

# MOVI-CLOUD: a social framework for labor integration by means of serious games

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**Abstract:** MOVICLOUD is a social simulation platform created by means of organizative multiagent systems that can be use as a game platform for labor integration of disabled people. This platform allows to configure a set of serious games oriented to the departments of human resources that can help in the task of adapt the work environment for disabled people, including spaces and business process.

**Keywords:** social simulations, labor integration, gamification, multi-agent systems

**Video:** <https://youtu.be/av9X1EDSg8M>

# 1 Introduction

According to United Nations (UN) about 15% of the population suffers some type of disability (physical or mental) [UN, 1993]. These people usually have different difficulties in carrying out their daily lives. Therefore, it should be necessary to create a personal environment adapted to them so that these difficulties can be decreased. It is remarkable that within this context, the integration of disabled people within the workplace represents a challenge that society has to face. In fact, the unemployment rate is about 50% and 90% depending on the degree of industrialization of the country<sup>1</sup>.

The key players in this context are both human resources departments as well as designers of workspaces. In this sense, a tool that seems appropriate to facilitate the integration of disabled people would be the one that allows them to determine whether their business processes or spaces are suitable for people with some degree of disability. In this context, the learning process through games and simple workouts (Gamification [Kapp, 2012]) is shown as interesting tool. Indeed, gamification has been used in different environments (some of them nearby to this) [Hamari et al., 2014]: business, education, Health, Organizations, Sharing, Sustainable consumption, work, innovation and data gathering). Gamification *can be defined* [Hamari et al., 2013] *as a process of enhancing services with (motivational affordances in order to invoke gameful experiences and further behavioral outcomes.*

This work proposes the platform MOVICLOUD<sup>2</sup> that is based on Multi-agent Systems (MAS) [Zambonelli et al., 2003] and social simulation models. Thanks to this tool, it is possible to perform simulations about the capabilities offered by a virtual environment that represents a real place with regards on the integration of people with disabilities. For example, it is possible to address the lack of accessibility of buildings, production processes adapted to the needs of disabled people, etc. Although, this platform was not designed following a gamification approach, the real evaluation, which has been performed, shows that this is the best way for its exploitation.

This paper is organized as follow, next section describes the platform MOVICLOUD from a gamification point of view, then the last section describes a case study performed.

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<sup>1</sup> Disability and Employment: <http://www.un.org/disabilities/default.asp?id=255> [Last Access: 09/08/2015]

<sup>2</sup> <http://tecnologiasaccesibles.usal.es>

## 2 MOVI-CLOUD: An overview

As already indicated, MOVICLOUD platform is based on MAS, which has been implemented using JADE platform [Bellifemine et al., 1999]. Technical details are far from the interests of this article and the reader can be found on [De la Prieta et al., 2015]. Throughout this section, MOVI-CLOUD is described from the point of view of the Gamification.



Figure 1.- 3D representation in MOVICLOUD

Any organization is surrounded by an environment that is in continuous change, so a simulation of a work environment has to take into account both business model (people, positions, work locations, etc.) and the work spaces itself. In this sense MOVI-CLOUD includes a complete tool based on Unity 3D<sup>3</sup> that allows to model all these details. This editor can generate virtual 3D environment at scale (walls, floors, floors, furniture, etc.).

Once the workspace model is defined, it is possible to perform simulations of the organization on the visualization tool of MOVI-CLOUD. These simulations are organized through small games. In each of them, the starting point (initial state) depends on the quality of the accessibility of the office environment. From this point, the disabled workers have to perform a set of task. This visualization tool also has a graphical 3D interface to interact and modify the organization as well as other parameters of the simulation. The operations that can be performed are the creation and deletion of workers and the assignments of task. In the case of any task fails, the system automatically displays a series of messages with related information.

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<sup>3</sup> <http://unity3d.com>



Figure 2.- Representation of user in a virtual context

### 3 Case study and conclusions

During this section, we will show the result of the application the framework MOVICLOUD in order to check if it works properly. First, the starting point is a previously 3D modeling environment, which consists of seven workstations, three of the helpdesk department and four of the administrative department. Then, it is set up the design of the structure of the organization, including the workers that will be part of the simulation and what kind of tasks have to be performed.

So, the present case study includes an organization where there are two departments with different number of employees, different roles and disabilities. All of these details are presented in the following table.

