Pruning Local Schedules for Efficient Swarm Communication

Schill, F.; Zimmer, U.;
Australian Nat. Univ., Canberra

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ABSTRACT

Reliable wireless communication underwater is a precondition for swarming technologies. This paper discusses a time division multiple access (TDMA) algorithm suitable for dynamic multi-hop wireless networks, which offers quick all-to-all information exchange (Omnicast), dense local schedules and predictable latencies. The algorithm is based on an earlier algorithm published by the authors in [Schill F., et al., 2006]. This paper presents an improved and simplified algorithm to calculate the local schedules, and uses a new mapping function for logical time slots to actual time slots, which balances sending frequencies between nodes. An extension of this algorithm is then presented which employs a technique to reduce the average degree of the connection graph as seen by the scheduling algorithm. It is explained how this reduction of degree can be achieved without causing communication collisions. The results of experiments performed in a real time simulation show the performance of the algorithm, and the performance gain achieved by local reduction of the degree.

INDEX TERMS

• IEEE terms

Delay , Dynamic scheduling , Frequency , Heuristic algorithms , Scheduling algorithm , Spread spectrum communication , Telecommunication network reliability , Time division multiple access , Wireless communication , Wireless networks

• INSPEC

◦ Controlled Indexing

radio access networks , time division multiple access , underwater acoustic communication

◦ Non Controlled Indexing

connection graph , dynamic multihop wireless network , local schedule pruning , mapping function , omnicast , quick all-to-all information exchange , scheduling algorithm , swarm communication , swarming technology , time division multiple access algorithm , underwater reliable wireless communication

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