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Performance Evaluation of Merkle Hash Based Decision Tree Model on Context Aware Geo Tagged Data Mining

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Abstract
Geo tagging is the progression of addition on geographical detection metadata to different media such as a geo tagged photograph or video, websites, SMS messages which is in the form of geospatial metadata. The data in multimedia resources are clustered with suitable latitude and longitude coordinates. It also consists of altitude, behavior, space, accuracy data, position and possibly a time stamp. The existing work was offered a Keyword Extraction Technique based on real-time automatic speech recognition solution. The system uses topic modeling techniques and sub modular reward function favors diversity in keyword set. The multiple topics are derived and separate queries from keyword set in order to maximize chances of making at least one relevant recommendation when using queries to search over English Wikipedia. However diverse key word extraction did not extract context aware keywords and Query formulation was more generic. Therefore, Merkle Hash Based Decision Tree Model on Context Aware Geo Tagged is proposed in Data Mining approach to suggest better geographical data on social media. Initially, user reviews are collected with various features on several social media which consists of relevant and irrelevant information. Next, Geo tagged mining algorithm is developed for adding additional features and capture the information at the time adding features. After providing the geographical identification, context aware gives the suggestion and explanation about the tagged features. Finally, Merkle-hash based decision tree model is introduced to split the decision tree information into various sub trees to sign in many messages. The advantages of Merkle hash tree is extracting clear features and removing the unwanted features for data mining.

Key Terms
Geo tagged mining algorithm, Merkle Hash Based Decision Tree Model and Context Aware Geo Tagged

I. Introduction

A. Data Mining

Data mining is referred as the extracting or mining knowledge from huge quantity of data. The mining of gold from rocks or sand is considered that are referred to as gold mining relatively than rock or sand mining. Therefore, data mining must have more suitably knowledge mining from data. There are many other terms carrying a related or somewhat different meaning to data mining, such as knowledge mining from databases, knowledge extraction, data/ pattern analysis, data archaeology, and data search. Knowledge discovers is one of the data mining methods used for data analysis from different user information. Data mining technique extract the hidden information from data base and they perform the classification process. Therefore, extracted hidden information provides the fundamental information about the users.

Data Mining is organized during various types of data mining software. Data mining field appear extremely efficient techniques and approaches like association rule learning. Data mining also executes attractive machine-learning algorithms like inductive-rule learning with the construction of decision trees to the development of large databases process. Data mining is commonly represented as mining of data to establish the knowledge and it is called as Knowledge Discovery in Database (KDD). It is described as the non trivial method of recognizing the reasonable patterns in data. Classification, clustering, regression and association rule learning is the major subtask used in data mining process. While data mining and knowledge discovery in databases are frequently treated as synonyms, data mining is actually part of the knowledge discovery process. The Knowledge Discovery in Databases method consists of a few steps that are most important from raw data collections to some form of new knowledge. Data cleaning and data integration can be executed collectively as a pre-processing phase to produce a data warehouse. Data selection and data transformation can also be combined where the consolidation of the data is the product of the selection, or as for the case of data warehouses, the selection is done on transformed data.

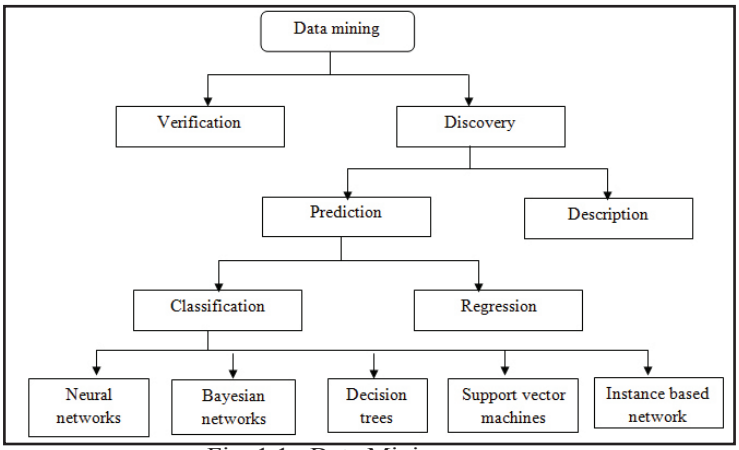

Fig. 1.1 : Data Mining

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Knowledge Discovery in Database is a routine process that examine and analysis the representation of data from data repositories. KDD process discovers the occupied data for improving the undefined pattern determination. The process of identifying the data or knowledge from different views of information is known as KDD process. Data mining is the method of determining the connections or patterns with dozens of fields in large relational records. Data Mining represents a method planned to examine large amount of data gathered. It is also a collection of tools employed to execute the process. Data collected from different areas like marketing, health, communication are employed in data mining.

