

# System to design context-aware social recommender systems

Jose L. Jorro-Aragoneses

Department of Software Engineering and Artificial Intelligence  
Universidad Complutense de Madrid, Spain  
email: jljorro@ucm.es, belend@ucm.es, jareciog@fdi.ucm.es

**Abstract.** In this document, we summarize my PhD thesis goals and the progression in 2014/2015. The principal goal of my PhD thesis is to describe an architecture to design context social recommender systems. Finally, we explain all goals that we will try to achieve during my PhD studies.

## 1 Introduction

The number of products and the amount of information that we can consider has increased with the growth of the Internet. Sometimes, all of this information could overwhelm users. Recommender systems were created to filter this information and they just show the most interesting results for each user. For example, recommender systems are an important feature in e-commerce, where they show what products may most interest a user [8].

Recommender systems are an active research area in the artificial intelligence community. The majority of recommender systems use features of products and user preferences to calculate recommendations [7]. A trend in this area is to use contextual information [1] in recommender systems.

We find a complete definition of context in [3] “*Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves*”. In our case, entities of recommender systems are items that systems recommend and users who receive a recommendation.

My PhD thesis goal is to study what kinds of context information there are in a recommender system, how many ways we can obtain this information (implicit, users introduce the information, or explicit, the system obtains this information itself) and design a system to build recommender systems automatically.

The paper is organized as follows: Section 2 defines specific objectives in my PhD thesis based on the main goal. Finally, we explain the progress to date in Section 3.

## 2 Research objectives

As we said before, the main goal of my PhD thesis is to analyse what type of context information could be used in a recommender system and we will use these results to create an architecture that creates templates of CBR recommender systems automatically. To do it, we need to analyse different recommender systems and observe what type of information have its elements.

We can find 4 types of context information based on [3]:

**Individual:** Features of entities (age, sex, restaurant type, ...).

**Location:** Location of entities (longitude, latitude, room of a museum, ...).

**Time:** Time or time restrictions of entities (timetable, date of an event, ...).

**Relationship:** Features that we obtain in entities relationship (a family, a group of pictures of the same theme,...).

Currently, we are studying recommender systems that we have built before and classifying context information of items and types and type of users. Firstly, we classify *MadridLive* [2, 6], a recommender system of tourism and leisure activities in Madrid. This system uses all types of context information, and after, we add the emotional context (part of my PhD thesis) to complete the system. At the same time, we study different ways to obtain this information (mobile devices, social networks, linked-data, etc.). With context types and forms to obtain the information we create an ontology that classifies CBR recommender systems by the type of information that these systems use. Finally, we are going to use this ontology to make a system that builds templates of CBR systems. This system will use the type of items, users and technology to create a template that explains how to build the recommender system.

Preliminary specific objectives are defined as follows:

**Objective 1:** Detection and study of the influence of emotional context in recommender systems.

**Objective 1.1:** Obtain a method to detect the user emotions by his/her facial gestures. *The preliminary results have been published in [5, 4].*

**Objective 1-2:** Investigate different applications of emotions in recommender systems.

**Objective 2:** Classify all context information types and all different forms to obtain each type of information. To do it, we will design an ontology that will be used to create the final system. In this objective we are going to study recommender systems for individuals only.

**Objective 3:** Extend classification to group recommender systems. The main goal is to detect and study the social context in recommender systems.

**Objective 3.1:** Obtain a method to calculate the influence between members of a group using social networks.

**Objective 3.2:** Determine if there are patterns of groups with similar characteristics, for example, families, seniors group, etc.

**Objective 3.3:** Add social context conclusions in the ontology that we have defined in **Objective 2**.

**Objective 4:** Design a system that uses our ontology to create templates for CBR systems. The system creates templates using the information that the recommender system will use.

**Objective 5:** Make experiments to validate the system and research the influence of each type of context in a recommender system. To do it, we are going to create a recommender system based in the tourism and leisure domain.

All these specific objectives permit us to study all information types that participate in a recommender system and propose a system to design recommender systems automatically.

### 3 Description of the progress to date

In 2014/2015, I have finished objective-1.1. I have proposed a CBR approach to infer the emotion state using images of the user's face. This method has been published in [5] and [4]. Next, we have compared the quality of our method with others, and this comparison is explained in the paper that we have published at this conference (ICBBR 2015). In this paper, we explain a possible solution to the cold-start problem. To do it, we have created specialized case bases with cases that have the same features. These features are:

- *Age*, classified in two categories, children and adults.
- *Gender*, classified in two categories, men and women.
- *Ethnic group*, classified in the ethnic group features as Japanese, European, etc.

Actually, I am studying the design of an ontology to classify recommender systems by the type of context information that they use. The objective is using the ontology in a system that creates templates of CBR systems.

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