Internet of Thing Based Tourism System: Survey and Proposed Solutions

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Abstract— These Tourism systems can be considered as an important motivation for tourists to visit the underlined places. These system employs the technologies, such as Internet of Tings(IoT), to manage the provided program and tourists by providing useful information. In this work, we state a survey of previous work on tourism system combined with IoT in terms of managing and analyzing of big data using data mining techniques. This is to extract important information from the huge data generated by the use of Internet of things in smart tourism system. By improving an algorithm for data classification algorithm, the proposed solution is formed to produce a classifier that can deals with different types of data with accepted complexity instead of using different classifiers for numeric data types. Moreover, it introduces an enhanced evaluation method, in which most of classifier can be included with high efficiency. The android based mobile application and web site can be produced to support the using of the proposed system.

Index Terms— Classifiers, cloud computing, clustering, data management, data mining, IoT, machine learning.

I. INTRODUCTION

There are many aspects are considered in developing the systems, including the establishment of a smart tourism data management system to manage data and tourism services. Data management globally encompasses all the controls identified with overseeing information as a profitable assessment. It is a deliberate procedure of catching, conveying, working, ensuring, improving, and cleaning of data cost-effectively, which needs the consistently going support of plans, approaches, projects and practices. IoT is defined as a network of networks where, typically, a massive number of objects/things/sensors/devices are connected through communications and information infrastructure to provide value-added services. The term. IoT was first coined in 1998 and later defined as "The Internet of Things allows people and things to be connected any time any place with anything and anyone, ideally using any path/ network and any service" [1]. The communication to each other with minimal human intervention each object has unique identification and self-directed data transfer capability over the network. The Aim of using IOT in tourism system is to offer more data resources, fasting automated system, and more comfortable for the user but also many activists have had access to excessive data and millions of data records are produced daily in this industry.

This work is selected to demonstrate the vital role of tourism industry for the future of humanity, specifically their relevance towards achieving the sustainable tourism growth goals. Smart tourism system can be proposed to address the problem of insufficient tourism information by guiding tourists to central website for tourism activities and services. A classifier that can deal with the diversity, scattered tourism data can be proposed with minimum complexity using data mining classification techniques with accepted complexity instead of using different multi classifiers for numeric data types. Moreover, this paper introduces an idea of proposing an evaluation method, in which most of classifier can be included with high efficiency. Using IoT, the system can merge into well-known elements of the surrounding infrastructure that provides multiple new services and benefits to the tourists. The system has to facilitate access to authenticated information and provide it to tourists. Cartographic services are going to provide information based on the internet to enable the tourist to use maps for the respective areas using GPS location from mobile. Data management in tourism system is expected to control and analyze the information can significantly ease managing and maintaining tourism resources. Then, the system employs data management to serve the tourist or the respective authorities,

The proposed system is expected to increase the beneficial of active industries in Iraq. This can include the hotels, restaurants, tourism places and so on.

II. SURVEY OF PREVIOUS WORKS

In this survey many papers were explored to give a comprehensive overview of previous works related to the subject of data management using IOT specifically that related to data mining and machine learning techniques that used for big data management .Some of these research are related to the use of IoT technology in the field of smart tourism or smart city applications to stop at the edge of last research in this field.

Muhammad Rizwan Bashir, .et al. in (2016)[3]presents IoT Big Data Analytics system for the capacity and investigation of continuous information produced from IoT sensors conveyed inside the smart building. The appropriateness of the system is shown with the assistance of a situation including the examination of continuous smart building information for naturally dealing with the oxygen level, glow and smoke/dangerous gases in various parts of the brilliant building. The underlying outcomes demonstrate that the proposed system is fit for the reason and appears to be helpful for IoT-empowered Big Data Analytics for smart structures. The key commitment of this paper is the complex incorporation of Big Data Analytics

and IoT for tending to the extensive volume and speed test of continuous information in the smart building area.

Oscar GCABA, .et al.(2016)[4] This work implemented IoT for the South African tourism industry to improve the effectiveness of the business, and effect on the South African economy. This paper answers the topic of what IoT advancements can improve the tourism business. The potential applications which are of business advantage to IoT in tourism traverse the zones of natural life observing and tracking, monitoring oceans and waters, plant species, promoting tourism, friendliness and enterprise tourism. the way things are, reports what is in the market and not the future innovations. The system requires to additionally create and pull these IoT toward the South African Surroundings, and to deal more with the IoT in tourism industry.

