Journal of Multi Disciplinary Engineering Technologies
Volume 18, Issue 02

DIY Folsky Airbrush Drone

Nargis Hoda Firdaus[1], Udaat Narang[2], Aditya Raj[3*]

[1]AJK Mass Communication Research Centre, Jamia Millia Islamia, Delhi, India.
[2]Circuit Mind Technology, India.
[3]SCA eCode Solutions Pvt. Ltd., India.

*Corresponding author(s). E-mail(s): adityaraj05494054@gmail.com;
Contributing authors: nargishoda786@gmail.com;

Abstract

Painting of tall buildings has always been a human-intensive task. However, painting tall buildings requires a lot of labour and time. The probability of accidents and loss of life is high. This manuscript proposes the design and implementation of a quadcopter, lightweight drone that is capable of assessing and painting commercial residential buildings. Moreover, the introduction of this innovative quadcopter drone not only addresses safety concerns but also streamlines painting processes, potentially reducing project timelines and associated costs while ensuring consistent quality across commercial and residential structures.

Keywords: Airbrush Drone, Unmanned Aerial Vehicle, Robotics, Do It Yourself

1 Introduction

The construction and painting of buildings is a global industry, intricately woven into the fabric of urban development. With expanding urbanization and the relentless growth of the human population, the demand for multi-story structures is steadily escalating, reflecting the ever-evolving needs of modern society. Amidst this dynamic landscape, the challenges of labor-intensive tasks such as painting tall buildings become increasingly apparent [1]. Painting-related mishaps, especially when tall buildings are involved, present serious risks to the health and safety of employees in addition to possibly delaying and costing construction projects money. The manual nature of painting tasks and the inherent risks of working at heights raise the possibility of mishaps like falls, slips, and contact with potentially harmful materials. To address these safety issues and protect construction workers' lives, proactive steps and creative solutions are needed [2].

The most suitable tech to automate painting is a drone. So far although this tech has been applied to various domains, its success in painting remains limited; however, avenues for overcoming these challenges. One of the most primary challenges lies in the precision and finesse required for painting tasks, which drones have struggled to achieve effectively. However, several advancements and adaptations can be implemented to enhance their capabilities in this regard and control systems. Despite the promising potential of drones in automating painting processes, several challenges must

Published on: May, 2025 ISSN(P) 0974-1771 ISSN(O) 2581-9372

be addressed to realize their full effectiveness in this domain. One primary hurdle lies in the precision and finesse required for painting tasks, particularly when dealing with intricate architectural details or delicate surfaces. While drones excel in aerial maneuvers and payload transport, achieving the level of control and accuracy demonstrated by skilled human painters remains a significant technical challenge [3]. Moreover, the environmental factors inherent in outdoor painting, such as wind speed, temperature variations, and sunlight exposure, further complicate the task for drones operating autonomously.

2 Literature Review

The literature review demonstrates the adaptability and potential impact of this technology by highlighting a number of varied application domains where drones have been used. Drones have been used in agriculture for tasks like crop monitoring and spraying, providing farmers with useful information about the health of their crops and enabling focused interventions to maximise yield and minimise pesticide use. The scalability of drone-based spraying operations, especially in expansive agricultural settings, may be hampered by constraints like limited payload capacity and flight endurance. Drones have proven useful in search and rescue missions, aerial reconnaissance, and delivering aid to dangerous or inaccessible areas in disaster response scenarios. Although they are useful in improving situational awareness and accelerating emergency response activities, issues with communication interoperability and airspace regulation continue to be major obstacles to widespread [4].

Table 1: Application Domain and Limitation

Ref	**Application Domain**	**Use**	**Limitation**
[1]	Manufacturing	Automated painting in manufacturing processes.	Limited applicability for large scale or complex painting jobs.
[2]	Aerospace	Real-time monitoring of unmanned aerial vehicle (UAV) flight status.	Limited payload capacity for transporting heavy Equipment.
[3]	Telecommunications	Optimizing wireless coverage	Constraints on altitude antenna gain may limit coverage range and UAV effectiveness.
[4]	Painting	Medical Supply Delivery	Challenges in Navigating complex Urban environments.
[5]	Construction	Site surveying and Monitoring.	Limited battery life affecting Operational Duration.