B. Context Aware Computing

Context-aware computing is described based on four categories of context-aware applications. They are namely, proximate selection, automatic contextual reconfiguration, contextual information and commands and context-triggered actions. Context-aware software make use in distributed computing according to the location of exploit, gathering of nearby group, hosts, and available devices, as well as to changes to such things over time. A system through these facilities can observe the computing environment and respond to changes to the environment.

Context consists of lighting, noise level, network connectivity, communication costs, communication bandwidth, and even the social situation. When a group of people is in one place, the people can share the physical objects without difficulty in that place. Contextual reconfiguration may also include operating system functions. Contextual information and commands intend to develop the queries on contextual information and produces different results according to the context.

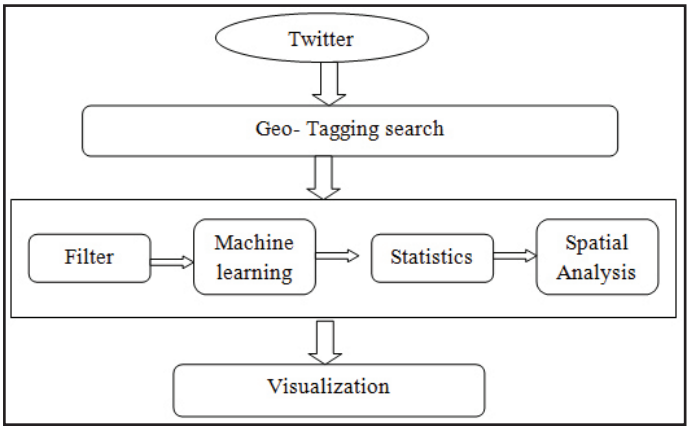

Fig. 1.2 : Context aware computing

Above figure 1.2 shows the basic diagram of context aware computing. Context-aware computing refers to a universal class of mobile systems that can mind their physical environment and adjust their performance accordingly. Context-aware system is a part of ubiquitous computing or pervasive computing environment. Context is very essential because it presents information about the present status of people, places, things and devices in the environment. 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 related to the interaction among a user and an application including location, time, and activities. Context-awareness is one of capable to use context information.

Context-aware recommender systems are using the user's context such as the user's position, social environment to recommend items. This system evaluates some types context information is relevant in a mobile shopping recommender system and this information utilized to improve recommendations of clothing items in a context-aware recommender system. By incorporating contextual mobile data into the recommendations it is expected, that the recommended items produce the customer's needs and hence customers are satisfied with the recommender scheme.

C. Merkle Hash based Decision Tree model

A hash tree or Merkle tree is a tree in which every non-leaf node is making with the hash of the labels or values of its child nodes. Hash trees permit proficient and protected authentication of the contents of large data structures. Hash trees are a simplification of hash lists and hash chains. The hash tree involves processing an amount of data proportional to the logarithm according to the number of nodes of the tree. Authenticated Data Structures is a technique in which some kind of authentication data is stored on the DSP. On the client's query, a DSP returns the queried data along with some extra authentication data that is then used by the client to verify the authenticity of returned data. A hash tree is a tree of hashes in which the leaves are hashes of data blocks in, for instance, a file or set of files. Nodes further up in the tree are the hashes of their respective children.

