HOTEL RECOMMENDATION SYSTEM BASED ON KASR SYSTEM

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Abstract:
In today's world of data, large amount of homogenous as well as heterogeneous data is available in service sectors like hotel, tourists etc. Accessing helpful information from these large pool of data is quite tedious task. In developing country like India, Hotel sector is becoming mature now and retrieving and providing information to the users to select appropriate hotel from any unknown place is very crucial. An automated system like recommendation system is useful to provide help in decision making process of any person. Large amount of hotel data, scalability and efficiency problem of traditional service recommendation system leads to create a new hotel recommendation system. In this intelligent system personalised recommendations are provided to the user based on keywords which elaborates user's choices and preferences [8]. This system uses collaborative-filtering approach to generate recommendations using MapReduce parallel processing paradigm. Implementations is based on real time data related to hotels situated in Pune city.

Keywords: KASR, MapReduce, Recommendation System, Hadoop, Collaborative-Filtering, Hotel Finder.

1. Introduction:

As traditionally developed recommendation system for hotel suffered from efficiency and scalability issues are tackled by developing Keyword Aware Service Recommendation (KASR) system which handles large data and generate recommendations based on ranking and rating basis. KASR is an intelligent system to address efficiency as well as scalability issues raised by traditional system. Big data analysis is handled by implementation this KASR on Hadoop environment with MapReduce. Collaborative-Filtering has two approaches based on memory-based model like user-based and item-based approach. As mainly is concentrated on user preferences user-based collaborative approach is widely used and suitable for KASR [1]. Results are tested based on hotel dataset which demonstrates improved efficiency and accuracy of proposed hotel-recommendation system based on Keyword – aware recommendation system (KASR). Also big data analysis is also current generation issues is handled by using this approach [3][4].

Objectives:

Traditional system provides recommendations and ratings are similar without taking care of user's needs, preferences so, new intelligent system based on KASR developed with following objectives.

- To save the time of an individual.
- Saves tedious work of an individual using the system.
- Make operation of the system simple and user friendly.
- To generate instant report.
- Availability of relevant information whenever required
- Improved decision making.

2. RECOMMENDATION SYSTEM APPROACHES

Recommendation System (RS) is an automated system helps in decision making process of a user's based on their needs and preferences [7].

Fig.1 Recommendation System Process

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Process of a recommendation system illustrated in figure 1 shows how recommender algorithm is used to provide useful suggestions based on given input data. Data pre-processing is a most important steps before sending meaning data to recommendation engine. In this step, duplicate entries, missing values such kind of impure data is removed from original input then processed to recommendations. Based on type of approach used for recommendation ranked list of hotels are generated then recommended to the users. There are two ways to provide recommendation
one is personalised and other is non-personalised recommendations with their approaches are shown in following figure2.

