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# Context Attentive Recommender System: A Survey

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**Abstract:** Recommendation is a process of suggesting something to someone. Since there is lot of information available around us, users find it difficult to find proper information. In order to solve this problem recommendation systems were being built that allow users to reach necessary information without wasting much time. The recommendation system is a weapon that helps users in finding the appropriate service within no time. Most of the traditional recommendation systems were being developed using content based filtering and collaborative filtering which works only on user and item profile. Many researches were done where it was found that beyond user and item profile, incorporating contextual information will enhance the prediction task and providing the more accurate recommendations. This paper surveyed the background, contextual information used in context based destination recommender system for tourism and types of algorithms.

**Keywords:** Contextual information, Recommender System, Context aware recommender system, Contextual postfiltering, contextual prefiltering, contextual modelling

## I. INTRODUCTION

The exponential growth of the internet usage by the users has greatly changed the social behaviour in many fields. The immense increase in the amount of digital data generated by electronic devices made it harder for users to find the interesting data within a reasonable time over the web. In order to solve this issue Recommender systems are developed to provide relevant information to the users within no time. Considering the tourism system, the web provides lot of information to the users about the destination places. Such excessive amount of information regarding destinations may make users to take incorrect decisions. User finds it very much difficult to get the most relevant destination places from such a huge amount of digital information. Tourism recommender system plays an important role in providing the relevant information to the users. Most of the recommender system generates the rating information, by considering only user profile (U) and destination profile (D), which is given by (UDR). They completely ignore the contextual information, which may give rise to generation weak ratings function that leads to weak recommendations. Building the recommender system using contextual information (C) with user and destination profile which is given by (UDCR) provide most relevant data to user. Contextual information adds more accuracy to the recommendation engine, as it provides the situation of a user under which the user would like to travel a particular destination. Many researches have been conducted with different approaches and techniques in context aware recommendation for tourists. Some techniques have been discussed further in this paper.

## II. LITERATURE SURVEY

### A. Data Collection

Data collection is the most important part of a context based destination recommender system for tourists. It has two parts, first one is collecting information about the user-destination i.e. collecting the data about users' interest for specific destination. The user's interest for a specific destination is shown through the ratings provided by the user for that destination. The second one is collecting the information about the context i.e. collecting the situational information of user while expressing his/her interest.

### B. Context

Context is a situational information which characterizes particular event. It is a circumstance that forms the setting for an event. The incorporation of contextual information in destination recommender system for tourists helps in enhancing the quality of recommendation. Context is an environmental situation under which event happens. The context information changes over time.

### C. Context Information

Context information is the situational data that is being used in context based recommender system. Many contextual information have been proposed depending on domain for which recommender system is built on. While considering the tourism domain the most familiar and most widely used contextual information is Location. This contextual data explains the current position of a tourist [2][4][6][7][8][9][10]. Next contextual information is Time. Time describes the current time at the tourist's end. Time can be characterized in weekday and weekend or Morning, afternoon and evening [2][4]. Depending on current time information

appropriate destinations are recommended. Weather as a contextual information also plays an important role in scrapping the appropriate the destination. The weather may be characterized as sunny, rainy and winter [3]. Other contextual information is user preference where user has to manually enter his/her preference [2][6][10]. Season is another contextual information which is classified into rainy, summer and winter[5].

#### *D. Context Acquisition*

In context based destination recommender system for tourism, the relevant contextual data is collected to generate context dependent tourist profile for prediction purpose. Context based tourist profiling is new way for tourist profiling which is proposed in [3], which addresses the limitations of traditional recommender system which used to focus only on tourist and destination and misses contextual data. context based rating generation technique is considered as multidimensional approach which accommodates tourist profile, destination profile and corresponding context information to generate the rating for tourist-destination. Actually the rating function is represented by  $R : \text{Tourist} \times \text{Destination} \times \text{Context} \rightarrow \text{rating}$  where  $R$  represents the rating function.

##### *Explicit*

The explicit way involves collecting the contextual information by directly asking the tourist to specify their interest. The system is dependent on user for their manual input. One way of acquiring the information is by directly asking the question to the user or let them fill the form.

##### *Implicit*

The implicit way involves collecting of contextual information by observing the user and sensing the user environment automatically. Location, time, weather, etc. are collected automatically using the smart devices that tourist has. In this approach there is no involvement of tourist with system for providing the data. system collects the tourist current location based on GPS that every mobile device has. Even time and weather information is collected from mobile devices.

##### *Inferred*

The inferring procedure involves collecting of information by simply tracking the tourist interaction with devices and resources and acquiring context by using statistical or data mining techniques.

#### *E. Rating Model*

Gediminas et.al. in [3] proposed two forms of model for generating rating model in context based recommender such as hierarchical structure or multi-dimensional model. In hierarchical structure the contextual information is arranged in hierarchical way, such as tree, to build the model. Such tree representation defines as a set of contextual dimensions, each having a set of attributes in which each attributes in the set has a hierarchical structure having a particular type of context. Ontology[1][5][10] and Context dimension tree[8] are the methods being used in hierarchical structure.