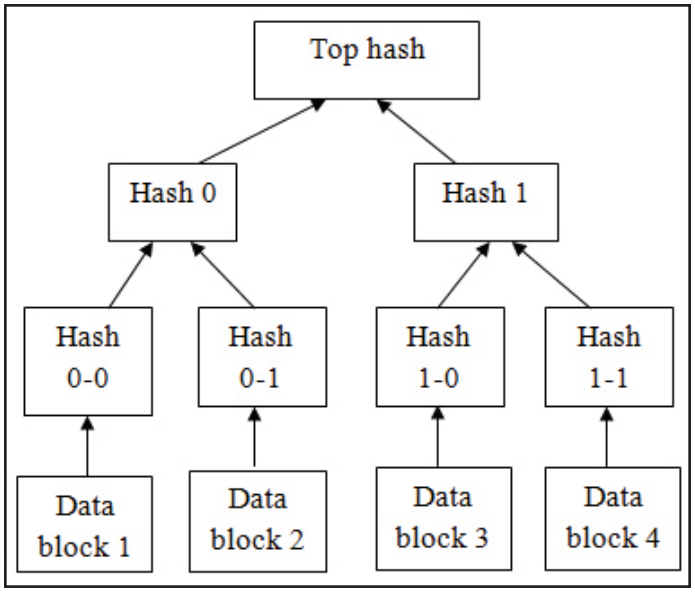

Fig. 1.3 : Merkle Hash based Decision Tree model

Merkle proposed a Signature Scheme based on a binary tree of hashes. Data integrity schemes based on MHT have been designed by replacing binary trees in original Merkle's Signature Scheme. The integrity of data blocks is verified and the hash tree does not need to be transmitted to the verifier. A signer transmits the hashes of only those nodes which are involved in the verification path of the data block under consideration. Leaf nodes in the Merkle hash tree are linked with direct pointers. Therefore, Merkle hash tree technique avoids maintenance or fetching the copy of whole data in order to run an insert or update statement. Hence, the process of inserting and deleting the data is simplified where the way are used in traditional database.

II. Literature Survey

1. Keyword Extraction and Clustering for Document Recommendation in Conversations

The keyword extraction from conversations was explained in [1]

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that used to recover the keywords for every small conversation fragment. There are number of relevant documents presents keywords conversion that are recommended to contributors. Here, the keyword extraction algorithm is developed with the help of topic modeling techniques and sub modular compensation idea. These keyword extraction matching minimizes the noise ratio and provides better potential diversity. Therefore, proposed keyword algorithm minimizes the relevant recommendation and split the queries from different keyword set.

With the application of conversation fragments, proposed method improves the word frequency or topic similarity. Therefore, implementation of both relevance and diversity fetches an efficient enhancement to keyword extraction and document retrieval. The keyword extraction method is improved by considering n-grams of words along with the individual words, but this desires some adaptation of the whole processing chain.

2. Document Recommendation in Social Tagging Services

Social tagging services were described in [2] that allow users to explain different online resources with generously selected keywords (tags). They make possible for users in the finding and organizing online resources and also to present significant collaborative semantic data which can potentially be exploited by recommender systems. Recommender systems alert established learning on user rating data whereas social tagging data is appropriate more and more prevalent.

Tagging data with the use of recommendation consider the document difficulty such as web pages and investigate document. Therefore, a novel graph-based representation learning algorithm is designed in proposed methods. The users, tags and documents are represented in the same semantic space in which two related objects are close to each other. However, the scalability on large database is difficult.

3. Behavior Identification Based on Geotagged Photo Data Set

Geotagged photo data set [3] produces a set of image data with geographic information, time information and text description information. The user's important location is identified with the help of data behavior and presence of location. These help's the data users to arrange the enormous image data. Based on the data arrangement, proposed method produces an index based on multiple classification result. They divide the dataset in several times and allocate the data to produce an index according to the predictable probability of classification results. This achieves the identification of users' important location and daily behaviors.

4. Personalized and Efficient Geographical Location Recommendation Framework

Geographical influence achieves maximum production based on location-based social networks for location recommendations. The geographical influences on users' check-in behaviors are modified. Hence, a personalized and efficient geographical location recommendation framework [4] was proposed and it is known as iGeoRec. The proposed iGeoRec method obtains full advantage of the geographical influence on location recommendations.

The proposed iGeoRec method examine with two investigations such as follows. Initially, they were personalizing the geographical influence to accurately calculate the probability of a user visiting a new location. Next, the probability of each user is computed efficiently to all new locations. Therefore, a probabilistic approach is developed in proposed method to personalize the geographical influence as a personal distribution for each user and predict the probability of a user visiting any new location using her personal distribution.

