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Mobile cloud computing for building user centric mobile multimedia recommended system

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A B S T R A C T

In this paper we propose a Mobile cloud assisted Mobile Multimedia Recommended System. In previous recommended systems heavy network overhead and context processing consumes huge computation. In system we are building recommended system of Multimedia in mobile cloud by using cloud which totally reduces network overhead and speed up recommended system and also rules are generated from user contexts, user's relationship and user profiles are collected also whenever a new user arrives the rules are extended optimized to prepare real time recommendation. The distributed architecture of Mobile Cloud Computing in utilized to overcome the process of offloading in Multimedia Services. The result provides desired service high precision, high recall and response delay.

Introduction

According to latest forecast it is expected that the number of mobile users will exceeds 1000 million by 2018. The limitation of mobile device such as short battery life, limited storage and computation power are all overcome by integrated concepts of Mobile web and cloud which gives a new parading called Mobile cloud computing. Involving this concept we are building a recommended system for mobile multimedia services. The users of Internet post large number multimedia messages such as video clips on video sharing website or social network applications every day. Facing these millions of multimedia web pages or online users are difficult to find this favorite or required concept may be based on location, time or also profession required videos or knowledge based videos, based to keywords or such, so. We provide a recommended system by which very easy process of recommendation is done and based on user behavior information like user location, user age, user profession, user login information based grouping means context clustering is done and based on complete user profile details and user context details by utilizing this user information some of video sharing websites recommended the list of videos for end users

we do video classification, video deception tag or watching history.

When users want to go with this favorite video different recommendation techniques are commercially driven and are very import for mobile multimedia applications. When comparison of different recommendation system is taken into consideration, we have some examples of which successful video recommendation algorithm and system that have been developed and exploited. Some examples of them are Google has content based filtering type of recommendation system in its Adwords service. Amazon used collaboration filtering recommended system Face book uses social network filtering.

By considering all these examples we have three challenging issues they are recommendation satisfaction, cold start and timelines in content recommendation. When we worked out with existing recommender systems or logarithm these was found two important essential components they are

- User interest identification, user interest recommender and result re-ranking.
- Different collectors that collect user context and activities content attributes and few contextual information such as time location age user opinion and so on.

In existing system real time recommendation cannot be guaranteed due to inevitable increment of computations. User interests and content clustering are often used to narrow the searching range of related content of user information for analysis.

In this paper we propose mobile multimedia recommender totally based on user behavior information. The three differences between proposed and existing system are as follows:

- Decentralization of collector and user profiles in to several computing nodes.
- Only user profiles are not collected but all the user behavior clusters are collected.
- Content based collaborative and context aware and graph based optimization mechanisms are introduced t speed up recommender system process.

Following are the contributions of proposed system

- Instead of detailed user profiles user clusters are collected to overcome network overhead, user based clustering is performed at first and then the collectors collect and calculate user cluster according to the user cluster to the recommender only.
- Here user clusters and multimedia content are collected, distributed and sorted in to distributed architecture of Multimedia service file system. These are partitioned during recommendation in to several checks and based on clustering of users splitting and merging together based on views and profiles.
- Rules of recommender system are recorded to improve scalability and real time recommendation. In system existing always recommended a ranked list to users after training from data but in proposed system a real time ranked list with all other different recommendation system, we can also put mapped reduce concept in cluster groups this speeds up the recommendation system even more.
- The problem of handoff mechanism and offloading in the multimedia services are overcome by the extraordinary distributed cloud architecture provided in mobile cloud computing. Does plays main role in multimedia services as it

may span difference in 2g 3g or in 4g and coherent information to mobile users

Related work and system architecture

Recommendation system

Recommendation system mainly focuses on specific domain of the user (Feng Xia et al., 2013). Recommender systems share in common means for describing the items that may be recommended a means for creating a profile of the user that describes the types of items the user likes and comparing to determine what to recommend (Yong et al., 2011). There are three main functions to be performed by a basic recommender system