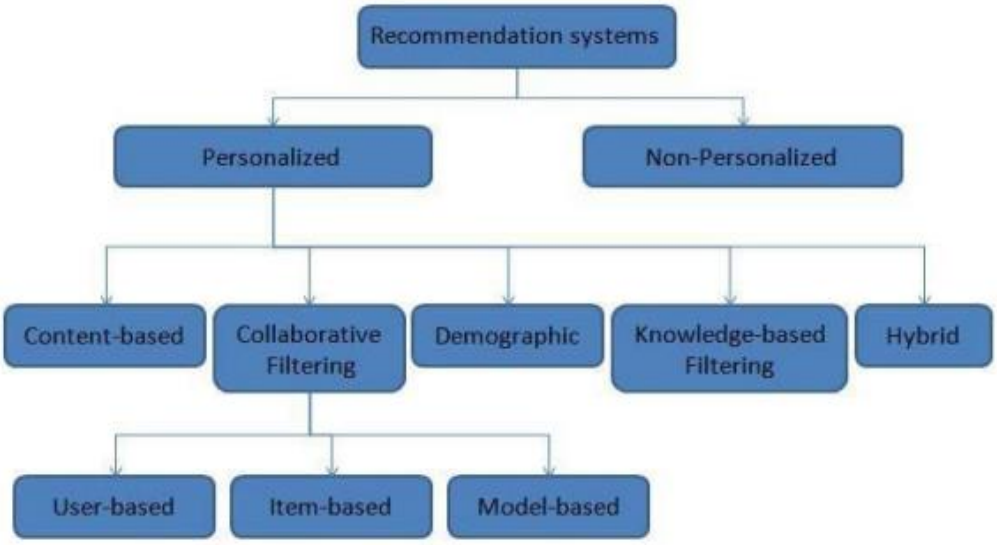

Fig.2 Types of Recommendation System

Personalised approach for hotel recommendations is preferred over non-personalised approach as it provides suggestions based on contents, description of products, rating and ranking given by users whereas non-personalised recommendations are more generic one.
Main types of personalised recommendations consists of different attributes enlisted in following table1.

Table 1. Personalised Recommendation Approaches

Approach	Technique
Content-based	Keywords, description of contents etc.
Collaborative Filtering	Similar users' preferences, explicit rating
Demographic	Demographic information like location, area etc.
Knowledge-based Filtering	Matches user requirements - resources features
Hybrid	Combines two or more approaches

In this work collaborative filtering approach is used consists of user-based, item-based and model-based collaborative-filtering approaches to provide recommendations. User-based approach computes user-user correlation based on user profiles description but this matrix is sparse as number of users are very high as compared with number of items available. So time required to process user-user approach is comparatively higher

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than item-item approach. In item-based approach based on item-item similarity values recommendations are provided which requires quite less time to process as compared with user-based approach. In both the approaches cosine similarity is calculated to find most similar users and most similar items respectively [6].

User- based approach consists of following steps to find most similar users

1. Finding set of items/products rated by target user
2. Find other users rates similar items
3. Find Similarity between neighbors.
4. Select top-K similar neighbors for recommendations.

Item- based approach consists of following steps to find most similar users

1. Finding set of users who rates given target item
2. Find other neighbors rated by user sets.
3. Find Similarity between neighbors and target.
4. Select top-K similar neighbors for recommendations

Model-Based approach is tremendously used as it deals with Sparsity problem of recommendation system. Large size dataset is well handled by this approach and provides better accuracy of recommendations than user and item-based approaches.

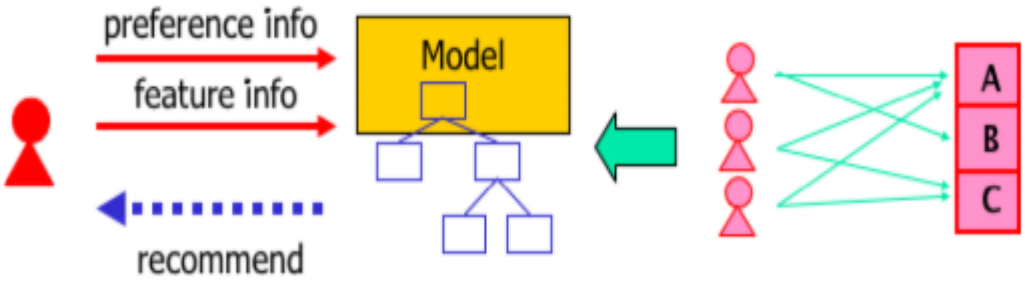

Fig.3 Model-Based Collaborative Filtering

As the model is built in advance of the online recommendation processes, this approach has a higher performance than the memory-based approaches and avoids the scalability problem. Depending on the learning techniques used to create the model, this approach can lead to higher recommendation accuracy and a reduced Sparsity problem. The major drawback of the model-based approach is that the recommendation results do not adapt automatically to data changes. Instead the model must be re-built to reflect updated data.

System Architecture: How Hadoop is working and MapReduce paradigm is implemented is shown in figure 4. This approach shows how efficiency and scalability is improved with respect to intelligent hotel recommendation system. Web crawling takes data from various sources and stored in database for further pre-processing.

