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A Critical Review on the Future of Swarm Robotics in Defense

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Abstract: *Swarm robotics, inspired by natural swarming behaviors, involves the decentralized coordination of autonomous robots to perform tasks collectively. In defense, it enables efficient surveillance, target acquisition, and situational awareness. Key trends include the integration of AI for decision- making, deployment of heterogeneous swarms, and development of resilient communication systems for contested environments. Major challenges include ensuring secure operations, scalable coordination, and hardware limitations for diverse terrains. This review paper explores these topics, highlighting future advancements in swarm intelligence algorithms, adversarial countermeasures, and autonomous combat systems. These innovations position swarm robotics to revolutionize military operations through enhanced autonomy and efficiency.*

Keywords: Swarm robotics, defense, AI decision-making, heterogeneous swarms, resilient communication, swarm intelligence, adversarial countermeasures, autonomous systems, situational awareness, military innovation.

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