Bishnu Prasasd Gautam,.et al. (2016)[5]This research effort to upgraded e tourism and offers arrangement philosophies by presenting IoT based applications. The work effort for the improvement of local tourism to revive the regional enhancement. This technique endeavors to join the Internet of Things (IoT) innovation with the improvement of the tourism industry and keen tourism urban communities. The target of this research is to upgrade the nature of tourism benefits by tending to the broadened needs of guests in the topographically tested regions and contribute to the economy of those areas by presenting new strategies

Shapoval V., Wang., C. Hara T., &Shioya, H. (2017) [6]This work Using Data Mining to Analysis Tourism Data for Inbound Visitors to Japan .The study consequences of around four thousand perceptions demonstrate the primary inspiration for guests' future return isn't driven by encounters had amid their most current visit but instead by foreseen encounters later on. Data mining strategy is helpful for valuable disclosures of specific examples with expansive guest informational collections, furnishing governments and goal advertising associations with extra devices to better plan viable goal promoting methodologies. This examination has a few basic restrictions, prompt more reasonable upcoming works in the field of quantitative goal advertising. The research depends on the information of guests who came to Japan, speaking to a little division of the considerable number of explorers who chose not to visit Japan and to whom the researches can't extrapolate their discoveries. Second, the exploration information was gathered at one time of the investigation year of 2010, after which Japan saw a colossal drop in guests because of Great East Japan Earthquake. The absence of direct information accumulation involvement with the dataset kept them from having certain bits of knowledge which might be helpful in assessing the dataset

Mervat Abu-Elkheir,.et al. (2013) [7] In this paper, the specialists examined a portion of the data management arrangements proposed for the Internet of Things, with an attention on the required outline components that ought to be tended to so as to give a thorough arrangement. the proposed configuration cover the three principle elements of taking care of information; how it is gathered, how it is put away, and how it is handled. The arrangements are just incomplete as in the address information administration prerequisites of IoT subsystems, for example, WSNs, and incorporate fractional subsets of the coveted plan natives. To make up for this limitation , the segments of an exhaustive IoT information administration system were illustrated with center information and sources layers and bolster for unified design. The structure concentrates the requirement for two-way, cross-layered plan approach that can address real time and chronicled queries, investigation, and administration requirements.

Yue Xu (2015)[8] This paper initially presents IoT and machine learning Challenges in managing IoT data .IoT tries to interface objects or things to one network, and join those date created to some sort of knowledge. Subsequently, the insight is finished up and produced naturally by machines. However, there are stills many limits and difficulties to overcome. In the paper theresearchers touched on a number of applications in machine learning application in IoT. From both research and industry, these applications are fundamental and extraordinarily esteemed. The research presents some ML algorithms to manage the information (Bayesian Statistics, k-Nearest Neighbors (k-NN), Neural Network, Support Vector Machines (SVM), Decision Tree (DT), PCA, K-Means, and Reinforcement Learning)

Leonardo L. A. Heitzmann (2016)[9] In this work, the construction for anticipating the status of a given gadgets in a smart surroundings were exhibited and designed using classification algorithms. The proposed design was assessed against numerous preprocessing dataset systems. Seven classifiers were computed using the AUC(Area Under the Curve) metric. As indicated by the acquired outcomes, considering time highlights amid the dataset preprocessing stage has prompted an expansion in prediction performance uncovered by more prominent AUC values . Also, the way toward linking no less than one preview expanded the execution in correlation with no connection. Indeed, even not having the capacity to reach exact determinations from the utilization of resampling procedures, the researcher was used down sampling to minimize the size of training dataset , which thus could request less computational assets (e.g. memory utilization, handling time). The work demonstrated that there is no single classifier that is most reasonable for every single given devices. In light of this actuality, a classifier decision technique was proposed with the exhibited decision strategy, they acquired an expansion in forecast execution when contrasted and related work. A measurable examination was performed of a few classifiers utilizing both Friedman factual test and Nemenyi post-hoc test.

Muhammad Nasir Khan, et.al. (2014)[10]In this paper a strategy for classifying data stream was proposed. Simple Aggregation and Approximation (SAX) was utilized for reducing data dimensions clustering were applied to find the number of classes and allot labels to the data depend on the extracted classes. classification algorithm was proposed for the data streams, customary classification calculation are of little significant in data streams due to the intricate nature, unbounded memory necessities and idea floating issue in information streams. The proposed strategy adopts a novel strategy towards the classification of the information streams through applying unsupervised classification strategies for example. The high volume information is tested also, lessened with Simple (SAX) Density based clustering algorithm DB Scan is connected on the information stream to uncover the quantity of classes introduce and thusly mark the

information. Support vector Machine (SVM) was applied to classify the label data. the proposed technique was tested on the Intel Lab Data set, an informational index of four ecological factors (Temperature, Humidity, light) gathered through S4 Mica2Dot sensors more than 36 Days at every below average. The calculation is assessed on distinctive test size and normal exactness of 80% is acquired

