Wild Life Protection by Moving Object Data Mining - Discover with Granular Computing

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ABSTRACT
Mobility is the key in a globalized world where people, goods, data and even ideas move in increasing speeds over increasing distances. For representing a particular moving object in a database, examining the position of the moving object would be in focus. To analyze the particular, we create a framework so that it can represent the relevant moving object and its position over the time. Since moving object data is tested in several different real data sets, it will benefit moving objects data owners to carry out various kinds of analysis on their data. Thus, we relate the whole moving object data mining with granular computing to make a flexible and scalable analysis of targeted moving object data. Granular Computing provides a conceptual framework for studying many issues in data mining for moving object databases. This paper examines those issues, including mining object data and related knowledge representation and processing. It is demonstrated that one of the fundamental task of data mining is searching for the right level of granularity in moving object data and knowledge representation. On that basis, it makes the granules in the process of problem solving for modelling the human thinking process.

Keywords
Moving object databases, Granular Computing, Data Mining.

1. INTRODUCTION
Analyzing data from various technologies like GPS, Web technologies etc have deep implications in many applications, e.g., ecological study, traffic control, mobile communication management, and climatological forecast [5]. In this paper, we focus our study on animal movement data analysis e.g. Figure 1(a) and 1(b) and examine the unexpected and abnormal behaviour of an animal for discovery of various animal movement patterns by describing it into the form of information granules.
A large number of occurrences of an "expected" frequent pattern sometimes may not be as interesting as a few occurrences of an "expected" rare pattern. [1] The support model (move mine) is not ideal for these applications because the assessment of significance of a pattern in a sequence should take into account the expectationof pattern occurrence (according to some prior knowledge). Recently, many researchers have been proposed towards this objective. In this paper, a new model is proposed to characterize and analyse the class of so-called unexpected (instead of frequent patterns).
We will show that our model not only has solid theoretical foundation but also allows an efficient way of analyzing and then implementing mining algorithm

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Figure 1(a)

Figure 2(b)

Information is a measurement of how likely a pattern will occur or the amount of "surprise" when a pattern actually occurs [3]. If a pattern is expected to occur frequently based on some prior knowledge or by chance, then an occurrence of that pattern carries less information. Thus, we use information to measure the surprise of an occurrence of a pattern. The information granule introduced to represent the accumulated information of a pattern in an event sequence and is used to assess the degree of granularity of the pattern. In the remainder of this paper, we refer to this model as the information model.
In particular, we introduce architecture of moving object data mining system with granular computing technique in the frame of observed moving data
object which further integrates multiple data mining functions, including sophisticated pattern mining and trajectory analysis [19].

This paper is organized as follows: the proposed architecture of moving object data mining with granular computing in section 2. Then, in section 3, a conceptual technique of granular computing will be focused and finally conclusions will be drawn in section 4.

2. SYSTEM ARCHITECTURE

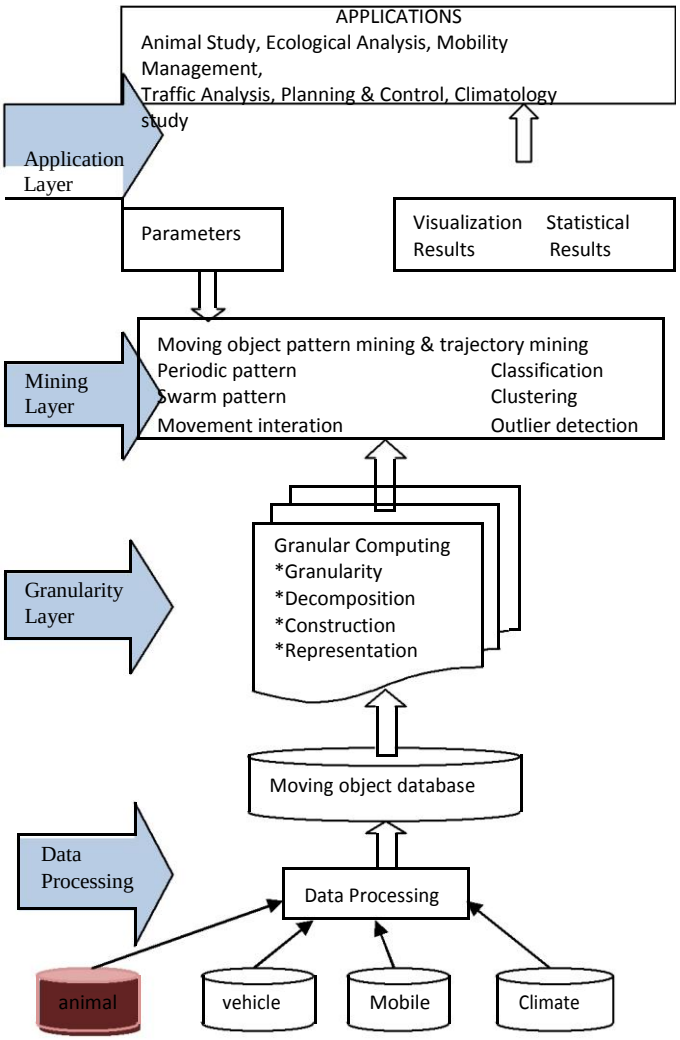

Figure 2

Our system shown in Figure 2 provides some interesting data mining functions for biologists to analyze the animal movement patterns [20]. We focus on mining [21] the repetitive pattern and the mutual relationship. Existing systems designed for answering spatio-temporal analysis of the moving clips [2][15].

