

Integrated Drone Solutions for Landmine Detection

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Abstract. Integrated drone solutions for landmine detection represent a groundbreaking approach to tackling one of the most pressing humanitarian and safety issues. These systems utilize a combination of aerial surveillance and advanced sensing technologies, including ground-penetrating radar, infrared cameras, and magnetic anomaly detectors, to accurately identify landmines from a safe distance. By incorporating AI and machine learning algorithms, these drones enhance detection accuracy and efficiency, enabling real-time data analysis and significantly reducing human risk. This technology aims to expedite demining efforts, ensuring safer environments in post-conflict regions and facilitating the safe reclamation of contaminated land. The ability to cover large and often inaccessible areas quickly and accurately makes drone-based landmine detection an invaluable tool in global demining operations. These integrated systems not only promise to save lives but also contribute to the rapid rehabilitation of affected communities by enabling the safe and productive use of reclaimed land. The use of drones equipped with advanced sensors and intelligent data processing offers a safer, faster, and more cost-effective approach to landmine detection, marking a significant advancement in the field. This integrated solution addresses a critical global challenge by reducing the time and resources needed for landmine clearance while minimizing the risk to human deminers. As technology continues to evolve, the potential for these drone systems to improve and expand their capabilities will further enhance their effectiveness in creating landmine-free zones. Ultimately, integrated drone solutions support global peace and safety efforts, contributing to a world where the threat of landmines is significantly diminished, and communities can reclaim and utilize their land without fear of hidden dangers.

References:

- [1] L. Amato, C. La Mura, and M. Nardone, "A UAV-based system integrating thermal imaging and ground-penetrating radar for landmine detection," 2021.
- [2] M. Bertini and G. Capineri, "Real-time surface landmine detection using robotics and deep learning with YOLOv8 models and optical imaging," 2024.
- [3] T. Dula, J. Green, and S. Wheeler, "UAV-borne Synthetic Aperture Radar (SAR) for buried landmine detection," 2020.

- [4]F. Guo, X. Zhao, Y. Li, and L. Wang, "UAV-borne landmine detection using intelligent multispectral fusion and deep learning," 2022.
- [5]J. Hu, S. Jiang, and Y. Luo, "Multispectral fusion strategy for detecting scatterable landmines using a UAV platform," 2023.
- [6]S. Lee, H. Jung, and K. Choi, "A UAV-based magnetometer system for detecting metal antipersonnel landmines in Korea's Demilitarized Zone," 2021.
- [7]X. Mu, Y. Li, T. Zhang, and F. Chen, "Deep Convolutional Neural Networks (DCNN) for UAV-borne magnetometer landmine detection," 2023.
- [8]P.Mukhopadhyay and R.Bhattacharya,"Advancements in UAV-based landmine detection technologies:A review,"2022.
- [9]R. Qiu, X. Liu, and G. Zhang, "UAV-based thermal imaging system integrated with AI for buried landmine identification," 2021.
- [10]H. Tollefsen and P. Jebens, "Affordable off-the-shelf UAV technologies for landmine detection: Drones, thermal imaging, and AI," 2020.
- [11]S. Vivoli, M. Bertini, and G. Capineri, "Real-time landmine detection using deep learning and optical imaging integrated within a demining robot," 2024.
- [12]Y. Wang, Q. Zhang, X. Li, and H. Zhou, "Integration of hyperspectral imaging with UAV technology for landmine detection," 2022.
- [13]P. Xu, L. Zhang, and J. Chen, "UAV-based LiDAR and deep learning system for non-metallic landmine detection," 2023.
- [14]F. Yao, J. Liu, and X. Zhang, "UAV-borne ground-penetrating radar integrated with deep learning for buried landmine detection," 2020.
- [15]Y. Zhang, H. Liu, S. Wang, and M. Huang, "UAVs equipped with electromagnetic sensors and AI-based analysis for landmine detection," 2023.