Information collection: this explicit or implicit feedback from interactions of users and multimedia recommender system

Recommendation learning process:This process provides the steps of clearing algorithm and information filtering from user information collectors.
Resource prediction: from the data set collected from user information and similarity or context prediction for recommender system is done from the user preference and interest

Different types of recommendation systems

There are around seven different types of recommendation system they are

1. Collaborative filtering [CF] recommender system: In this type of recommendation users are recommended based on items that people with similar tastes interest and preferences like in the past. This has two approaches user based and item based. Do not have over specialization (Yong et al., 2011).

2. Content Based [CB] filtering recommender system: In this recommendations are given by automatically matching a user's interest with item contents .note the recommendations don't depend on information provided by other users but only solely on items contents and users profile .then descriptions is more there prediction is even more accurate .there is a chance of creating a problem of over specialization when user does not rate them.

3. Knowledge based recommender system: In this type of recommender system all the knowledge about the users and items (multimedia) and then applies this knowledge of aggregation to generate recommendations. Sensitive to preferences change requires a very good understanding of domain in question. When we consider technical aspects knowledge engineering expertise is required.

4. Utility based recommender systems: In this type of recommender systems makes suggestion based totally on a competition of the utility of each object for the user .the central problem is to create a utility function for each user. The user profile is itself called utility function that the system has derived for the user and the system employees constraint satisfaction to locate best match.

5. Demographic Recommender Systems: In this type of recommender systems the main aim is to categorize the user based on personal attributes and make recommendations on matching between a users rating history and other users rating history with same type of interests.

6. Context aware Recommender Systems: when analyze user interest they vary according to location time and emotion this type of recommendation systems complement users context sensed on smart phone and longtime user profile to assist the

user in selecting better services audios, videos, photographs or videos dynamically. The situation context or only context is a very difficult concept to capture and describe fuzzy on ontology's and semantic reasoning are used to augment and enrich the description of context

7. Graph based recommender Systems: When we question why graph the graph is built in the systems to calculate the correlation between recommendation objects moreover recommendation problems turns into a node selection problem on a graph.

8. Hybridized Recommender Systems: In this type of Recommendation systems we combine collaborative and content based filtering recommendations. Advantages of both the types are only made use in this recommendation.

Cloud based Mobile Multimedia Recommender system

We propose a novel Mobile cloud based recommender system for video applications. The frame work is shown in the figure 2. The system is divided in to two parts they are: recommendation training and real time recommending.

When we came to recommending training components we have collect contexts user relationships and user profiles and then cluster and filter the behavior data on distributed platform to obtain recommendation rules and also will return the recommendation lists in accordance with respects to optimization rules we describe the focus components and procedures in our framework they are as follows.

1) User behavior context collectors: There are many video surfing information that depends on user context type (such as user time, user location, user network type etc) user interest (such as browsed content, access patterns and preferred keywords and categories) friend recommendations (such as reviewed, replied, commented and forwarded relationship). All the user contexts information cannot be easily retrieved on application server. Application plug ins are loaded at user terminal to collect the contexts .whenever the context types and online users increase by that time networking and computing resources also be consumed quickly. Initially collected contexts are clustered at the server side to overcome high dimensional contexts. Application plug-ins use clustering rules to calculate the uses clusters and clusters are reported to context collectors instead of former user contexts so by this method networking and computing load is retrieved. To maintain and guarantee that clusters keep fresh; context collecting and clustering will be restarted periodically.

2) User content clustering: The main function of this component is to find user content similarly by exploiting user's social connection and user profile. All the social connections are retrieved from users actions on videos shared by other users along with content categories of users profile several communities are formed .in each community content descriptions (such as filters tags and resolutions) content access patterns are divided or mashed into 6 attributes tuples. Then the user content clustering algorithm is executed on the each tuple to obtain user internet cluster user content similarity to form effective clusters.

