiometer. All the above components are selected for the better outcome and performance of the system in user-friendly way. Arduino UNO is an open-source microcontroller board based on the ATmega328P chip, widely used for prototyping and DIY electronics projects. The Arduino IDE is used for coding , making it easy to program and integrate with other electronic components. The proposed system comprises a lightweight drone equipped with a camera and an onboard processing unit. The camera captures the user's hand gestures, and the computer vision algorithms process the image data to identify predefined gestures. These gestures are mapped to corresponding drone commands, allowing users to command the drone's movement. The usability and effectiveness of the hand gesture-controlled drone system are evaluated through a series of experiments and user studies.

KEYWORDS: Arduino Uno microcontroller, Computer vision algorithms , Lightweight drone, ATmega328P.

I. INTRODUCTION

In this paper, we're diving into the creation of a drone that you control with hand gestures, using the versatile Arduino Uno. We're using a tiny computer called Arduino Uno to create a special kind of drone. This drone doesn't need a remote control; instead, it listens to your hand gestures. It's like teaching the drone to understand your moves, to make flying a drone feel more natural and fun for everyone. All the drones come with complex controllers which can be tricky for one to understand as of the young generation they can learn within weeks and multiple failed attempts but the case won't be the same for elderly people, thus we used the Arduino Uno to facilitate an accessible and engaging user experience. It's all about making drone flying accessible and enjoyable, opening up new. We're using simple and cheap parts, and our goal is to make this technology accessible for everyone. The most essential component of the project is none other than the drone and Arduino. The project uses special technology to watch and understand the movements of your hand. Think of it like magic eyes that can see what your hand is doing. These magic eyes tell the drone what to do when you move your hand. The reason behind choosing this project is that flying a drone with hand gestures is easy for anyone to learn. It's safer because you don't need a tricky remote control. A readymade drone was used for this project, and we did the essential modifications on the controller of the drone to make it able to be controlled on hand gestures. The Arduino was useful for Gesture Recognition, Data Processing, communication with the drone's flight controller or microcontroller, sending commands to control the drone's movements, and most importantly customization.

II. PROBLEM STATEMENT

1.Cost: Drones with sophisticated hand gesture control systems may be more expensive than basic models with traditional controllers. This cost factor could be a deterrent for some consumers.

2.Limited Functionality: Hand gesture control may not offer the same range of functionalities as traditional controllers. Advanced features, such as precise camera control or automated flight modes, may be limited in hand gesture-controlled drones.

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OBJECTIVES OF THE PROJECT

1.Develop a user-friendly drone control system using Arduino Uno.
2.Enhance user experience by eliminating the need for complex remote controllers.
3.Ensure affordability and cost-effectiveness using simple components.
4.Allow customization and flexibility in gesture definitions.

SCOPE OF PROJECT

1.Gesture Recognition: Implement coding for hand gesture recognition, ensuring accurate interpretation for controlling the drone.

2.Accessible Drone Piloting: Make drone flying accessible to a broader audience, including those with limited or no experience, by eliminating complex controllers.

3.Enhanced User Experience: Provide a safer and more enjoyable drone-flying experience, especially for those afraid of traditional controllers.

4.Cost-Effective Solution: Limit expenses by using affordable components, ensuring the project's affordability for users with different financial backgrounds.

5.Usability Evaluation: Conduct experiments and user studies to assess the usability and effectiveness of the hand gesture-controlled drone system.

6.Customization and Flexibility: Allow users to customize gestures and adapt the system to their specific preferences.

EXISTING SYSTEM

There are many existing systems present but these are some that match with our project which are based on gesture control.

1.Bebop 2 Drone by Parrot- This system allows the user to control the drone using hand movements, a built in 14MP fish-eye camera on the drone captures hand movements. Provides visual feedback in the app .Bebop 2 combines aerodynamics, style and durability all into a lightweight and compact drone.

2.Leap Motion Controller-It is most widely used because of its accuracy and easy integration. The Leap Motion Controller is a small USB peripheral device which is designed to be placed on a physical desktop, facing upward. It can also be mounted onto a virtual reality headset.

3.Intel RealSense- It uses depth-sensing cameras and algorithms for 3D hand tracking. Camera modules are present to detect hand gestures using computer vision algorithms. This camera is intended for augmented reality applications, content creation, and object scanning. Its depth accuracy is on the order of millimetres and its range is up to 6.0 metres.

4.Gestoos- Ultrasonic sensors and machine learning algorithms are used to convert gestures into drone commands. Gestoos CREATOR leverages the latest image recognition features to generate AI models that can classify a variety of human behaviors . Our end-to-end platform lets you create custom detection engines that are both high-performance and robust.

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LIMITATIONS OF THE EXISTING SYSTEM

1.Bebop 2 Drone by Parrot

- Gestures may not work well if placed at certain angles or distances
- Fish-eye lenses has image distortion
- It wont work as well in low light or in extreme sunny conditions

2.Leap Motion Controller

- IR sensors do not work well in bright suntime .
- The vibrations by drones get transferred to Leap Motion unit and it affects the accuracy of hand tracking.
- LEDs consume more power.

3.Intel RealSense

- Cannot work well in darkness
- Cameras add more cost
- Powerful computer is needed to process high requirements

4.Gestoos

- Algorithms may have errors in noisy environments
- Accuracy impacted by objects
- Machine learning needs lots of training.

PROPOSED SYSTEM

The proposed system is a hand gesture-controlled drone that overcomes limitations found in existing systems. It prioritizes cost-effectiveness by using affordable components, integrates the versatile Arduino Uno microcontroller, and employs robust gesture recognition through computer vision algorithms. The system aims to provide a user-friendly interface, making drone piloting intuitive and enjoyable for users of all ages. Additionally, it addresses accessibility challenges faced by individuals with disabilities in conventional drone controllers, enhances safety by eliminating concerns associated with traditional controls, and offers flexibility through customization options. Thorough documentation will facilitate knowledge sharing, and usability evaluations will gather feedback for continuous improvement. Overall, the proposed system aims to contribute to the accessibility and enjoyment of drone technology for a broader user base.

III. CONCLUSION

In conclusion, the hand gesture-controlled drone system represents a significant advancement in drone technology, offering a user-friendly and accessible alternative to traditional remote controllers. The integration of the Arduino Uno microcontroller and computer vision algorithms for gesture recognition has resulted in a cost-effective and efficient solution. By eliminating the complexities associated with conventional controllers, the system enhances the overall user experience, making drone piloting intuitive and enjoyable for individuals of various skill levels.

The project's focus on addressing accessibility challenges, particularly for individuals with disabilities, aligns with the broader goal of inclusivity in technology. The emphasis on safety and affordability further contributes to making drone flying a viable and enjoyable activity for a diverse audience.

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Documentation of the project ensures that knowledge is shared, fostering collaboration and potential improvements in similar initiatives. The usability evaluations and user studies conducted provide valuable insights for refining the system and addressing user preferences and concerns.

In essence, the hand gesture-controlled drone system stands as a successful implementation of innovative technology, offering a glimpse into a future where drone piloting is not only technologically advanced but also widely accessible and user-friendly. The project team expresses gratitude to contributors and the project guide for their support in bringing this vision to fruition.

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