5. Optimal Parameter Selection Using Merkle Hash Trees

The selection of optimal parameters is implemented using Merkle hash trees [5] and the parameters are such as block size and tree depth. The Merkle hash trees are based on the size of the memory region that need to be sheltered and the number of memory updates between updates of the hash tree. The cost of updating the hash tree is derived using optimal block size for the leaves of a Merkle tree. It is provided with the file size and update interval that minimizes the cost of update operations.

Initially, a minimum update cost is achieved by a hash tree during suspicious collection of the block size at the leaves of the tree. Next, it obtains these optimal block size which provides easy parameters that are easily determined in practice. The selection of optimal parameters for tamperproof memory direct to efficient systems for secure, trustworthy execution.

6. Location Recommendation Algorithm Based on Temporal and Geographical Similarity

A new location recommendation algorithm based on temporal and geographical similarity [6] was proposed by improving the traditional location recommendation. Initially, proposed algorithm modifies the traditional processing method of time dimension. The proposed time division divides the time period according to the regulation of people's work and life. This measures the user's similarity to provide the time period with more accurate.

Next, location recommendation algorithm is enhanced by introducing grid thought along with the cluster objects. The speed of location recommendation algorithm is improved by containing check-in points. Finally, a new rating function is proposed for the potential points of interest which are never visited by the user. Here, the users-clusters matrix is used to analyze the most comparable users and the corresponding similarity.

7. Personalized Travel Recommendation

Leveraging community-contributed data such as blogs, GPS logs, and geo-tagged photos are considered for personalized recommendation [7]. Active recommendation considers contexts and human activities by leveraging the liberally presented community-contributed photos. In addition to that specific user profiles or attributes are considered to perform personalized travel recommendation.

The automatic detection of people attributes and travel group types in the photo contents were developed. Based on the measure of information-theoretic, user profile detections are informative and effective for travel recommendation. The demographics of individual and group travelers are extracted from various locations and their respective path. Finally, probabilistic Bayesian learning framework is considered to provide broad examination of profiling activities in communities according to temporal and spatial information.

8. Contexts-Aware Location Recommendation Using Geotagged Photos

This paper [8] investigates context-aware methods to present location

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recommendations matching on a tourist's travel preferences and visiting context. The location of touristic is identifies by applying clustering methods and remove travel records from geotagged photos on Flicker. Therefore, a novel context similarity measure is proposed to compute the similarity between any two contexts and enlarge three context-aware collaborative filtering methods. With the help of proposed method, location recommendations are provided with the current user. Finally, matching process is performed in proposed context similarity, thus it considerably improves the recommendation performance.

9. Tag Features for Geo-Aware Image Classification

Geo-aware image classification [9] approach was designed to record the location of image metadata. The proposed approach develops both geo tags and geo context for classifying the images. Geo-aware image classification predetermines geo information into image representation. The geo-tagged features are different from the conventional tag features that are obtained by tag propagation from visual neighbors. Then, geo-aware tag features are extracted from given geo-tagged images by tag propagation from the geo and visual neighbors of the given image. The geo-aware tag features are presented and shows the similarity variants of geo-aware tag features. Flicker images are used as source data for tag feature extraction, thus it produces the effectiveness and robustness of tag features for geo-aware image classification.

10. Tourist Locations and Travel Sequences from Public Geo-Tagged Photos

Geo-tagged photos of users on social media sites provide abundant location-based data such as tourist locations and travel sequences [10]. Geo-tagged data produces the information about user behaviors and increases the possible images that are associated with location information in the form of geo-tags. The information is approved from geo-tagged photos for learning to recommend tourist locations. A system recommends interesting tourist locations and interesting tourist travel sequences (i.e., sequence of tourist locations) from a collection of geotagged photos.

11. Context-aware travel recommendation method exploiting geotagged photos

Context aware travel recommendation method [11] was developed based on topic distribution of travel histories in other cities and the given context. The interest distribution of users are extracted by using the topic model and then broken to assemble the user–user similarity model and make travel recommendations. The period and conditions on context information is considered through the mining and the recommendation processes. Hence, the effectiveness of the proposed method in terms of precision on travel behavior prediction is attained.

A travel recommendation method uses topic distribution based on the similarity of users. They provide information on travel histories of users and the context history of a location in which it has been visited. The similar users are identified based on preferred similarity of users and preference of a user. The travel locations in different contexts such as profile matching process are used to filter the locations and arrange using the collaborative filtering method for travel recommendations.