3) Dynamic recommendation rule generating: When all similar users and user content lists of a user are stored in his profile ,for each and every user the

system as to allocate storage space with user increase of users and videos. So the system becomes unsalable and brings more latency to the search recommendation taking user contexts into consideration some user contexts risks will be duplicated. To come out with this problem rules of recommendation are extracted from user contexts clusters and user content clusters .the main rules are composed dynamically during real time recommendation.

4) Optimized real-time recommendation: The main real time component accepts the user's new requests and reply with list of recommendations to user. The procedure converts the users request into recommendation rules on the basis of request the words and implicit user context and also searches each users for favorite according to rule implied To be guarantee with the user experience the procedure must provide a real time response with respect to request them. Adjusting is happen in system to the process of execution in order of rules based on weighted graph to minimize the searching latency.

User behavior construction and analysis

Almost all the mobile users totally depend on accurate and complete user behavior models in making perfect recommendations user behavior means user information based on situation, context, location, time, emotion, may be user preference also may be user interest sometimes user behavior also consists of users likes and user ratings based on the application they are into based on the all information we divide user behavior into three kinds they are access preference, social activities and reading interest .these are extracted from connection maps and user profiles.

1. User contexts and access preferences: when we went through a process of verification it was shown that user context are essential to provide user a right service in ubiquitous networks. Users, access attributes are analyzed and similar conclusions are taken such as access network types (and devices taken effect on the resolution length and bit rate of requested videos)also access time and users location makes effect on the accessed video categories of the mobile users. This gives combinations are occasions of contexts the same users shows extra difference of his interest for example 3g user in journey prefers short video clips or TV series with low bit rate while with wifi in the office neglects length of video and prefers the clips with higher resolution Same way some like fixed time at specific time on some like random time specific resolutions. The cluster users and to collect user clusters we developed plug-in on the user terminal with user context collecting protocol.

The working of the protocol as follows

1. The plugins on initial users collect basic user contents such as network type, device type, access time, leave time, location. The contexts are then given to collectors at the server side.
2. The collectors store the context into an input type with five attributes which are given in step 1.
3. All the features of associated accessed video are mapped into an output type with five attributes such as video resolution, video length, video bit rate, video age and video categories.
4. Based on all these input and output tuples the method subspace clustering through attribute clustering is adapted. Here we drop noise points, merge some

small size clusters base these rough clustering rule generated.

5. The server takes the cluster rules into key value pairs and pushes all possible rule pairs to mobile users.
6. Whenever the user request is given the plugins will collect user context and will compute the belong cluster.
7. The cluster will be given to collectors at server side for later clustering and recommendation repeatedly.

2. User connections and social activities: There are several multimedia sharing websites like flicker, facebook, twitter, etc., user all assign tags on resources. This tagging information is analyzed the co tagging behavior of users indicated to show high similarity and specific .so by the connection of use context the community collectors perform function of collecting information by user connection activities, Smart communities and social activities. When we consider online users often the resources used or recommended by their concerning users or groups of interest are given, based on relationship of user –users or user resource in social network. So from this better performance and lower time cost of recommender system is achieved. The main clients of user's relationships are idol, fan profiles, co commenting behaviors and interest groups

In idol fan profiles –if one user adds another user as his idol, then those two users are linked together same way if both take each other as idols there is two edges between users. Co-commenting behavior -when a user comments on his interested video, an edge links user and video Interested group – when a user joins an interested group, he is connected with the group.

3. User profiles and viewing interests

Contexts clusters and social communities make a rough recommendation for users' .For making recommendations accurate we depend on users reading interest on content which are extracted from users profiles which keep track of videos watched or viewed .the constructions of users profile is done from two concepts-video content and video attributes.

1) Videocontent: It is characterized by a probability vector of keywords in video title and tags and the vector is denoted by ({key1, pro1}…..) if tags are synonyms associated elements will be merged.