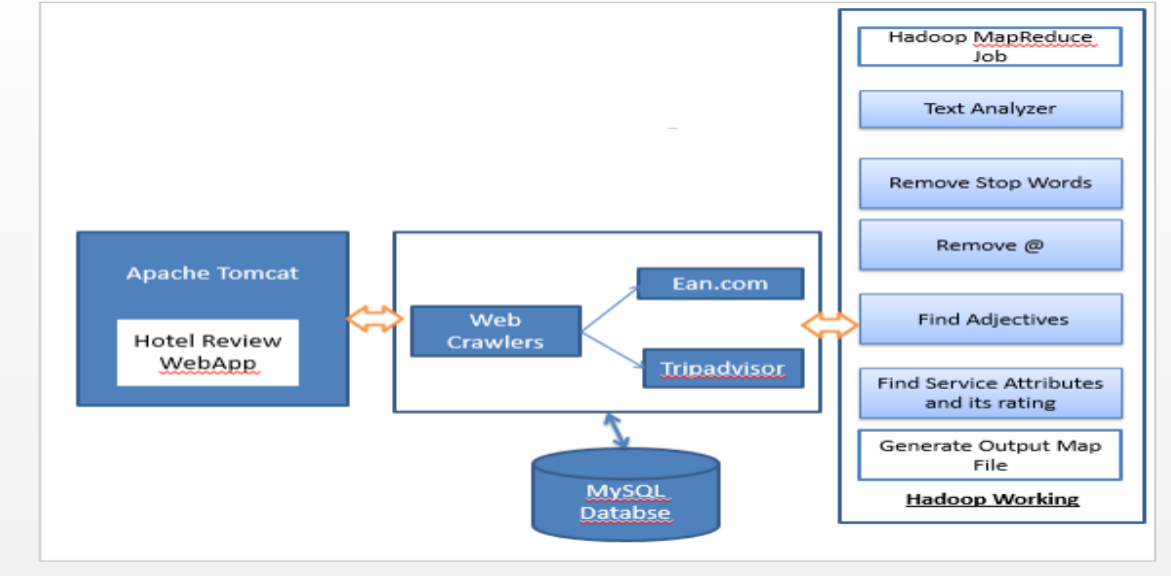

Fig.4 System Architecture

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Client Browser: - Using this browser the active users can enter the preferences for hotels. Web Crawler: - Fetching of previous users review is done using Crawler.

MySQL: - MySQL is used as container between Hadoop and browser.

Hadoop Working:

• Map-function generates intermediate key-value pairs based on given input

• Reduce-function based on intermediate key-value pairs generates small set of values by merging them

• After map-reduce analysis is done like stop-words removal NLP removing @ symbol and from this output file is obtained [5].

Implementation: Keyword-aware service recommendation system for hotel recommendation mainly consists of following steps

1. Based on Keyword capture users choices/preferences

2. Similarity Computation consists of most similar user (neighbors) based on their interests and raring given by previous users.

Implementation of keyword-aware service system which provides recommendations to the active users based is shown in figure 5

