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Reliable Communication Protocol for Applications in Multi-Robot Systems

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Abstract

Multi-robot systems (MRSs) have a wide variety of applications, such as search and rescue in disaster scenarios, where many robots coordinate with each other to accomplish a task. Such MRS applications use infrastructureless environment in which robots rely on inherently unreliable ad hoc network to communicate with each other. Reliable communication among the peers can greatly enhance the performance of a multi-robot system. This paper proposes a reliable communication protocol (RCP) for applications in multi-robot systems. RCP acts as an interface between MRS applications and the underlying communication framework. RCP accepts data from MRS applications and reliably delivers it to other peers. RCP is transparent to MRS applications as well as the underlying communication hardware. To evaluate its performance, we have implemented RCP on seven Stargate micro-controllers that communicate with each other using an ad hoc network. Further, to test the performance of RCP in MRS applications involving higher number of peers, we have also implemented RCP on laptops with Intel i7 microprocessors. The obtained results show that RCP achieves reliability while reducing packet delivery time as well as the number of retries needed to deliver a failed packet. © 2015, King Fahd University of Petroleum & Minerals.

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