2) Videoattributes: along with video content user interested videos have many specific features such as video length .video resolution, video popularity and video age which are denoted as a list so we obtain the probability of users interests on specific video clusters by analyzing historic attribute lists from user profile.

IV. Cloud based clustering for user behavior information

The features of protocol is made use and for k means algorithm of clustering based on the basic analysis of user profile user interest, user preferences comparisons done.

Cloud multimedia recommender system uses a hybrid recommender system to do the process of recommendation so we provide this activity in order to speed up the process of recommendation. The Dataflow Diagram of the Hybrid Recommendation is shown in the figure 5.

Figure.1 Basic Mobile Multimedia Recommended system Frame work

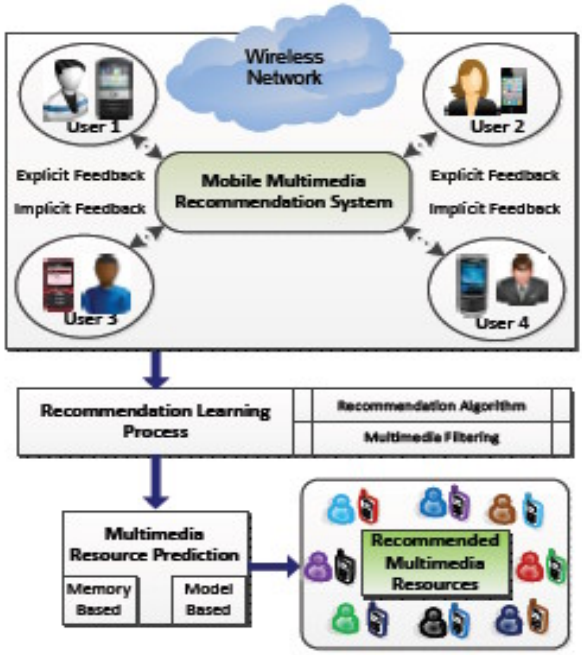


Fig.2 System architecture of cloud based mobile multimedia recommended system

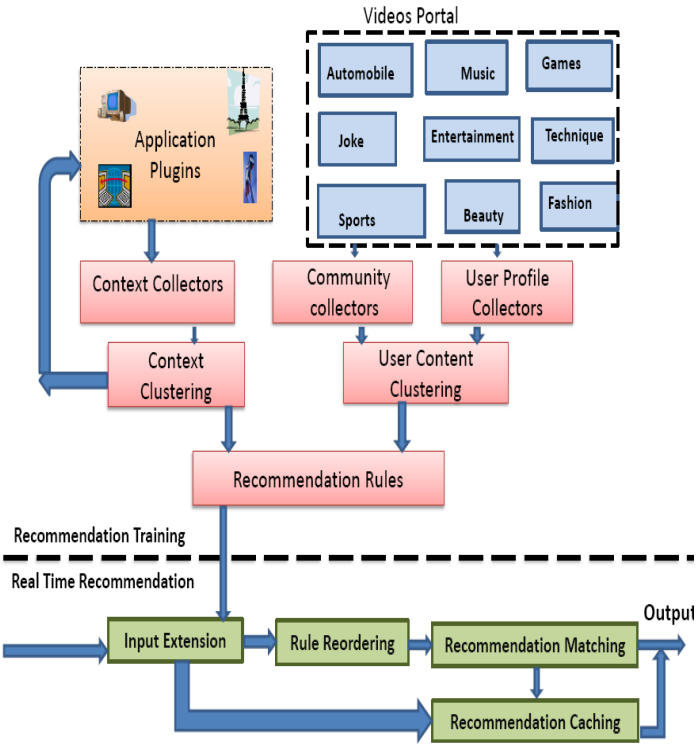


Fig.3 Protocol of user context collector

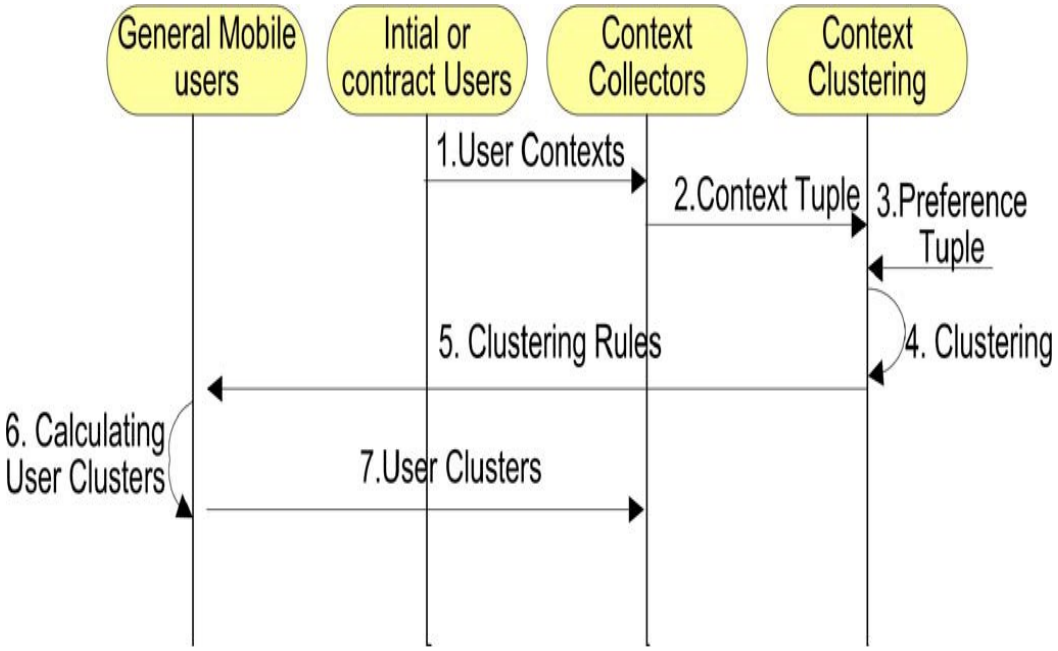


Fig.4 Protocol user Context collectors

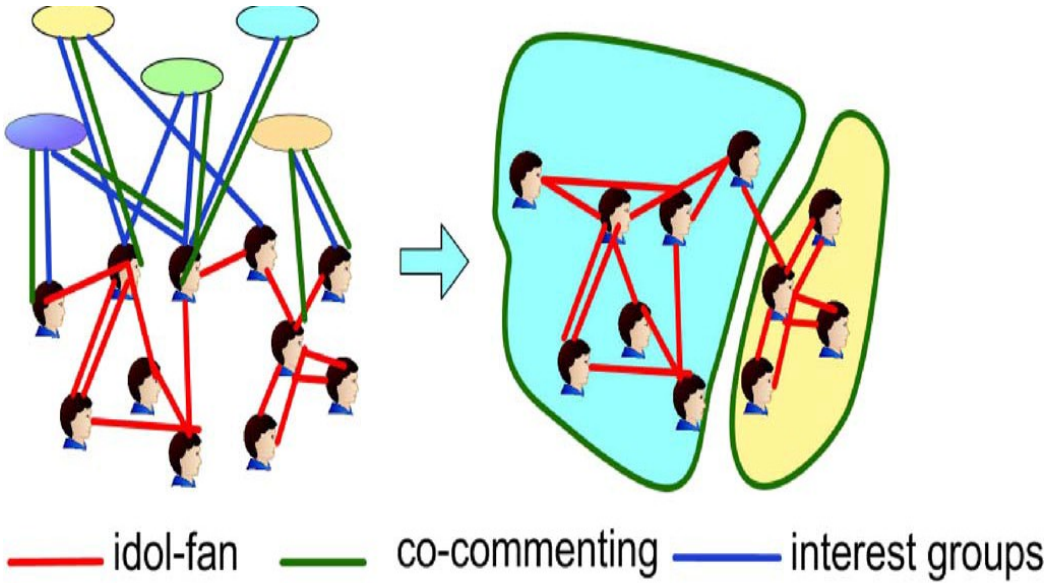
