Football stadium

Motivation

Welcome to the most anticipated game of the season! Gauß-tria Wien is facing off against their historical rivals Sturm-Liouville Graz at their home-stadium, the famous Galois-field in Vienna. An estimated 6000 fans are expected to attend the spectacle. But while the team prepares for the onslaught on the pitch, the stadium management needs to ensure a smooth and fast entry, for all fans. As an employee of Gauß-tria Wien it is your job to simulate the fans rush to the stadium-gates, so management can rest easy as they know what to expect.

Model

The Galois-field has n gates, each with their own queue. The expected number of fans is 6000. It is assumed that the first fans arrive 2 hours before kickoff. The security check at a gate for a standard visitor takes 6 ± 3 seconds. For season ticket holders, who make up 40% of all expected visitors, it takes only 3 ± 1 seconds to be processed.

To Do's

Simulate the supporters rush to the stadium-gates and find answers to the following questions by experimenting with your Model!

Task 1

How many Gates are to be employed, so it can be assured that at least e.g. 99% of fans are inside the stadium in time for the kickoff? Think about what would be a sensible arrival rate for the supporters. For the rest of the tasks (B,C,D) keep this number of gates.

Task 2

One hour before kick off a group of 500 Sturm-Liouville Graz Ultras arrive all at once. These away fans are to be processed as standard visitors. Can the resulting queue be dealt with in time for the kick off?

Task 3

By how many minutes will the last fan miss the kickoff if the number of fans exceed the expected value by 2000?

Task 4

Find out how the simulation result changes when season ticket holders get preferred treatment when queuing. What effect does this have e.g. on the average queuing times or the number of fans entering the stadium after kick off? If the season ticket holders knew they were going to get preferred treatment

in the security check, they could take advantage of that and come later than normal to avoid waiting for the kick off inside the stadium, experiment with scenarios like this.

Task 5

Is it true that staying in one queue is faster than switching between lines? Try to implement an impatient kind of visitor that switches queues once, after for example, a waiting time threshold is reached, in the hopes that the new queue is faster than the old one. Think of a sensible condition for switching. Compare average waiting times between patient and impatient fans.

Suggested Programming Languages

Anylogic