A Deterministic Improved Q-learning for Path-Planning of a Mobile Robot

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Fig. 1: World map without any obstacle

Fig. 2: Path planned by the robot (marked in red) using the Q-table returned by the IQL in the world map of Fig 1.

Fig. 3: Path planned by the robot (marked in red) using the Q-table returned by the CQL in the world map of Fig 1.

Fig. 4: Path planned by the robot (marked in red) using the Q-table returned by the EQL in the world map of Fig 1.
Fig. 5: World map with six obstacles added after the learning phase

Fig. 6: Path planned by the robot (marked in red) using the Q-table returned by the IQL in the world map of Fig 5 containing six obstacles.

Fig. 7: Path planned by the robot (marked in red) using the Q-table returned by the CQL in the world map of Fig 5 containing six obstacles.

Fig. 8: Path planned by the robot (marked in red) using the Q-table returned by the EQL in Fig. 5 containing six obstacles. The robot fails to reach the goal. After reaching state no. 36 the next state is state no. 35 but an obstacle is present in that state. The robot will stop at the state no. 36.
Fig. 9: World map with four obstacles.

Fig. 10: Path planned by the robot (marked in red) using the Q-table returned by the IQL in the world map of Fig 9 containing four obstacles.

Fig. 11: Path planned by the robot (marked in red) using the Q-table returned by the CQL in the world map of Fig 9 containing four obstacles.

Fig. 12: Path planned by the robot (marked in red) using the Q-table returned by the EQL in the world map of Fig 9 containing four obstacles.
Fig. 13: World map with six obstacles.

Fig. 14: Path planned by the robot (marked in red) using the Q-table returned by the IQL in the world map of Fig 13 containing six obstacles.

Fig. 15: Path planned by the robot (marked in red) using the Q-table returned by the CQL in the world map of Fig 13 containing six obstacles.

Fig. 16: Path planned by the robot (marked in red) using the Q-table returned by the EQL in the world map of Fig 13 containing six obstacles. The robot fails to reach the goal. When the robot reaches at state no. 8, the best action at state no. 8 is move left but an obstacle is present at state no. 7. So, the robot will stop at the state no. 8.