Abstract

In recent times, smart handheld devices have become an indispensable part of human lives. These devices have inbuilt sophisticated sensors which are sensing the environment and hence a huge amount of data are being accumulated in the devices. These data can be utilised for improving the lives of the people. The various applications of mobile crowd-sensing (MCS) are public safety, traffic and transportation planning, environment monitoring to name a few. Along with these implementations comes a set of challenges. The main challenges in MCS: i) Energy efficiency of the smart devices, ii) Fault tolerance of the system when the data are being offloaded to the backend servers and iii) Computation and load balancing while distributing the offloadable tasks to the backend servers in an efficient manner. These are the main challenges addressed in this thesis. The first challenge is addressed by proposing energy efficient strategies that enable mobile devices to utilise the energy in a well planned fashion so that the limited resources can be managed well without hindering the quality of services. In order to address the second challenge, an efficient framework is proposed which helps in detecting faults, segregating the faults and trying to steer clear of the faults whenever possible. The framework also aids in tolerating faults. The third challenge is addressed by implementing optimisation technique, Simulated Annealing (SA) for allotting the computation intensive and time-sensitive tasks to the backend servers in a balanced manner.

All the experiments in this thesis are simulated and the results of simulation are validated by real-life implementations. In a situation where the smart handheld devices needs to take the decision of whether to participate in crowd-sensing, energy efficient strategies are proposed which outperforms the benchmark strategies in better utilisation of the energy. In the event of finding faults in offloading systems, our proposed framework not only detects faults in the offloading systems, but also classifies the faults. The framework also helps to tolerate one degree fault. It has also been observed in offloading systems, that during dissemination of tasks to the backend servers, our proposed framework, implementing SA outperformed to other techniques with 90% success rate for efficient load balancing and completion of the allotted task. These proposed framework can be utilised in mobile devices for better utilisation of the constricted resources.