



International Conference on Knowledge Based and Intelligent Information and Engineering Systems, KES2017, 6-8 September 2017, Marseille, France

Curumim: A Serendipitous Recommender System based on Human Curiosity

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Abstract

Tourism is an important source of income of countries, since nowadays 10% of GDP corresponds to a direct, indirect or induced effect of tourism. In European countries like Spain, the activity reached numbers like 11% of GDP in 2016. Therefore, providing an efficient and personalised service for tourists has become an essential issue in the development of new technological resources. This work aims to build a better experience for the tourist through the fusion of three axes: human psychology, namely curiosity, technological innovation and social networks. This article describes CURUMIM system, which, from data available on social networks, predicts the level of curiosity of a user and then, tied to other measures, generates novel and serendipitous recommendations of touristic places around the world. In other words, the recommendations will be accurate and adapted to the level of curiosity of a given user on one hand and, on the other, they will positively surprise the users.

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Peer-review under responsibility of KES International

Keywords: Curiosity; Recommendation System; Social Network; Serendipity; Novelty; Personality;

1. Introduction

The area of tourism is an important source of income of countries, where 10% of GDP corresponds to a direct, indirect or induced effect of it. In European countries like Spain, this activity represented 11% of GDP in 2016. This way, the tourism industry is demanding an ever-increasing level of value-added services in technologically innovative environments, which are integrated and highly dynamic¹.

On the other hand, we can count on improvements and globalisation of technologies, as it happened with the Internet in the mid 1990s and with the advent of social networks (SNs) in the middle of 2004². The exponential growth of smartphones and tablets in mid-2009 also have led to a positive scenario. For example, independently of the type of the device used, whether for the online shop, browse the social network or even search for hotels for vacations, the recommendation systems (RS) are usually present in companies from different sectors like Amazon or Netflix.

In relation to the tourism sector, Google Trips³ for instance, is a personalised tour guide for mobiles, which compiles personal travel info and combines it with top spots to recommend nearby sights. It is also interesting the experiment that sought to analyse the user's emotions to figure out how she is feeling when she is about to book a

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travel⁴ on Expedia^a. That means, the globalisation have opened up infinite opportunities for exploiting the user's network contribution, by providing personalised recommendations in tourism. Set within this background, this paper represents the fusion of some of the most important trends in RS: serendipity, novelty, social networks, and some traits of human psychology. As it will be discussed later, new value-added tourism services can be provided by combining all these aspects.

In this context, we present CURUMIM, an online system whose aim is to generate serendipitous, personalised and novel recommendations, considering some implicit parameters such as the curiosity and education level of a user, besides other characteristics extracted from the SN Facebook. In other words, this system seeks to create surprisingly positive, novel and adaptive recommendations, considering the implicit psychological values of those who receive it. CURUMIM is a system whose generated recommendations suit the personality of the person and her expectations regarding the degree of serendipity. Thus, the recommendations will be more or less serendipitous depending on the personality of each one, specifically the curiosity, which is defined as the desire for new knowledge or new experiences, and widely recognized as an important antecedent of exploration^{5,6}.

The system was designed to be able to recommend items in any context because, as we will explain, the techniques developed are independent of the application domain. However, in order to show the capabilities of CURUMIM, we have applied it to the tourism context and we have elaborated two use cases, demonstrating how this system is able to provide serendipitous recommendations in this context.

This paper is structured as follows: Section 2 provides an overview of the state-of-the-art in serendipity, novelty and psychology in RS. Section 3 presents CURUMIM, the solution proposed here, including its architecture, the necessary input data, and the developed techniques to then, in Section 4, detail two complete use cases. Finally, Section 5 discusses the conclusions and future works.

2. State of the Art

As the tourism industry grows around the world, technological challenges in the industry follow the same trend. Different approaches, solutions and innovations have been developed in this area. Computational recommender systems have emerged as a means of selecting and recommending items from a wide range of alternatives becoming like a users aid⁷. They can be defined as tools and techniques providing suggestions for items to be of use to the user⁸. They range from approaches that aim for solving the difficulties encountered by tourists from planning to arrival in an unknown city. Some projects of information systems seek to help users through recommendations of places, routes or points of interest, through traditional approaches of recommendations such as Content-Based⁹, Collaborative Filtering¹⁰ and hybrid approaches¹¹. In the technological current context, the massive use of social networks made the role assigned to recommender systems change from the selection of items through traditional techniques, to a growing need to bring “what really matters to each individual” based on the personality, tastes and wishes of each individual with the items that have not been discovered by him.

In this scenario, the RS turns to an approach of multidisciplinary knowledge, combining the traditional inputs (users ratings, items descriptions, etc.) with psychological aspects of users. For instance, TWIN¹² is a recommender system that creates a bridge between the automatic personality score estimation from plain text and the field of RSs, providing valuable recommendations of hotels of TripAdvisor^b for “like minded people”. Unlike other sectors where products have a more clearly defined utility or used value, in tourism the “product” utility is more often based on the tourists' perception and curiosity. In fact, the understanding of the curiosity is an essential precondition to understand the tourism sector¹³. Bearing this in mind, this section summarizes the state of the art in the two aspects combined in CURUMIM: serendipity in RSs and the relationship between personality and the environment in travel choices.

^a Expedia is a travel website that can be used to book airline tickets, hotel reservations, etc. (<https://www.expedia.com>).

^b TripAdvisor is a travel website company providing reviews of travel-related content (<http://www.tripadvisor.com/>)

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