Gediminas et al. in [3] proposed second way to generate the rating model is by defining the context data as multidimensional model. This dimensions are defined in such a way that first two dimensions are tourist and destination and rest dimensions are the contextual data in which each dimension is a subset of a Cartesian product of some attributes (fields) having a single or domain of values. If suppose model assumes be  $n$  dimensions since the model take dimensions as a Cartesian product the rating function  $R : \text{Tourist} \times \text{Destination} \times \text{Context} \rightarrow \text{rating}$  can be defined with this dimensions as  $R : \dots$

#### *F. Recommendation*

Recommendation is a list of top  $N$  destinations that user might be interested to visit. This recommendations are taken out based on the prediction score which is actually the rating, the one with high prediction score will be to in list. Recommendation is a shortlisted destinations from predictions based on contextual information.

#### *G. Contextual Paradigm*

Context based recommender system are modelled with a data records which are of the form  $\text{Tourist} \times \text{Destination} \times \text{Context} \rightarrow \text{rating}$  where each and every record specifies how much particular destination is liked by a tourist in specific context. Three types of contextual paradigm are identifies in [3] namely, contextual postfiltering, contextual prefiltering and contextual modelling.

Contextual postfiltering procedure ignores the contextual information at initial phase and use one of the two dimensional model for generating the rating on the whole data set. The contextual information is considered as a part of destination and not as separate entity. Contextual prefiltering technique uses current contextual information of tourist to filter out the records from dataset that

pertaining to that contextual information. One of the two dimensional model is used over the filtered data set to generate the rating model.

The contextual modelling approach is a third type of algorithm that directly utilizes the contextual information to predict the rating for an item by formulating a multidimensional recommendation functions. This function represents predictive models that are built using probabilistic models, decision trees, regression or heuristic-based calculations by using the rating as well as the contextual information.

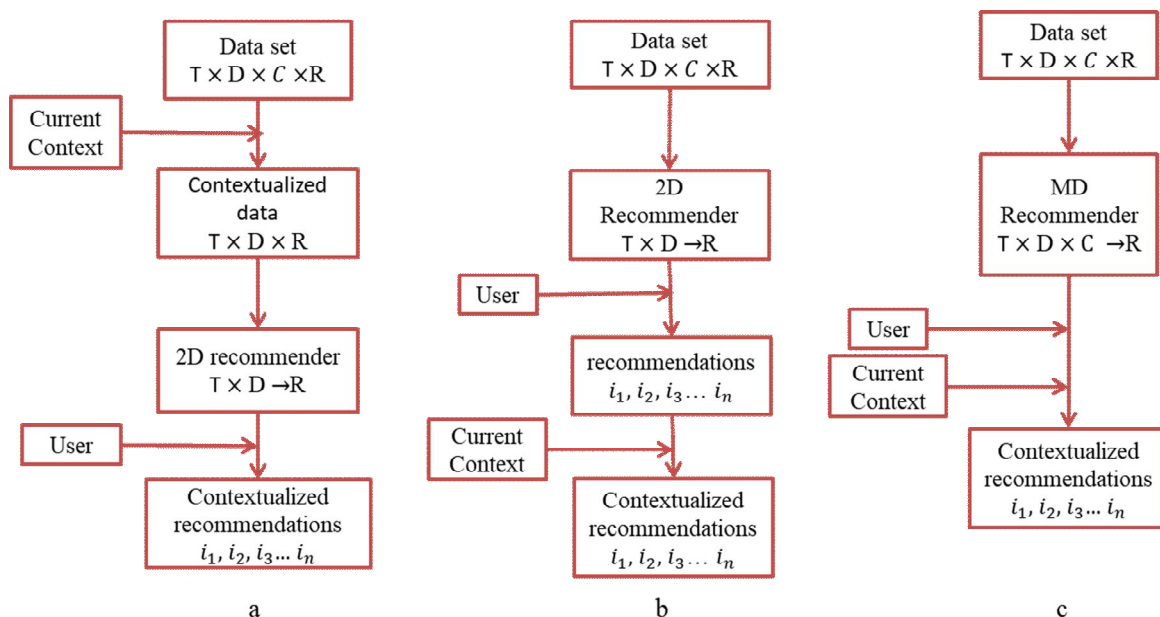


Fig 1. a. Contextual Prefiltering b. Contextual Postfiltering c. Contextual Modelling

### III.CONCLUSION

This article discuss the approaches that are being used destination recommender system for tourism along with the context that have been used in the system. It also brings the general techniques for acquiring contextual information. It explains the two rating generation model such as hierarchical structure and multidimensional models that can be used to build recommendation system.

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