12. Location-aware online learning for top-k hashtag recommendation

The difficulty of recommending Twitter hashtags for users with known GPS location is examined using location aware online learning [12]. The proposed method derived from the flow of geo-tagged process. The significance of regions in a geographical hierarchy is discovered by combining the local recognition of the hashtag. The online recommendation framework with model training is derived simultaneously with the iterating process. The user become dynamic and exposes its location to the recommender system. Next, recommend hashtags of potential interest for the user depends on the context for the exact time instance of the tweet.

13. Multi-Context Trajectory Embedding Model

Multi-Context Trajectory Embedding Model [13] was proposed to investigate contexts in a systematic way. The proposed method is developed in the scattered demonstration learning framework, and it is elastic to distinguish various kinds of useful contexts for different applications. The distributed representation learning methods are applied to trajectory data including user-level, trajectory-level, location-level and temporal contexts. All the contextual information is represented in the same embedding space, which makes it convenient to analyze the association among different contexts.

14. Collaborative Location Based Travel Recommendation System

Collaborative location based travel recommendation system [14] convey the views on social network data. It is based on recommender system that consists of various recommendation algorithms, system functionalities, interfaces types, filtering techniques and artificial intelligence techniques. Data management techniques are combined with recommender system for improving the system quality. Recommender systems employ social network data to improve conventional recommender system through enhanced prediction and accuracy.

The utilization of ontologies on hybrid approach is used for representing the user's preferences in the semantic manner. It defect the difficulties in lack of personalization with the textual information. Therefore, a location recommendation system is proposed based on social pertinent trust walker (SPTW). Afterward, the SPTW model is enhanced for group of user's recommendations.

15. Geotagged social media data to characterize tourist flows

Cilento approach [15] was described to investigate geotagged social media data from Twitter to differentiate spatial, temporal and demographic features of tourist flows. The study of geotagged social media data gives spatial, temporal and demographic information of tourist activities. The proposed methodology however provides consideration on the data as well as practical restrictions from analytical results.

III. Performance Evaluation of Merkle Hash Based Decision Tree Model On Context Aware Geo Tagged Data Mining

A context-aware recommender system uses the user's context such as the user's position, location and social environment that are proposed for the respective hah decision. Context-aware computing refers to a universal group of mobile systems that can intellect their physical environment and adjusts the performance on users. Context-aware system is a part of ubiquitous computing or pervasive computing environment. Context-aware identifies the

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function of recommendation process such as filtering the relevant information on social media and providing accurate decision on user keyword. Geo tagging data mining provides various information such as location and specific information from sources where the users can add the geographical information. Role mining in context aware group the users that add the specific information and provides the tagged keyword explanation and suggestions. Therefore, effective relationships among the users are identified with relevant information on geographical social media.

The proposed method of Context aware Diverse Keyword is related to the topic and abstract refers to the conversation. Context aware abstraction obtains more specific keyword relating to the conversational users. Extracted context aware diverse keywords are grouped with specific spectral clustering of Implicit and explicit Query formulation. With intention of generated with context aware and diverse keywords. Decision tree is constructed based on diverse extracted keyword to build a concise, diverse and relevant lists of documents recommended to the participants of a conversation.

Geo tagging is the progression of addition geographical information to different media in the form of metadata. The data frequently consists of synchronize like latitude and longitude, but may even include bearing, altitude, distance and place names. Geotagging is generally used for photographs and can facilitate groups to get a lot of specific information about where the picture was taken or the exact location of a friend who logged on to a service.