Name	Department	Role	Disability
Antonio	administrative	Manager	Wheelchair
Sofía	administrative	Worker	-
Pablo	administrative	Worker	Wheelchair
María	administrative	Worker	Wheelchair
Jesús	Helpdesk	Manager	Blind
Álvaro	Helpdesk	Worker	--
Sandra	Helpdesk	Worker	Deaf

The building has an elevator for easy access between floors and allow the physically disabled workers to move freely. To check this architectural barrier on the environment, a worker in a wheelchair is assigned a task which implies the movement to another floor (deliver mail). Thus, the agent Antonio (administrative department, manager, first floor) asks the agent Pablo (administrative department, worker, second floor) to deliver mail on the first floor. Through visualization tool it is possible to see how Paul collects the letters, go to the second floor using in the elevator (see figure below) and delivered the mail to Antonio and then return to his workplace.



Figure 3.- Disabled person trying to perform a task (Success)

On the second step, the same task is repeated but an architectural barrier is introduced (see figure below). This barrier indicates that the elevator is broken. When the agent Pablo goes to the elevator and after the contact with environment (elevator), it receives the signal that it is out of service. As Pablo is unable to reach his destination, Pablo can not carry out the assigned task, and so it is notified to the supervising agent, which is responsible for issuing a warning in the user interface indicating that the task could not be performed and why.



Figure 4.- Disabled person trying to perform a task (Fail)



In a similar manner as the previous example, MOVICLOUD allows to model and assign a set of tasks for other agents, systematically. After performing these task, the system shows a series of recommendations (see figure below) that inform of all warnings that have occurred during the simulation. Then the department of human resources can learn and understand the performance and operation of the office workers.



Figure 5.- Report about possible improvements

## 4 Real experiments, conclusions and future work

Currently, MOVICLOUD is being tested in a real environment. Specifically, the experiments have carried out at offices of the company Indra at Salamanca, which are located at the Science Park of the University of Salamanca. These offices are particular suitable for the study as it has several employees with disabilities (blind and motion), plus their facilities are located on two separate floors. In the picture below a screenshot with a representation of the offices of Indra modeled through the platform MOVICLOUD shown. The preliminary results are quite good because this tool allow to the human resources unit to discover accessibility problems not only on the buildings, but also on the tasks that have to perform the disabled people.

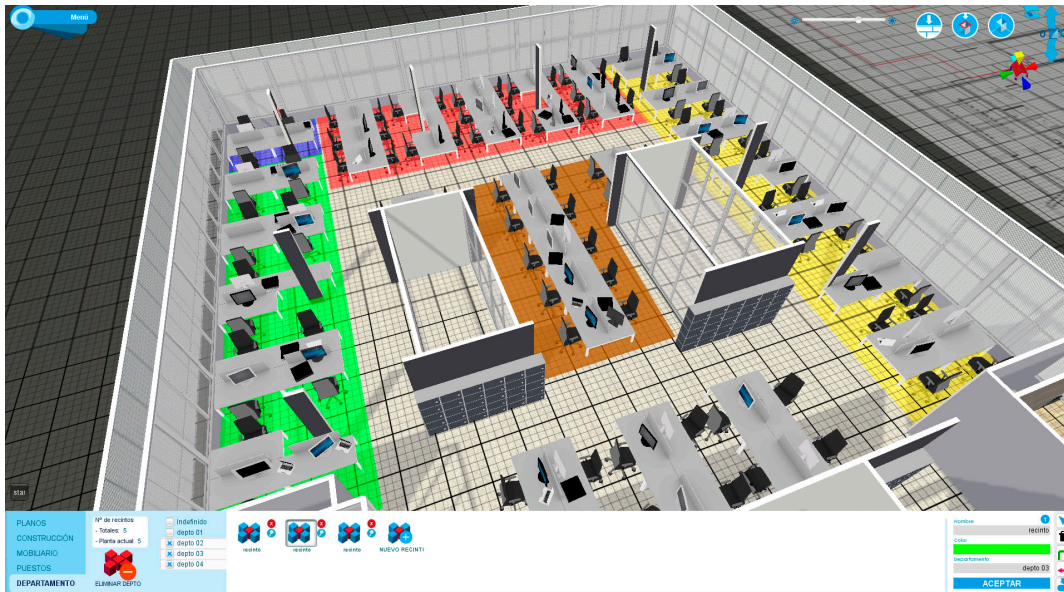


Figure 6.- Indra headquarters in Salamanca

In conclusion, MOVI-CLOUD is a tool that helps people with disabilities achieve the equal opportunities in the workplace. Thank to the use of simple and serious games it is possible to achieve universal access in work environments where the workers have to carry out their activities.

However, it is still remaining many things to design and develop in order to transform MOVICLOUD in a real game platform for work integration. Concretely, the future work will follow these research lines:

- Integrate some gamification principles such as: problems discovery, goals, interactive feedback, etc.
- Include more game roles like observers that can influence the game.
- Include more and complex task that the simulated users can perform and design a model to evaluate the grade of performance of the task.



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