The Human-Robot Ratio (m:N) Theory: Limitations and Considerations

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The traditional human-to-robot ratio, or m:N theory states that the number of robots limits humans ability to manage and maintain overall team performance. This theory was developed primarily based on ground robot capabilities 10-15 years ago. While some traditional m:N limitations persist, both applied research and commercial systems debunk this traditional theory, particularly for very large numbers of robots (m<<N). This keynote will discuss the limitations of the theory, provide evidence that contradicts the theory, and discuss human factors aspects that will have an impact on the number of robots a single human can safely deploy. Results and examples will include simulated large autonomous uncrewed aircraft with associated necessary interactions with air traffic control, heterogeneous swarms deployed in urban environments, and commercial delivery uncrewed aircraft.



Dr. Adams is the founder of the Human-Machine Teaming Laboratory and the Associate Director of Research of the Collaborative Robotics and Intelligent Systems (CoRIS) Institute. Adams has focused on human-machine teaming and distributed artificial intelligence for thirty-five years. Throughout her career she has focused on unmanned systems, but also focused on crewed civilian and military aircraft at Honeywell, Inc. and commercial, consumer and industrial systems at the Eastman Kodak Company. Her research, which is grounded in robotics applications for domains such as first response, archaeology, oceanography, and the U.S. military, focuses on distributed artificial intelligence, swarms, robotics and human-machine teaming. Dr. Adams is an NSF CAREER award recipient, a Human Factors and Ergonomics Society Fellow as well as a member of the National Academies Board on Army Research and Development and the DARPA Information Science and Technology Study Group.

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