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Technology

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Success Story

Passenger Flow Simulation at Frankfurt Airport

As operating company of several major international airports, the Fraport AG is one of the “Global Players” of the airport industry. With more than 140.000 passengers per day and over 80 aircraft movements per hour, the airport in Frankfurt - an aviation hub of worldwide significance – serves the Fraport AG as home base.

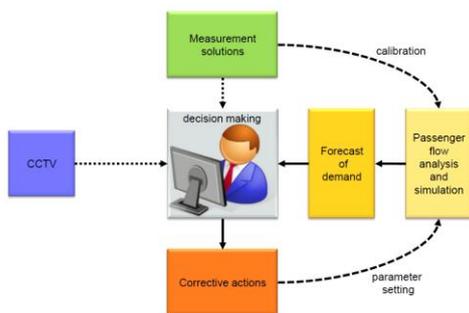


Frankfurt Airport (Source: Fraport AG)

Between 1980 and 2010, the annual passenger volume in Frankfurt has roughly tripled from 17 million to 53 million. In its 75-year history, the airport has gone through a variety of construction projects in order to constantly adapt the airport to the increasing demands. The result of these adaptations is a very complex structure.

Because further structural measures were limited, the Fraport AG decided in 2008 to develop of a passenger flow management in order to increase capacity utilization and customer satisfaction, e. g. by reducing waiting periods.

By the use of an active terminal management, the passenger flow within the building is controlled for example through dynamic sign switchover. The terminal management itself is based on measurements of the current and forecasts for the future passenger traffic.



Passenger Flow Management (Source: Fraport AG)



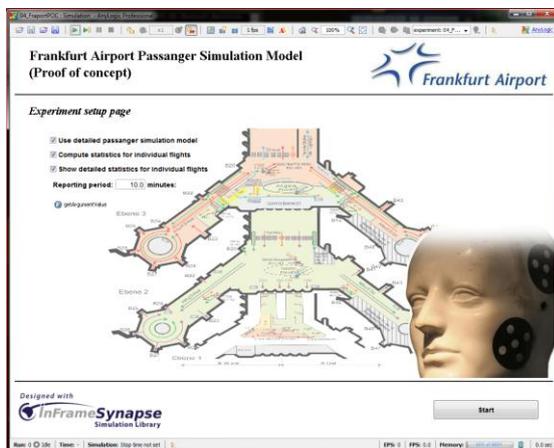
Dynamic Sign Switchover
(Source: Fraport AG)

Core of the forecast methodology is a simulation model that was developed by the acp-IT AG on behalf of the Fraport AG. It is based on the acp-IT InFrame Synapse Simulation Suite and the simulation tool AnyLogic.

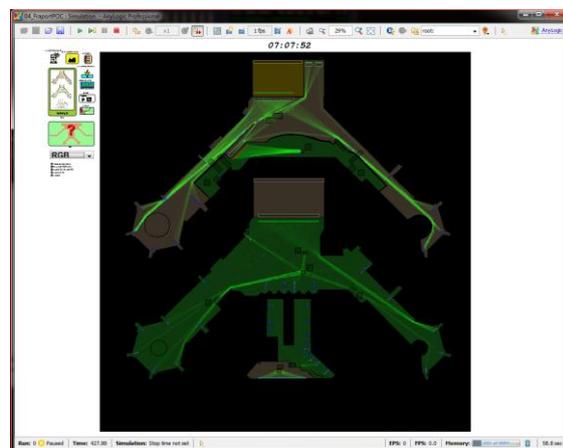
In addition to satisfactory simulation accuracy, the target was to achieve an excellent performance since passenger flow forecasts for several hours must be calculated within a few minutes. Nevertheless, all the essential characteristics that affect the passenger flow had to be considered. This means in addition to 26 security check points, 8 boarding pass check points, 15 border control points, 90 stairways and elevators, 266 gates, 1 tunnel and 3 SkyLine stations especially one thing: The passengers themselves. For their representation, a simple mathematical model, a trajectory model and a so-called social force model, which involves the interaction between people, were implemented and compared in terms of accuracy and performance.

The trajectory model as well as the social force model provided required accuracy. However, the simulation speed of the trajectory model was about twice as large. Since it took about five minutes to perform the simulation, the performance targets were met.

Since the summer of this year, the terminal management of the Fraport AG is successfully using the developed simulation model to optimize the passenger flow. The simulation is run almost 300 times per day and about 15 GB of data is generated. With the help of the passenger flow management it was possible to master the August 2011 – with 5.5 million passengers the most successful month in the history of the airport – without any problems.



Simulation Start Screen



Passenger Flow Representation

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