OPTIMIZATION OF THE ROBOT SWARM'S FIRMWARE

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Abstract

Eledia Research Center has developed a Robot Swarm to monitoring a parameter in a research area. Furthermore the Swarm are able to identify the location of the maximum of the monitored parameter.

The swarm is formed by four robot, everyone composed by:

- a WSN node that control every device,
- a robotic kit to permit movement,
- infrared and compass sensor to know his position,
- a brightness sensor to monitor the light parameter.

The movement of the robot are controlled and coordinated by PSO algorithm, a stochastic and multiple agent optimization algorithm that follow the logic of how a swarm of bee reach the area where there is more honey in a grass. Every robot, at every iteration of the algorithm, know his best position (pbest) and the best position of all the swarm (gbest), following the PSO algorithm calculate his movement to reach the area where the brightness reach his maximum value.

Now all the computations (localization of the robot, PSO implementation, ecc) are implemented in the firmware of the WSN node, in a way to get the system completely independent from the host that only receive the data measured by every node. In this way the system can search the maximal value of the monitored parameter in the research area without an host that coordinate all the operation. In this implementation the dimension of the firmware is very high, and the limit of memory of the WSN node were reached.

The goal of this project is reorganize and optimize the Robot Swarm's firmware in order to move the most onerous computation from the firmware to the host computer, in order to give back the firmware lightweight.

Reference Bibliography: Wireless Sensor Network [1]-[7]; Evolutionary Optimization [8]-[10].

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This report is submitted in partial fulfillment of the degree of the course "TPCW".
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