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Crowd Simulator

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# 1. General Presentation

## 1.1. General Description of the Application

The theme of our application is centered around mass public protests. These are very present in France and have a tendency to escalate causing multiple injuries, arrests and damages. Our application will aim to simulate a demonstration with protesters, law enforcement forces along with all the elements that goes with the event. The end goal is to study the behavior of the masses in such scenarios and learn how to minimize damages and maximize civil behavior through the control of the law enforcement forces.

The studied scenario would be a protest march from point A to point B (may add several starting points). The goal of the protesters in a “civil” state would be the travel from A to B. On the other hand, for protesters in an “aggressive“ state, they aim to destroy properties around the march. For the ones in a “panicked” state their goal is to run away from the march. As for the law enforcing agents (“players side“) the objective is to keep everything under control and stop things from escalating.

## 1.2. Measurements

To study the behavior of the masses and get estimates on the “civility” of the protest we chose the following measurements:

1. *What:* Damages (in %)

*Why:* this will allow us to estimate if the demonstration has degenerated or not.

1. *What:* Evolution of the number of protesters in each state: aggressive, civil or panicked. (in %)

*Why:* this will allow us to see the evolution of the protestor’s state during the whole demonstration.

1. *What:* Number of people that arrived peacefully

*Why:* This serves to show how many protestors ended the demonstration peacefully.

1. *What:* Number of arrests

*Why:* This will show the capability of arrest of the CRS and will be an indicator of escalating demonstrations.

1. *What:* Number of escapees

*Why:* It will be used to see how much panic was caused during the event.

# 2. Project Management

## 1.1. Agile methodology and Scrum Application

We have chosen to use the agile methodology because we are working in small effective with short deadlines. Indeed, this methodology designed according to the startup state of mind which is perfectly suitable for our management requirements. More precisely, we will use the Scrum application and mainly the rituals gravitating around. It will help us to have a dynamic and more human oriented. Our main goal is to avoid the waste of time that the provisional planning that won’t be followed represent. The objective here is to focus on efficiency with monthly and weekly objective.

Our adaptation of the Scrum methodology consists of a monthly Sprint Planning in which we define the main needs about the report and the deliverable. The second one is the Weekly in which we define what tasks we embed and what were the difficulties and problems we faced the previous week. To help us managing those events, we use Jira which is an Agile Development tool. Even if, we haven’t defined specific roles, Stephane G would be both the Product Owner and the Lead Developer, and we all would be Business Analyst and Developers with our own specializations. Finally, we designated one of us to be the Scrum Master and so the facilitator of the events, he will prepare in advance the meetings to avoid time wasting and fix objectives.

## 1.2. DevOps

Furthermore, we need a day-to-day code release, that is why we will also use the DevOps spirit but only with some of its tools otherwise, it would be a waste of time to deploy every useful tool that would be interesting in a long-term project. For instance, we will use GitHub to manage our code.



# 3. Technological Environment

For this project we made the choice to work with the java and SARL programming languages. We chose to go with SARL for several reasons. First, it’s a powerful and diverse tool in mutli-agent programming. It is also quick to set up, conveniently made for group programming and well documented. Of course, we also chose it because we've already started working with this technology.

For the UI we decided to use swing because it is simple to implement and good enough for our application. In this project we truly aim to have a functioning backend simulation more than anything, to really be able to get coherent studies out of our work.

Our project will also use maven to allow the use of libraries like the Arakhnê Foundation Classes with quad tree structures implemented (to be used for the environment).

For the physics of our simulation, we decided to go with the social force model.

# 4. Simulator Architecture

## 1.1. ??

We have chosen to use the agile methodology because we are working in small effective

**Reprendre partie 2 de l’ancien dossier**

# 4. Map graph storage

## 1.1. ??

# 5. Environment Implementation

**Reprendre partie 2 de l’ancien dossier**

## 2.1. Environment OBJECTS

Describe (UML class diagram) the objects in the environment.

## 2.2. Environment Structure

Describe (UML class diagram) the overall structure of the environment.

## 2.3. Environment Dynamics

Describe (algorithms) the endogenous dynamics of the environment, if applicable.

## 2.4. Agent Perception

Describe (algorithms) the mechanisms for computing the perception of each agent.

## 2.5. Agent Actions or Influences

Describe (algorithms) the mechanisms for applying into the environment the actions that are provided by each agent.

# 6. Agent Behaviors

**Reprendre partie 2 de l’ancien dossier**

Describe (UML class diagram, UML sequence diagram, algorithms) the behaviors of the agents, and the interactions among the agents.

# 7. Physic implementation

# 8. User Interface

The interface of this project will be a 2D view of the map from above. On the map the agents will be represented as circles of colors. The design of the objects is still not decided (probably rectangles of colors). The user will be able to choose between different scenarios and/or place the number of agents and objects on the map then start the simulation. The user may also be able to choose the different parameters of each agent placed on the map (original state, tolerance, ….).

Extend the description of the user interface from the requirement document in order to provide a complete guide to the user in order to use your simulator.

# 9. Simulation comments

For each of the measurable indicators that are defined into the requirement document, provide the measured results from your simulator.



1-2-3-8 moi

4-5 hadrien

6-7 Stephane

ANNEXES