Introduction

The various tasks of everyday life have never been easier thanks to wireless sensor networks that
are continually expanding in many areas, like forest fire detection [4], harvesting [8], intrusion
detection [2], [10], etc. These networks are composed of a set of microsensors called nodes, which can collect and transmit data autonomously. These microsensors are often deployed randomly in a region of interest. This randomness makes it difficult to determine the topology of the network.

Energy and efficiency are the most recurrent problems in wireless sensor networks. Since energy is a resource, often non-renewable and limited, it is of great interest to preserve it and to optimize its use. The effectiveness of a wireless sensor network, and its ability to perform the task assigned to it, is part of the quality of service of this network. These two objectives are mutually contradictory and require a compromise to ensure a quality network that can serve for a long duration by minimizing the energy.

The authors of [1] propose a centralized algorithm for the construction of a connected dominating
set based on multipoint relays. The authors of [7] propose a new distributed greedy algorithm for approximating the construction of a minimal connected dominating set. The authors claim that their method obtains good results in terms of construction cost compared to classical algorithms. The authors of [5] propose a system of clustering, called EBDSC, based
on dominating sets that effectively extend the lifetime of the network by balancing the energy consumption between different nodes.

The main idea of this work is to detect a connected dominating set, which will be designated to perform special tasks and serve other nodes of the network. This strategy aims to reduce communication overhead and increase bandwidth efficiency, reduce overall energy consumption,
and ultimately to extend the effective lifetime of the network. For this purpose, we introduce a new distributed algorithm for the search of the nodes forming connected dominating set in a wireless sensor network, using a new concept called *wait before start*, which allows each dominating node to declare itself the number of its neighbors and its residual energy. This method is based on a delayed start of each sensor with respect to an associated value. If the value refers to the number of neighbors, then the sensor having the maximum number of neighbors so far, will start the process first, so that its waiting time for an associated value corresponds to the energy consumed up to the instant t, and so on for all the nodes of the network. This procedure is hybridized with the iterative local aggregation method proposed by [9]. The results of the simulation on several randomly generated networks show that the proposed method guarantees the generation of a dominating set using two criteria: the number of neighbors and the remaining energy.