1. System Architecture

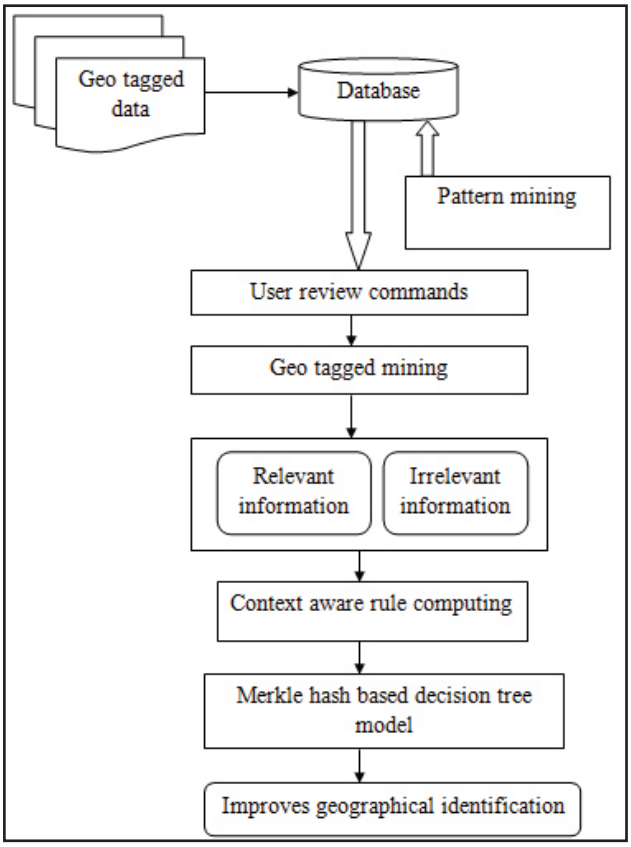

Fig. 3.1 : Architecture diagram of Merkle Hash based Decision Tree Model on Context Aware Geo tagged data mining

Above figure 3.1 explains about the system architecture of Merkle Hash based Decision Tree Model on context aware geo tagged data mining. The proposed Data Mining approach suggests better geographical data on social media. Initially, several social media consists of relevant and irrelevant information and the user reviews are collected with various features in this process. Next, Geo tagged mining algorithm is developed for adding additional features and capture the information at the time adding features. After providing the geographical identification, context aware gives the suggestion and explanation about the tagged features. Finally, Merkle-hash based decision tree model is introduced to split the decision tree information into various sub trees to sign in many messages. The advantages of Merkle hash tree is extracting clear features and removing the unwanted features for data mining. The process of Hash based Decision Tree Model is separated into following steps.

a) User review data for rule mining
b) Geo tagged Mining
c) Context Aware mining
d) Merkle hash based Decision Tree model

a) User review data for rule mining

The database illustrate in rule mining consists co-occurrence relation data that are presented among different geospatial metadata. The clients communicate their opinions or reviews on different product features in a single review. Co-occurrence relative patterns among features and opinion words are measured and quantified. They utilize geotagged characteristics of opinion features in review corpus to identify the review commands. The data in multimedia resources are clustered with suitable latitude and longitude coordinates.

Initially, pre-processing stage is carried out with the user review command that collects geographical suggestions from various review pages. The terms geographical is referred as suggesting the products according to original data of web pages. The collected suggestion consists of different labels and documents that are performed to avoid the un-preferred product results. The extracted review suggestions are stored in the relational database at the sentence level.

b) Geo tagged Mining

The geographical location data used in Geotagging and it is derived from the global positioning system that is based on a latitude/ longitude-coordinate system. There are two main alternatives for geotagging photos namely, capturing GPS information at the time the photo is taken and attaching the photograph to a map after the picture is taken. Geotagging is the process of adding geographical identification metadata to various media such as a geotagged photograph or video, websites, SMS messages

The geotagged information is stored in camera location and it is characteristically embedded in the metadata. They are stored in Exchangeable image file format (Exif) or Extensible Metadata Platform (XMP) format. There are a variety of techniques for adding geographical identification metadata to an information resource. Geo tagged mining is preferred for adding the additional geographical information.

c) Context Aware mining

Context awareness is a control of portable procedure to facilitate the complementarily to location awareness. The location is derived from the operation of device contributing and the context is applied more flexibly with mobile users, particularly with users of smart phones. Context awareness initiates in the pervasive computing term from everywhere to deal with linking changes in the environment with computer systems. The term has also been applied to business theory in relation to contextual application

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design and business process management issues
There are various categorizations of context that distinguish between the context type location, identity, activity and time. The user's activity and location are essential for many applications. Context awareness provides the fields of location awareness and activity recognition. Finally, they group the user's information and suggest the geo tagged information to balance relevant and irrelevant information's.

d) Merkle hash based Decision Tree model

Decision tree is assembled based on diverse extracted keyword to build a summarizing, diverse and relevant lists of geo tagged data recommended to the participants of a conversation. Decision tree lists are recovered periodically by submitting multiple embedded queries based on pronounced words. Each query is connected to the topics identified in the conversation fragment preceding the recommendation.
Hash trees are used to verify any kind of data stored, handled and transferred in and between computers. Presently the most important use of hash trees is to make sure that data blocks received from other peers in a peer-to-peer network are received undamaged and unaltered.

