ABSTRACT

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Multi-Robots Systems provide advantages over a single robot when performing a task, achieving a greater speed, higher accuracy and better fault tolerance. The studies of social behavior in nature has allowed to develop bio-inspired algorithms useful in swarm robotics. Following simple and repetitive rules, groups of robots can provide solutions to complex problems. When two or more tasks to be executed by a set of heterogeneous robots, it is possible to cluster the robots according to their intrinsic features. When homogeneous robots are used, the clustering may be achieved by considering the robot relative position regarding the location where the task has to be performed or adding some other distinct feature. In this dissertation, a technique for spatial clustering simply based on local communication between robots is proposed. Through the message exchange between neighboring robots, this technique allows cluster formation without robot movement. Based on the token clustering methods, the proposed technique employs a virtual token, which is called a *load*. The load allows identifying the class to which a robot belongs. Depending on the amount and weight of the loads available in the system, the robots interchange information to achieve uniform load distribution. When the loads become stationaries, a density is calculated as to guide the remaining loads that are still in motion. As a consequence, the loads of higher weight cluster first and the those of lower weight continue shifting through the swarm, until they start forming different density ranges for each class, thereby achieving the final aim which is robot clustering.

Keywords: Spatial clustering. Swarm robotics. Distributed computing. Swarm intelligence