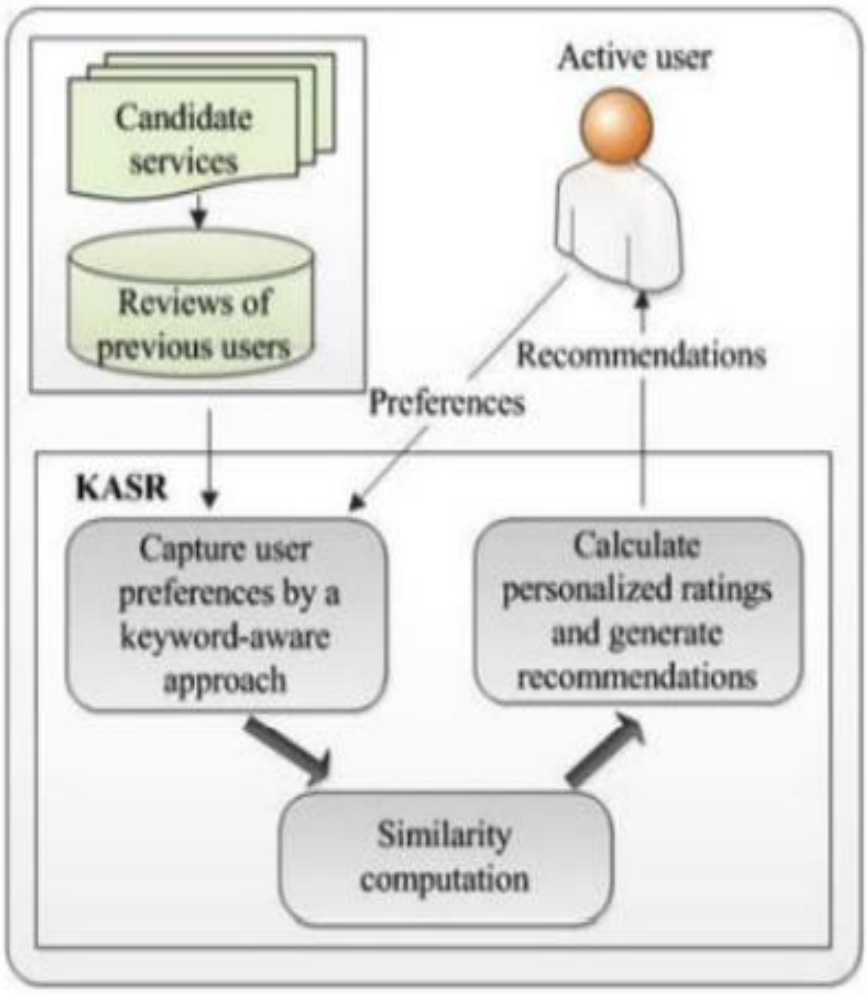

Fig 5. KARS implementation

Basic algorithm of Smart Recommendation System

Input: The preference keyword set of the active user APK

The candidate services WS={ws1,ws2,…,wsN}

The threshold δ in the filtering phase

The number K

Output: The services with the TOP-K highest ratings {tws1,tws2,….,twsk}

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1: for each service wsi € WS

2:R=ϕ, sum=0,r=0

3: for each review Rj of service wsi

4: process the review into a preference keyword set PPKj

5: if PPKj ∩ APK ≠ ϕ then

6: insert PPKj into R

7:end if

8: end for

9:for each keyword set PPKj € R

10:sim(APK,PPKj)=SIM(APK,PPKj)

