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(57) Abstract :
Urban fire fighting has a number of difficulties, such as congested traffic, winding streets, and isolated locales, all of which can delay firefighting teams' reaction times and access. In order to overcome these obstacles and improve the effectiveness of firefighting operations, this article suggests developing an autonomous firefighting drone. A comprehensive needs assessment is carried out with a focus on traffic congestion, narrow streets, and distant terrains in order to comprehend the unique obstacles that urban firefighting crews encounter. Research is done to find weaknesses and opportunities for development in the current firefighting drone technologies. The suggested drone system incorporates a number of characteristics meant to enhance firefighting performance. Rapid response and containment of flames guarantees early identification, and drone surveillance of difficult-to-reach locations improves coverage. In order to track environmental conditions and improve accuracy through the use of advanced sensor technologies for precise fire detection, real-time monitoring makes use of sensors and data transmission systems. Continuous monitoring and little human intervention are made possible by autonomous operation, and quick deployment of firefighting resources is made possible by integration with emergency response systems. The investigation also looks at how smart city infrastructure may be used to combat fires by utilising innovations like wireless sensor networks and unmanned aerial vehicles (UAVs) to identify fires early. Sensor architecture is used to monitor environmental parameters, and data collected is processed by Internet of Things applications. To improve fire detection capabilities, cloud computing, IoT sensors, wireless technology, and UAVs are merged. By integrating image processing systems and formulating rules to optimise the true detection rate, system accuracy is further enhanced. Real-time statistics show a notable boost in fire detection rates. The recommended strategy beats traditional models with an accuracy rate of up to 98%. When all is said and done, the Autonomous Firefighting Drone presents a viable solution to problems related to urban firefighting. For traversing complex metropolitan situations, it offers improved accessibility, quicker reaction times, and increased effectiveness.

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