Input : Number geographical information **Output:** Improved geographic identification
Begin **Step 1:** Perform user review data for identifying the geographical data **Step 2:** Geo tagged mining add geo information **Step 3:** Perform grouping operation using context aware mining **Step 4:** Perform hash based decision tree model **Step 5:** Verify large data **End**

IV. Results And Discussion

The performance analysis is carried out in this paper with the metrics of Processing Time, Classification Accuracy and Computational Complexity. The performance metric of Merkle Hash based Decision Tree Model (MH-DTM) on Context Aware Geo Tagged is evaluated and analyzes the values in java environment. Following metrics are used for experimental purposes.

- Processing Time
- Classification Accuracy
- Computational Complexity

A. Processing Time

The processing time is defined as the measure of time taken to suggest the geographical data on social media. It is referred as duration which one or more input data's are transformed into a finished result. Processing time is given as the difference between the numbers of geographical data to the sum of response time and calculation time taken for adding the data. It is measured in terms of milliseconds (ms).

Table 4.1 : Tabulation of Processing Time (ms)

Number of geographical data	Processing Time (ms)	
	Existing KET	Proposed MH-DTM
10	8.36	6.2
20	9.74	7.85
30	10.25	8.96
40	11.47	9.47
50	13.63	10.24

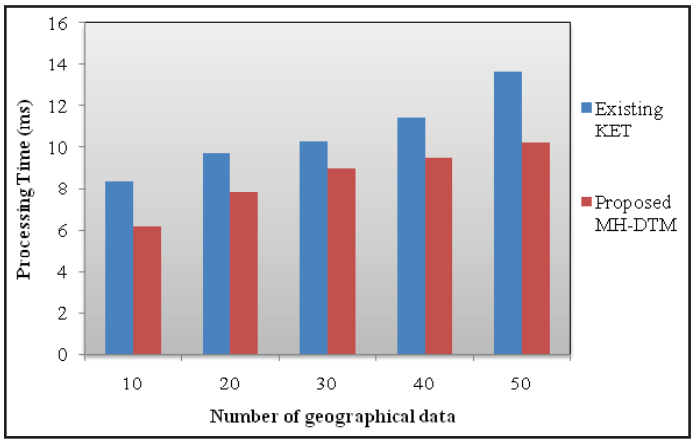

Fig. 4.1 : Measure of Processing Time (ms)

Above figure 4.1 shows the analysis of processing time with respect to different number of geographical data in the social web media. For experimental purpose, the geographical data is considered in the ranges from 10 to 50. The figure shows the comparison made between existing Keyword Extraction Technique (KET) and proposed Merkle Hash based Decision Tree Model (MH-DTM). When the addition of geographical data is increased, processing time is also increased. Therefore, Merkle Hash based Decision Tree Model on context aware geo tagged achieves minimum processing time. As a result, processing time is reduced by 20% when compared to the existing Keyword Extraction Technique (KET).

B. Classification Accuracy

The classification accuracy is defined as the measure of number of web data that are correctly classified from the social web media. Data classification is considered with number of web data given by the several social media. The data classification accuracy is measured in terms of percentage (%).

Table 4.2 : Tabulation of Classification Accuracy (%)

Number of geographical data	Classification Accuracy (%)	
	Existing KET	Proposed MH-DTM
10	67.23	72.63
20	68.96	74.56
30	70.23	77.14
40	72.84	79.32
50	74.36	81.56

