CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

In this research work, the path planning for a robot in an Indoor environment using the Agent Based Framework is developed for various simulation and real-time environments. The main objective of reaching the target by a mobile robot in minimum time without any collision against the static and dynamic obstacles during navigation is achieved in the research work. Statistical analysis of all the proposed agent-based techniques shows the reliable results with respect to the statistical significance compared to existing techniques.

The DTA results show that the robot path planning using the Global approach always gives shortest path selection. Increasing the number of obstacles does not affect the Global path selection. The path planning agent and obstacles agent share the distance as common criteria and selects the path for mobile robot navigation. The distance calculation, done by the DT agent predicts the position of the static obstacle in advance and makes the robot find the shortest path. The unreachable condition of goal is also predicted by the multi-agent in prior and informs the robot about the non-existence of a path in advance.

The DPPA used Local Navigation for effective obstacle prediction and avoidance for every step movement. Promising results show that for
various shape of moving obstacles, DPPA works well to avoid obstacles and reach the goal with minimum time. The collision with the dynamically moving objects is avoided by DPPA by continuously updating the present status of the robot in comparison with the neighbouring grid cell’s status. Simulation and real time experiments are conducted and the analysis of the result proves that the DPPA effectively avoids the dynamic obstacles effectively with less computation time to reach the target.

The reinforcement learning Agent uses the computation of Q values that arise when learning from the interaction with an environment in order to achieve the goal. Reinforcement learning uses a framework defining the interaction between a learning agent and its environment in terms of states, actions, and rewards. Simulation results show for reaching the target, the learning rate decides the optimal path in a static environment. It uses the concept of learning from the environment for optimal path selection.

Using Agent based GA, a novel approach with a modification is applied to the fitness evaluation. Due to this modification, the optimal path is obtained in 50 generations. Analysis also shows that the execution time decreases as the number of generations increases. Agent based GA create generations, select the chromosomes, finds fitness and mutation values and arrives at the optimal path among the possible paths.

The hybrid approach integrates the trajectory planning with the path planning. The GJK agent finds the obstacles position and incorporates the value in the fitness function during every step movement of the robot in the grid environment and adds the internal mechanism of obstacles values into the Genetic Algorithm Agent, which makes the effective optimal path selection in the environment. The results show that the optimal path is found for various
shapes and sizes of the obstacles within minimum time since the trajectory information is immediately available to the robot. From the experiments conducted in this research, it is inferred that the integration of the distance based algorithm with heuristic approach makes the best optimal path selection with the effective obstacle prediction and avoidance in the environment during navigation with different shapes of obstacles incorporated.

7.2 FUTURE ENHANCEMENTS

Among the various research work proposed for robot path planning in simulation and real time experiments, the proven results will be incorporated to the prototype robot model for people assistance and guidance robot for supporting the elderly people. The implementation of the hybrid approach in the real time Firebird robot can support robot assistance for people in house and office environments.