CHAPTER 8

Allocation of Multiple Tasks in DCS

This chapter consists of four propositions of TA algorithms: first of these addresses the realistic consideration of multiple tasks in a DCS whereas earlier proposed algorithms (Sec. 5.3 and 7.1) consider only one task at a time; the second proposition, a cluster based algorithm, does not require the priori knowledge of execution time of modules of a given task, as it is difficult to estimate the same, for allocation purposes. These propositions appear in sections 8.1 and 8.2 respectively. Section 8.3 and 8.4 deals with the LBTA strategies for multiple tasks using A* and using GA respectively.

The task allocation models & algorithms, discussed in previous chapters, concentrated on improvement of execution characteristics of an individual task, consisting of a number of modules, submitted to the DCS. A DCS, in fact, keeps on receiving multiple tasks from time to time. This calls for consideration of all the tasks for allocation, simultaneously, to the processing nodes of the DCS. Such an allocation would be able to aim at a good throughput of the system apart from improvement in the turn around time of the individual task. The idea of multiple task allocation is elaborated in section 8.1.
The major problem of the allocation techniques is the assumption that the execution time of the modules of the task on the PEs of the DCS and the communication among them are available priori. The execution time on the PEs of a DCS, prior to its execution, is just difficult to estimate. The allocation method that may work with other parameters, without prior knowledge of execution time, is desirable. The allocation model proposed in section 8.2 considers the inter module communication for grouping modules into the clusters and at the same time clustering of PEs are done based on the inter-processor distances. This cluster-based algorithm for the task allocation can make assignments by consideration of similar clustering of processing nodes for matching and mapping of module clusters onto these node clusters. Section 8.3 and 8.4 concentrates on LBTA strategy, as discussed in chapter 4, for multiple task allocation.

8.1 Multiple Task Allocation

Several task allocation algorithms for distributed computing systems have been reported in the literature [1-13]. These algorithms consider the execution time of the different modules, of a single task, executing on different processing nodes. The assignment problem, in these, optimizes some characteristic parameter by allocating modules onto the processing nodes, considering the Inter Module Communication (IMC) overhead. The number of tasks for execution is usually substantive, but these algorithms consider assignment of the modules of a single task to various processing nodes. In reality, a DCS facilitates concurrent execution of