11. sim(APK,PPKj) < δ then

12. remove PPKj from R

13. else sum=sum+1 r=r+rj

14. end if

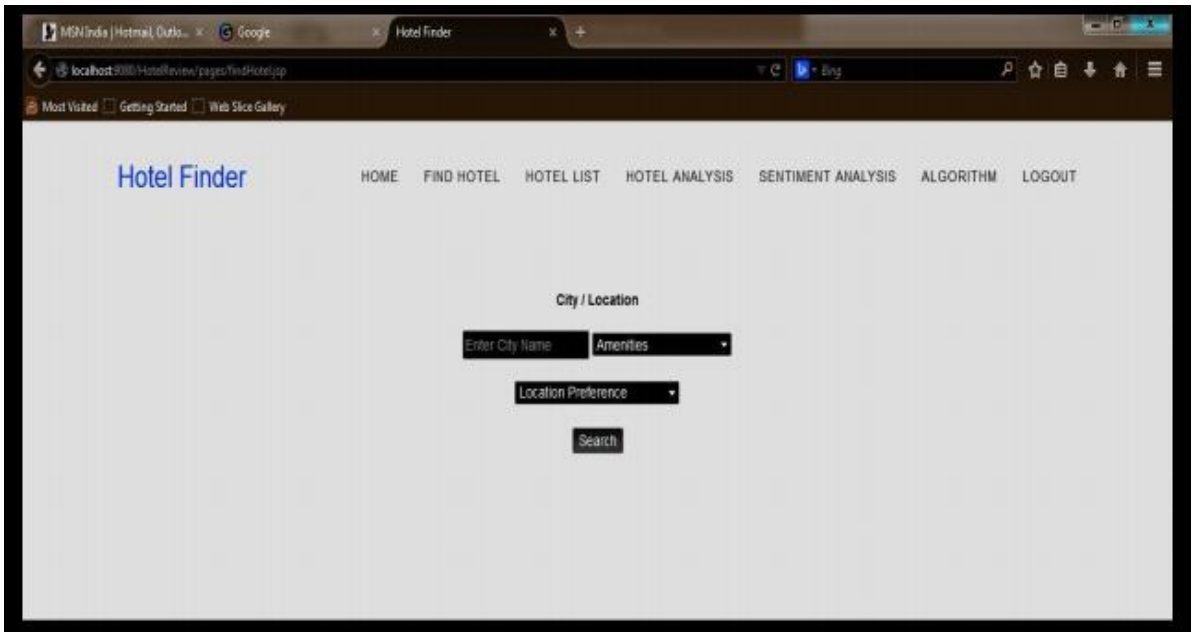
15. end for

16. r=r/sum

17. get pri by formula (7)

Fig.6 Recommendation System Algorithm

Results :



Hotel finder suggest different hotels to the users based hotel descriptions and explicit rating given by other users.

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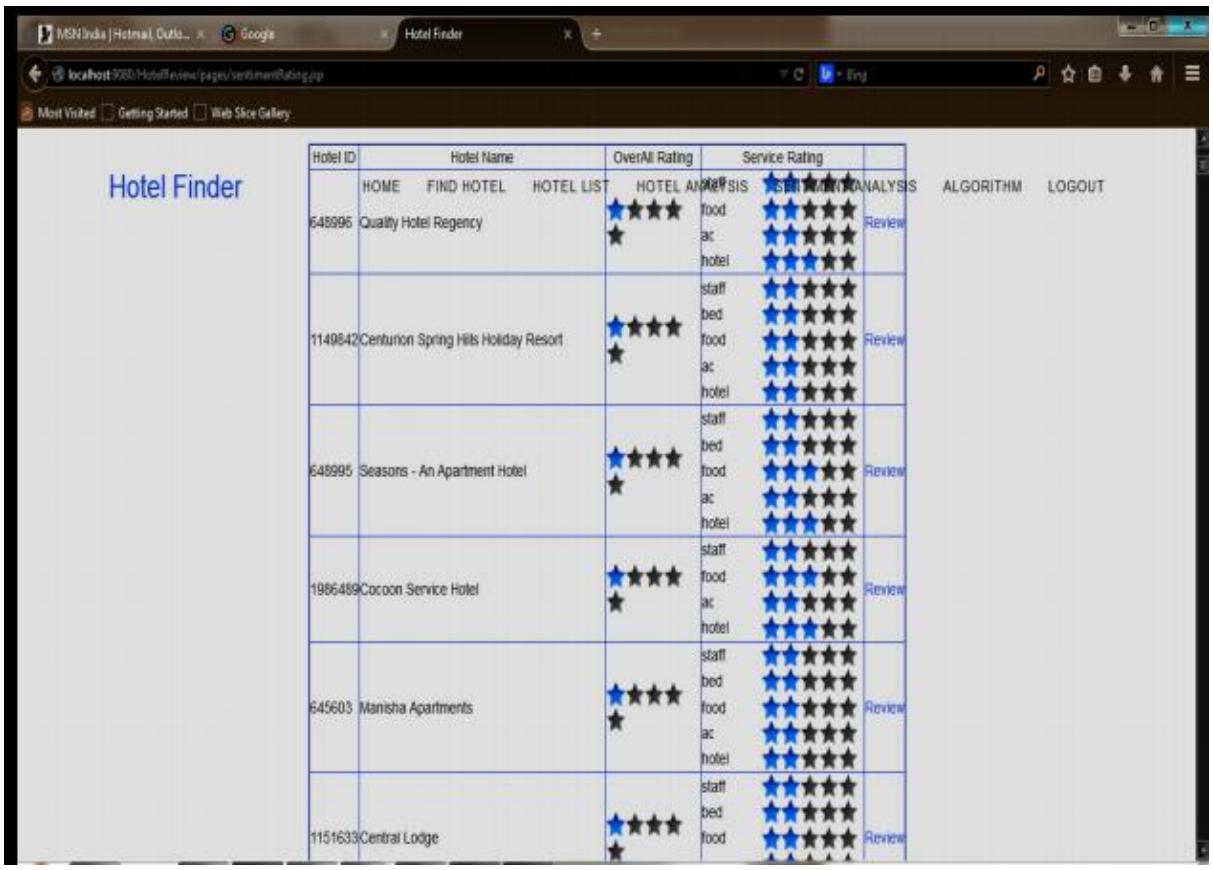

