# Proposal for CSE 6730 Project 2

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The team was formed through Piazza. Peijun Wu posted on Piazza about making a team. The other four members emailed Peijun Wu and built this team.

In this project, the simulator provides 3 running options: non-distributed, distributed using YAWNS or distributed using NULL message. If, for some reason, these algorithm lead the simulation to a livelock and time permitted, we may also try time warp as optimistic algorithm to execute the simulation.

In the airport logistics simulation, each logical process (LP) simulates an airport or multiple airports. A LP only sends message to another when there is a departure event for the airport. The lookahead for scheduling an arrival event in another airport is the time needed for an airplane to travel between the two airports, which we will model as "distance divided by the speed of airplane". Since such lookahead cannot be 0 or really small compared to average gap between two events in the whole simulation, we assume they will all work without problems like Time Creep[1]. Thus we can compare different algorithms and find out which one performs best in the airport simulation.

In the modeling procedure, the most important thing is to figure out what is essential which need to be included in the simulation and what need to be excluded for the simulation. In reference[2], it consider how the wind and gear force will affect the landing time. However, in our simulation we do not need to consider this much, so we just set the landing time and taking off time for different airport.

Project 2 is based on Project 1. There are three additional features listed below:

1. Multiple runways at each airport

   The simulation model allow several runways for each airport. For each departure or landing, planes can choose any of the available runways. It
2. A GUI for simulation configuration and observation

   Add a GUI for the simulator. Through the GUI, users can add and initiate airports or planes; choose running options among non-distributed, YAWNS and NULL message; set simulation time or end manually by users; see the event output of each simulation.
3. More detailed models

   a) Consider large airplanes like A380, which could only use special runways. When initiating airports and planes, there is runway type as an optional parameter. Assuming some airports may not provide such runways and will not accept large airplanes, when arranging departure events, we will check if the destination airport is capable.

   b) Since we are going to simulate multiple airports and airplanes, it is possible that one airport can not hold any airplane at some time. So we add a capacity parameter in every airport. Every time an airport initiate a new take off event, it need to check if there is any port available for next airport, if not it need to change the take off time of this airplane or choose another airport.

   c) In real situation, the total number of planes in the air for all airport should not exceed a certain number to maintain safe flying. So we can calculate the total number of flight in the air waiting to land for every airport, and delay the departing event of the next flight if this flight will make the number of flight in the air surpass the threshold.

Literature research:


1. PARALLEL AND DISTRIBUTED SIMULATION, Richard Fujimoto, Proceedings of the 2015 Winter Simulation Conference L. Yilmaz, W. K. V. Chan, I. Moon, T. M. K. Roeder, C. Macal, and M. D. Rossetti
2. Secure Large-Scale Airport Simulations Using Distributed Computational Resources, William J. McDermott, David A. Maluf, Yuri Gawdiak NASA Ames Research Center, Moffett Field CA Peter Tran QSS Group, Inc. 2001-01-2650