ABSTRACT

Wireless Sensor Network (WSN) is an emerging technology that opens a wide perspective for future applications in pervasive and ubiquitous technology and is the important part of Internet of Things. One major reason for the increasing interest in wireless sensor networks in the last few years has been their potential usage in a wide range of applications. Yet today, most sensor networks function in isolated patches, each with different mechanisms to deliver data to their users, and often have no formal methods to share data with others. The future sensor networks are envisioned as comprising heterogeneous devices assisting a large range of applications. To achieve this goal, an architecture based on Service Oriented Architecture (SOA) was proposed for the design of sensor networks, in which sensor nodes are service providers and applications are clients of such services. Service oriented architecture consists of a set of design principles which enable defining and composing interoperable services in a loosely coupled way. The promise of service oriented architecture is to enable the composition of new distributed applications: when no available service can satisfy a client request, available services can be composed in order to satisfy such a request. The value of SOA lies in assuring such compositions which are easily and rapidly possible with low
costs. Thus, service composition is a key to SOA. Achieving service composition in WSNs remains a major challenge.

The proposed work aims at enabling the use of pre-implemented services in a potentially heterogeneous sensor networks which can be easily combined to form an application. The application logic is not going to be re-implemented each time from scratch. Instead applications are implemented or adopted by means of composing existing services. The proposed work consists of four phases. The first phase proposes set of algorithms for automatic service graph generation. Service graph is generated by discovering appropriate services and by finding the order of their execution. Discovering appropriate abstract services and finding sequence set out of the available services is based on input/output relationship between services.

The second phase proposes a global quality of service aware service selection algorithms to select a set of service candidates for each abstract activity. In wireless sensor network more than one node provides the same service. When there are many functionally equivalent services, the quality of service becomes the deciding factor. This selection phase ensures user quality of service requirements at the global level based on the advertised quality of service of services.

In order to reduce the energy consumption of the sensor network, the third phase proposes algorithms for service sharing. Instead of running
each query independently, if similar queries are merged or new request is rewritten in terms of currently existing requests, the overall energy consumption of the sensor network can be reduced because duplicate data requests can be eliminated. Finally this work proposes cluster based query routing algorithm for routing service requests. An evaluation of the proposed system was conducted. That included a comparison with related works. The obtained simulation results show that the proposed system achieves significant improvements on aspects including query success ratio, latency, energy consumption and Quality of Service.