Objective:
To develop an automated air traffic management system to reduce waiting time and increase capacity of aerodrome in dealing with traffic. In the project, a conceptual planner of 15 airplanes taxiing on CDG airport was demonstrated.

Approach

- Motion planning problem is split into two parts: Path Planning and Velocity Scheduling.

- Physical path will be calculated by normal Breadth First Search (BFS) algorithm. Velocity profile, or how fast the aircraft will travel on this chosen path, is planned by Rapidly Random-Exploring Tree (RRT) growing in the coordination diagram shown below in Figure 1.

- Deadlock problems are resolved on a separate coordination diagram (Figure 2). P1 and P2 represent physical paths for 2 airplanes that might have head-on collisions. If an obstacle is created as the shaded region such that when RRT is growing in the coordination diagram, no nodes will be sampled in it during path finding process, thus resolving the deadlock.

Conclusion and Recommendations

- Computational complexity was reduced because of dimension reduction algorithms involved in the RRT process. In practice, physical paths and velocity profiles of 10 aircrafts could be obtained within 3 seconds.

- Adding auto-broadcast or passive detection by sensors would allow one to consider environmental variables as well.