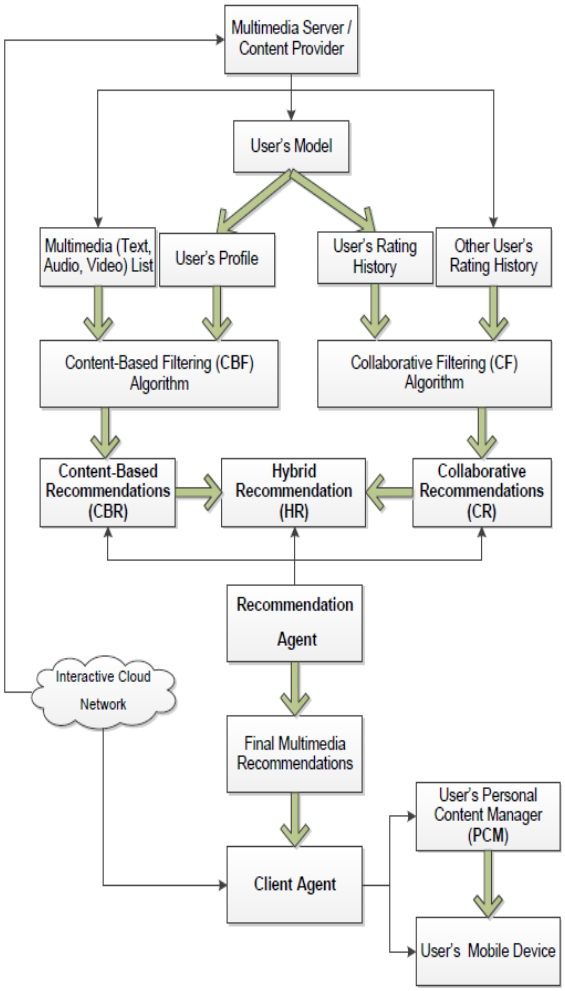


Fig.5 Dataflow diagram of hybrid recommender system



In this we show how the request of user reach server and by applying rules of recommendation How are the information about user profile, users rating history and other methods of user preferences are analyzed and applied on concept of content Based Filtering and collaborative filtering after Process of filtering the process of recommendation is applied when these two different type of Recommenders are combined they form Hybrid Recommender system Based on these 3 forms of Recommenders Recommendation agent does the final Multimedia Recommendation and given to Client Agent for users Personal Content manager and then to users mobile device by utilizing the features of Interactive Cloud Network.

Results and analysis

Effect of Number of Clusters: There are Three different types of clusters used they are effect of user profile cluster number, the number of attribute clusters is evaluated then at last the number of user group clusters. When we undergo by cumulative method we also improve Quality of recommendation step by step.

Clustering latency: In the cloud platform the clustering latency is not reduced when the

cluster number is small but overall it helps in increasing the performance of the system with the help of increment of the cluster number.

Real time Recommendation Latency: When compared with existing system the real time latency of Systems is reduced for another 50% i.e. six times rather than collaborative filtering only is used.

Conclusion and future work

In this Article we have proposed a mobile cloud assisted recommended system for multimedia based on Hybrid recommender system utilizing all the user behavior information and making user centric recommendation System for multimedia by distinguishing other existing recommendation systems as well as the storage of resources in cloud and a distributed architecture is provided for computations and perform rule based recommendation instead of lists. The analysis says we Provide higher quality of recommendation with totally low training latency and Training latency and recommending latency.

For Future work still much more innovative Mobile Multimedia recommendation Paradigms such as Proactive, Sensor based, Accurate recommended systems can be built in Distributed architecture to reduce hit rate even More.

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