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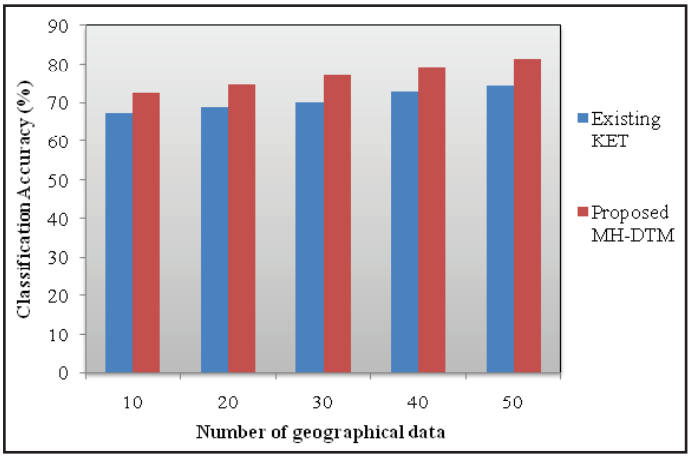

Fig. 4.2 : Measure of Classification Accuracy (%)

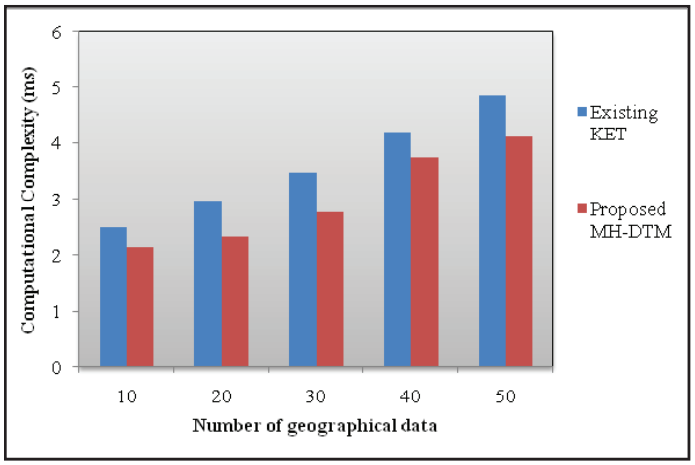

Fig 4.3 : Measure of Computational Complexity (%)

Above figure 4.2 shows the investigation of classification accuracy with respect to different number of geographical data in the social web media. For experimental purpose, the number of social geographical data is considered in the ranges from 10 to 50. The figure shows the comparison made between existing Keyword Extraction Technique (KET) and proposed Merkle Hash based Decision Tree Model (MH-DTM). When the addition of geographical data is increased, classification accuracy is also increased. Therefore, Merkle Hash based Decision Tree Model on context aware geo tagged achieves higher classification accuracy. As a result, classification accuracy is increased by 9% when compared to the existing Keyword Extraction Technique (KET).

C. Computational Complexity

Computational complexity for proposed method is defined as the time taken to evaluate the computational process with regards to multidimensional data. Computational complexity is the product to time taken to compute single data with respect to total number of web data considered for experimental purpose. It is measured in terms of milliseconds (ms).

Table 4.3 Tabulation of Computational Complexity (%)

Number of geographical data	Computational Complexity (ms)	
	Existing KET	Proposed MH-DTM
10	2.51	2.16
20	2.95	2.34
30	3.47	2.78
40	4.21	3.74
50	4.87	4.11

Above figure 4.2 shows the study of computational complexity with respect to different number of geographical data in the social web media. For experimental purpose, the number of social geographical data is considered in the ranges from 10 to 50. The figure shows the comparison made between existing Keyword Extraction Technique (KET) and proposed Merkle Hash based Decision Tree Model (MH-DTM). When the addition of geographical data is increased, computational complexity is also increased. Therefore, Merkle Hash based Decision Tree Model on context aware geo tagged achieves minimum computational complexity. As a result, computational complexity is reduced by 16% when compared to the existing Keyword Extraction Technique (KET).

V. Conclusion and Future Work

Geo tagging is referred as the addition on geographical detection metadata to different media in the structure of geospatial metadata. In order to suggest better geographical data on social media, Merkle Hash Based Decision Tree Model on Context Aware Geo Tagged is proposed in Data Mining approach. Initially, social media consists of various information and the respective user reviews are collected with various features in the form of relevant and irrelevant information. Next, additional features are added and capture the information with the help of Geo tagged mining algorithm. After providing the geographical identification, context aware gives the suggestion and explanation about the tagged features. Finally, Merkle-hash based decision tree model produces the result on geo ragged information. The future work is developed with the addition of geographical information through multiple databases.

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