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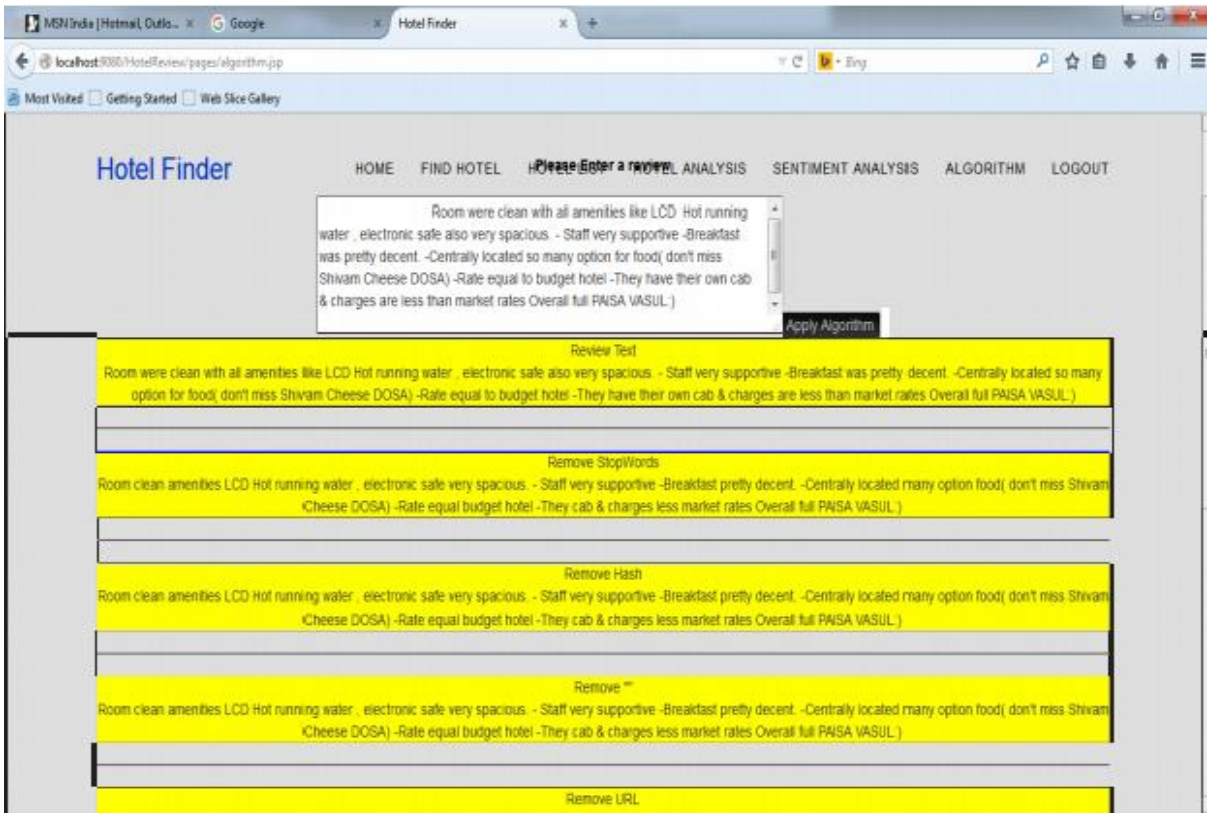

CONCLUSION

Keyword-Aware Service Recommendation provides best approach to active users to select appropriate hotel by providing list of recommended hotels. Preferences given by previous users and rating given by them personalised recommendation list is provided to the active users based on keyword extraction. Smart intelligent recommendation system successfully handles big data environment which handles scalability and efficiency of the system. This work may further elaborated based on different domains, positive and negative reviews related to various service sectors.

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