Problem: Not well equipped to handle the continuously changing data (e.g. positioning of moving object)
The proposed architecture provides an accurate analysis of the animal moving patterns. In this, we focus on mining repetitive and mutual relationship of the moving target [16][17]. The analysis through granular computing basically emphasizes on the particular behaviour of an animal.
Existing architecture [18] developed on the basis of providing data mining functions and tested on the real animal movement data.
The whole proposed architectural layers consists of data processing layer, granularity layer, mining process and then visualization to represent the relevant knowledge that can further proceed the mining process of classification, clustering, regression etc.

Various moving object data sets are collected from different resources like animals etc. Due to the lack of analysis, we are not able to get the relevant information about a particular moving object data. After mining the pre-processed data sets stored in the moving object databases, our proposed architecture aims to make a frame of targeted object.

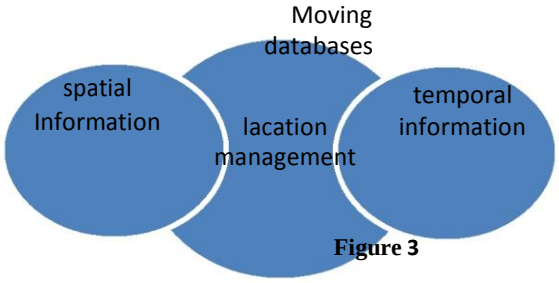

Figure 3

Here, in Figure 3, the moving object databases represent information about moving targeted object and their location [6]. The spatial information representing the collection of spatially referenced data that acts as a model of reality. Temporal information can store and retrieve temporal data, i.e. data which depends on time in some way.

Pre-process is essential to analyse the multivariate databases before data mining. The target data then cleaned and removes the observation with noise and missing data. So as a result we have data in useful format [14].

This transformed data undergoes to the process of granular computing technique of construction and decomposition that represents the information at multiple levels of granularity. Granular computing techniques need to be implemented as multiple hierarchies and multiple levels in each hierarchy. Now the group of granules are represented and
interpreted as a granulated view for the further pattern recognition process of data mining for getting the knowledge acquisition.
For acquiring the relevant knowledge, the resultant process undergoes to the process of classification, clustering and regression [4]. Thus, granular computing unifies techniques and tools that utilize granules in the process of problem solving and simplifies the information processing without loss of important information as granular computing itself a paradigm of information processing.

3. OVERVIEW OF GRANULAR COMPUTING

Granular computing (GrC) is an emerging computing paradigm of information processing. It concerns the processing of complex information entities called information granules, which arise in the process of data abstraction and derivation of knowledge from information [7].
At present, granular computing is more a theoretical perspective than a coherent set of methods or principles. As a theoretical perspective, it encourages an approach to data that recognizes and exploits the knowledge present in data at various levels of resolution or scales [8][9]. In this sense, it encompasses all methods which provide flexibility and adaptability in the resolution at which knowledge or information is extracted and represented [22].

4. GRANULES, GRANULATION AND GRANU-LAR RELATIONSHIPS

A granule can be defined as any subset, class, object, or cluster of a universe. These granules are composed of finer granules that are drawn together by distinguishability, similarity, and functionality.

A group of concepts or objects can be considered as a granule by their spatial neighbourhood, closeness, and cohesion. Although granular computing is intended to deal with imprecision, uncertainty and partial truth, the granules may be of crisp or fuzzy format [10][11].

Granulation involves the process of construction and decomposition of granules. It is an operation performed on granules. Construction involves the process of forming a larger and higher level granule with smaller and lower level granules that share similarity, indistinguishability, and functionality. Decomposition is the process of dividing a larger granule into smaller and lower level granules. The former is a bottom-up process. The latter is a top-down process.

Relationships amongst granules may be classified into two types, interrelationship and intra-relationship. Granulation, regardless of direction, is dealing with relationships between granules. The relationship involved in construction granulation is considered as an interrelationship and the decomposition granulation as an intra-relationship. Interrelationship is the basis of grouping small objects together. Granular computing involves structured human thinking. A high-level granule represents a more abstract concept and a low-level a more specific concept. The level of abstraction may be represented in terms of coarse and fine relationships [12].

By focusing on different levels of granularity, one can obtain different levels of knowledge, as well as a greater understanding of the inherent knowledge structure [13]. Granular computing is thus essential in human problem solving and hence has a very significant impact on the design and implementation of intelligent systems.

5. CONCLUSION

This paper is based on the movement of the targeted object and its behaviour. We have proposed an idea of architecture to represent the thorough analysis of the behaviour of targeted moving object (e.g. animal). In addition to, we focus on the case studies of some wild life animals, so that the analysis will trigger research and development to face the new challenges of moving object mining with Granular Computing. Our purpose is to meet the special focus on wildlife and forest protection, health care and mine safety. The whole idea will offer us to further work on the algorithmic implementation of the proposed architecture so that we create a concrete base for the protection of wild life environment so that the promising directions and highlighted problems will get acquired.

6. REFERENCES

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