SMDE Second assignment

# Executive summary

A brief and concise description of what is going to be analyzed, the problem and the solution proposed.

**We want to simulate the behavior of different groups of runners in Boston Marathon (one group of runners by each component of the group).**

# System description, introduction

This section only contains the description of the system to be modeled (not the problem, not the data), other elements must be described on the subsequent sections of the document.

**Describe the system to model, the details of the marathon that are relevant for the analysis, Are the tree editions equal? There are some differences that can affect the analysis? can these differences used for a deeper understanding and modelling?**

# Problem description

Describe the problem you want to solve using simulation. Be as clear and concise as possible. Be aware, the problem you discover through modeling can be different to the proposed problem by the client of the stakeholders. In brief, the problem is the problem that you detect through the model use.

**Once the marathons simulation is done, what are the issues you detect? Are enough resources for the runners? (WC, water sources, meals…), there are some unexpected queues?**

## Systemic Structural, Systemic Data and Simplifying Hypotheses

Complete the problem description with the hypotheses. Usually they are going to be presented with an identifier.

SH\_01 Since we cannot predict the weather with exact precision we are not taking into account the weather as a factor

SH\_02 We are not going to measure or simulate injured people. We assume that anyone is injured or abandon the marathon

SH\_03 We are going to reduce the amount of water, wc and solid spots in order to simplify DOE after and not to have so many factors.

SH\_04 Where there is a 2 colliding points, for example water and solid or water and bathroom, we are going to distribute the runners between the 2 points. There is not going to be runners that go to both resources.

SS\_01 The marathon cannot last more than 6 hours. The system will be consider finished after 6 hours.

SS\_02 The total distance of the marathon is 42.195 Km

SS\_03 Time performance for each runner is going to be taken every 5 km.

SS\_04 We are going to analyze 2 groups, Male 30-40 years old and Women of 25-40 years old.

SD\_01 We are going to use a linear regression model for predict the time that takes to each runner to cross each segment

SD\_02 Elite runners are going to be calculated as a percentage based on Boston Marathon 2017 on each group

SD\_03 Elite runners are going to take less to cross each performance measurement based on the same percentage defined in SD\_02

SD\_04 There is going to be 3 water points at Km 10, 21 and 30, and it can deliver 100 unit of water at time

SD\_05 There is going to be a fruit and glucose point at Half marathon and 35km and on each point there is going to be capacity of 500 units at time.

SD\_06 There is going to be 2 bathroom points at Km 25 and 30.

# Model specification

The model entities, operations and processes that defines the behavior of the model. We can use DEVS, Petri Nets or SDL here. Since we are not going to use those formal languages, define a flow diagram to simplify the definition of the model. If using GPSS you can use the GPSS icons of the language.

# Codification

Codify the model using GPSS. If you plant to use any other tool, please consult us.

## Data.

Describe the connection mechanism of the data used along the model.

# Definition of the experimental framework

Explain the DOE to be used. Detail the process to execute the replications.

1. Define a DOE to explore with what parametrization of the factors the answer obtains the best value (define what means best, i.e. maximize or minimize the value).
2. Detect and analyze the interactions.

# Model validation

Propose some methods to perform a validation of your model. The validation will be done in the third assignment, hence here we will only propose the methods.

# Results /Conclusions

Be as concise as possible, describe the main conclusions of the analysis done.