

## ABSTRACT

The continuous decreasing price of digital micro-controllers and considerable increase in their performance enabled system engineers to move from traditional electro-mechanical control systems to digital control systems. A digital control which introduces additional functionality, reduces cost, weight and allows scalable reliability. This facilitates the use of digital control in safety-critical applications like airborne systems, railways and autonomous cars having multiprocessor environment. By introducing fault tolerance in the system, the reliability requirements for safety critical systems will be improved.

The introduction of fault tolerance though increases the complexity of the digital control system, the development and verification cost may slightly be increased.

Further, introduction of hard real time system like Time Triggered Architecture in safety critical applications reduces the fault-tolerance-related problems. The problems may arise due to intermittent faults and non availability of processing elements (Electronic Control Units) present in the system. These problems may lead to system malfunction and the system can remain alive by having redundant processor in use. In order to avoid the schedulability related problems in these multiprocessing systems, the optimization of system processors referred as nodes becomes apparent.

Nowadays, most of the optimization techniques adopted are nature inspired, or based on evolution. These optimization methods take significant attributes of our problem and using them as the variables in their algorithms to yield better solutions. In the present work different algorithms such as Greedy Nearest Neighbor, Simulated Annealing, Ant Colony and Genetic Algorithms, for optimization of processing nodes have been investigated.

The research work is carried out and analyzed in both subjective and objective ways, the outcome from subjective approach helps in the discussion of node scheduling and better optimal solution whereas, objective approach elucidates the statistical and graphical comparison of existing methods. It is therefore proposed in the research work an adaptive approach hereafter called as Adaptive Dynamic Genetic Algorithm (ADGA). The proposed algorithm may allocate tasks to the different nodes in optimized way during the execution.