Overall, while drones hold immense potential for revolutionizing various industries and addressing critical societal challenges, their widespread adoption requires concerted efforts to overcome technical, regulatory, and societal barriers. Collaborative research, stakeholder engagement, and regulatory frameworks are essential to harnessing the full capabilities of drones and realizing their transformative impact across diverse application domains of all field [5].

3 Experimental Design

The experimental design for our project involved carefully selecting and assembling various hardware components to build a functioning drone system. Table 2 provides a detailed breakdown of the hardware components used in the experiment, including their parameters, ranges, and quantities.

The Lippo Cells with Holder served as the power source for the drone, providing the necessary energy to drive its motors and electronics. Additionally, the Transmitter and Receiver modules,

consisting of Arduino Nano, NRF24l01, adapters, joysticks, and PCBs, facilitated wireless communication and control between the ground station and the drone. Electronic Speed Controllers (ESCs) played a crucial role in regulating the speed and direction of the drone's motors, ensuring precise and responsive flight control.

Table 2: Different Hardware Components Used

Components	**Parameters**	**Range**	**Quantity**
Lippo Cells with Holder	Volts	NA	4 Pcs
Transmitter and Receiver (Arduino Nano, NRF24l01, NRF24l01, Adapter, Joystick, 10 by 10 PCB, Header Pin, Male and Female)	Distance	Upto 1Km	2 Pcs, 2 Pcs, 2 Pcs, 2 Pcs, 1 Pc, 1 Pc
Electronic Speed Controller	Amps	NA	4Pcs
Arduino Drone DIY Motor, Arduino Uno, MPU 6050 Gyro Sensor, XT60, Jumper Wires, 1045 Propellers, F450 Frame	NA	NA	1 Pc, 4 Pcs, 1 Pc, 1 Pc, 1 Pc, 4 Pcs, 1 Pc

Fig. 1: Drone Design.

The quadcopter design was painstakingly created following a thorough investigation into structural engineering, electronic systems, and aerodynamics. The objective was to develop a high-performance, adaptable UAV that could carry out a range of tasks accurately and effectively. An extensive examination of current quadcopter configurations and their advantages and disadvantages served as the foundation for the design process. To guarantee optimum performance and dependability, this analysis influenced the choice of crucial parts, such as the frame, motors, propellers, and electronic hardware. Prioritising stability, agility, and manoeuvrability was a key component of our design philosophy. The quadcopter's aerodynamic profile was carefully examined in order to accomplish this.

This analysis informed the selection of key components, including the frame, motors, propellers, and electronic hardware, to ensure optimal performance and reliability. The culmination of our meticulous design process resulted in a quadcopter that seamlessly integrates aerodynamic principles, structural integrity, and advanced electronic systems, embodying our commitment to achieving unparalleled stability, agility, and maneuverability. Through rigorous analysis and careful component selection as shown in Fig. 1.

The incorporation of picture featuring the actual drone prototype offers a concrete depiction of the culmination of research efforts, showcasing the integration of various hardware components

essential to its functionality. From the frame, motors, and propellers to the electronic hardware such as the flight controller, sensors, and communication modules and other hardware components, the image provides a visual testament to the meticulous assembly and configuration of the UAV as shown in Fig. 2.

Fig. 2: Actual DIY Airbrush Drone.

4 Results and Discussion

Our experimental trials' outcomes show that the quadcopter design was successfully implemented and validated. We were able to assess the UAV's performance and capabilities using a variety of metrics thanks to thorough testing in both controlled and real-world settings. The quadcopter's remarkable flight stability and manoeuvrability, demonstrated by its capacity to follow user commands quickly, make precise turns, and maintain a steady hover, was one of our study's main conclusions. The incorporation of cutting-edge sensor technologies and flight control algorithms further improved this stability, resulting in dependable and seamless flight operations.

Additionally, our experiments revealed the quadcopter's robustness and resilience in challenging conditions, including gusty winds and turbulent airflows. Despite these environmental factors, the UAV maintained its trajectory and stability, underscoring its suitability for operation in diverse weather conditions.

Furthermore, the results highlighted the quadcopter's versatility and adaptability for various applications, ranging from aerial photography and surveillance to package delivery and environmental monitoring. Its modular design and customizable configurations allow for seamless integration of additional sensors, payloads, and accessories, further expanding its utility across different use cases.

