Disaster Management Framework: Data Fusion From Various Types of Urban Search and Rescue Robots

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Abstract: There is an extensive demand for a robotic solution to address the threats involving natural and human-made disasters, especially regarding disaster response and management. These robotic frameworks are obliged to withstand challenging terrains within either water or land. Therefore, this robotic system, which is a component of an elaborate operational framework, employs unmanned aerial vehicle (UAV), unmanned ground vehicle (UGV) and unmanned surface vehicle (USV) into the disaster area. As the elaborate operational framework depends upon the co-ordination among heterogeneous teams as well as among various systems, the robots require appropriate sensing technologies and a fusion sensing system. This system enforces the assimilation of a number of sensing information to create a detailed collaborative thematic map along with an information system that is vital for the safety and success of the rescue operation. This also means that the system would rely massively on sensors so a variety of sensors such as GPS, laser scanners, sonar sensors, thermal cameras, current leakage detector, gas leakage detector, CO2 sensor, soil quality assessment sensors including various cameras are incorporated within the UAV/UGV/USV systems. To ensure reliability, safety, and effectiveness, the system could be operated either in the teleoperated or semi-autonomous modes. While this framework yearns to become a benchmark in the field of disaster site management, this would demand a central role of standardization and a standard testing method. Along with the development of an appropriate testing facility, the reliability study and risk assessment would be principal to ensure proper operation even in extreme cases. Moreover, our experience with the research within the area, national/international competitions and also the real rescue scenario are the bedrock on which the technology would be driven further. Finally, the system could spearhead the operational framework in serving with reliability, efficiency, and effectiveness for assisting the disaster response management.

***Keywords*:** Disaster management frameworks, data Fusion, Urban Search, rescue operation, rescue robot, unmanned aerial vehicle (UAV), unmanned ground vehicle (UGV), unmanned surface vehicle (USV)