Table 3: Working Statistics w.r.t Time and Area

Wall Dimensions (m2)	Time Taken (mins)	Finishing Iterations
1	1.5	5
2	3	10
3	4.5	15

5 Conclusion

An unmanned aerial vehicle (UAV) with painting capabilities is called a homemade painting drone. Usually, hobbyists or enthusiasts who combine their love of drones with artistic painting skills create these drones. A specialised painting tool is integrated onto a standard drone frame to create a homemade painting drone. A paint reservoir, a pumping mechanism, and a nozzle for controlled paint release are frequently included in this equipment. To guarantee accurate and controlled painting strokes, the drone's flight is managed by a remote-controlled or pre-programmed system. It takes a solid grasp of both drone technology and artistic techniques to build a homemade painting drone. Various tools and materials, such as brush mechanisms, GPS systems, and Arduino controllers, can be used by enthusiasts to improve the drone's accuracy and efficiency. These DIY projects showcase the intersection of technology and art, allowing individuals to express their creativity in innovative ways through the marriage of aerial robotics and painting techniques.

The DIY painting drone project was a bold attempt to push the limits of creativity and innovation by fusing technology and artistry. To identify the best design, materials, and drone components, extensive planning and research were done in the project's early phases. The project's success depended heavily on the combination of a lightweight frame, an effective propulsion system, and a precisely controlled painting mechanism. The drone's stability and durability were guaranteed by the use of premium materials, which enabled it to follow complex patterns and apply accurate brushstrokes.

During the development phase, engineering and artistic expertise were combined with an emphasis on improving the drone's painting and flight dynamics. To maximise the drone's performance and guarantee smooth coordination between its flight path and paint application, extensive testing and fine-tuning were carried out. A key factor in increasing the drone's autonomy and allowing it to adjust to different surfaces and canvases was the integration of sensors and sophisticated control systems. To achieve a harmonious balance between technology and artistic expression, engineers and artists had to work together.

Future Scope: Homemade painting drones have a bright future ahead of them thanks to possible technological breakthroughs and imaginative uses. First off, more advanced and approachable painting drones are probably on the horizon as drone technology advances. With the help of these drones' enhanced painting mechanisms, sophisticated sensors, and artificial intelligence, users could easily produce complex and accurate artwork. By democratising artistic expression and enabling people with different levels of artistic ability to experiment and produce original works, this has the potential to completely transform the art world. Second, combining DIY painting drones with augmented reality (AR) and virtual reality (VR) technologies may expand the scope of artistic experiences. Beyond geographical limitations, artists might be able to work remotely or paint in virtual environments. The combination of drone technology and AR/VR could also enhance art education, offering immersive learning experiences for aspiring artists. This fusion of technologies may redefine traditional artistic processes, fostering innovation and creativity. Finally, the scope of the future goes beyond conventional canvas painting. Large-scale mural projects, 3D printing, and even painting on unusual surfaces could all be accomplished with homemade painting drones. Eco-friendly painting supplies and techniques may also be incorporated into these drones as environmental sustainability becomes a major concern, meeting the increasing need for sustainable technologies across a range of sectors. In addition to being a tool for individual expression, the homemade painting drone has the potential to advance a variety of fields and open up new creative avenues.

References

[1] Shinde, D.B., Ingole, S.D., Gomase, R.P.: Design fabrication of remote operated 3-axis spray painting machine. IJARIIE **2**(2), 1263–1268 (2016)

[2] Mozaffari, M., Saad, W., Bennis, M., Debbah, M.: Efficient deployment of multiple unmanned aerial vehicles for optimal wireless coverage. IEEE Communications Letters **20**(8), 1647–1650 (2016)

[3] Xue, X., Lan, Y., Sun, Z., Chang, C., Hoffmann, W.C.: Develop an unmanned aerial vehicle based automatic aerial spraying system. Elsevier (2016)

[4] Koshta, N., Devi, Y., Chauhan, C.: Evaluating barriers to the adoption of delivery drones in rural healthcare supply chains: preparing the healthcare system for the future. IEEE Transactions on Engineering Management (2022)

[5] Liu, Y., Li, X., Jia, L.: Control of a nonlinear system based on backstepping and disturbance observer. In: Proceedings of the 11th World Congress on Intelligent Control and Automation (WCICA), pp. 2172–2176. IEEE, Shenyang, China (2014)