Zhenjun Li (2017)[11]checked the viability of the enhanced BP(back propagation) calculation, in this paper data classification system were executed for the Internet of Things. Through the framework, a lot of classification tests were done. The outcomes demonstrate that the enhanced BP calculation can quicken the union speed of the system in a specific training period. The BP neural system is utilized to group the informational collection in the Internet of Things. The achievement rate of grouping is as high as 98% that can meet the necessity of general data classification. By investigating the blunder surface of a solitary neuron, it is discovered that the system isn't caught in the nearby least. Clearly, the enhanced BP calculation can enhance the execution of BP neural system to a specific extent. The presentation and improvement of the Internet of things has conveyed awesome chances and difficulties to the current Internet framework. In spite of the fact that this paper develops the data classification under the Internet of Things framework, there are still a few issues that need additionally think about. The Internet of things is excessively expansive. Particularly in managing a lot of high-dimensional information, the current BP arrange calculations should be demonstrated , In the functional application, it is discovered that the conventional BP neural system has the issues of slow convergence and easy fall into the local minimum. Clearly, these issues will limit the use of BP neural systems in the Internet of things with a lot of data. The framework is utilized to order the information gathered by the coal mine security observing framework, and the network convergence performance is compared before and after the enhanced algorithm.

III. MOTIVATIONS OVER PREVIOUS WORKS

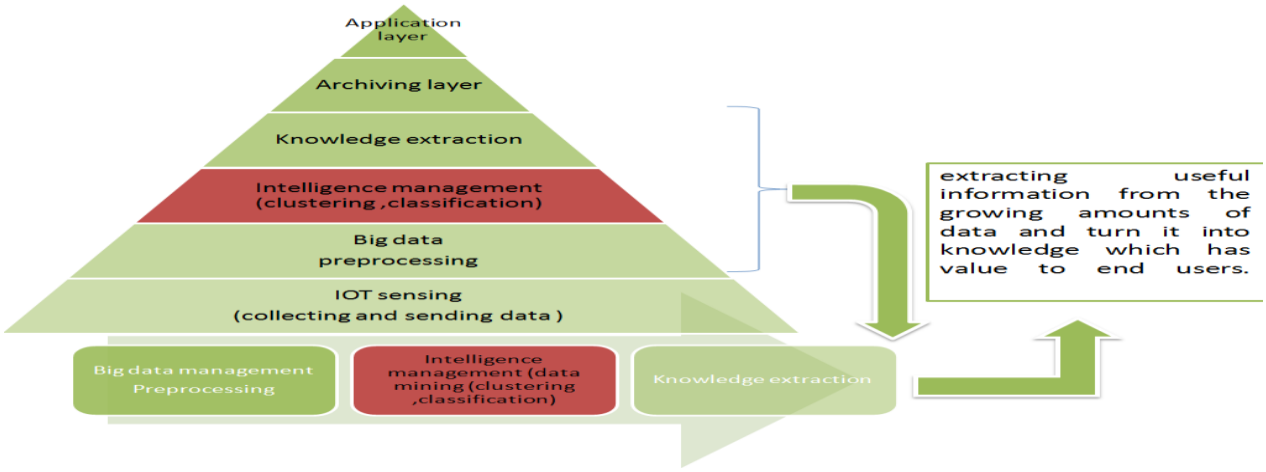
Data Management of IoT is related to the big data problems. Big data is massive amounts of data that is commonly described as the 4V's (volume, variety, velocity and veracity). The available work [3]-[11] suffer from different issues, such classifiers complexity, and evaluation for different types of data in big data management. To deal with the massive data generated form IOT, data mining classification techniques can be apply in combination with intelligent methods to extract data patterns. Data mining is the computing process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems [2]. Using IoT, the system can merge into well-known elements of the surrounding infrastructure that provides multiple new services and benefits to the users, but it is difficult to obtain real time and valid information of the huge online tourism data. This process creates complex and unstructured data sets ranging from data related to daily transactions to data about customers 'preferences. At the other hand, level of smart tourism in Iraq is still in the beginning steps of organizational and practical progresses. There are many aspects, including the establishment of a smart tourism with data management of IoT system to produce a smart real-time system for managing the information and tourism services.

IV. PROPOSED SYSTEM

As mentioned ealrlier, the idea of this paper is to present some solutions for the issues that the current system suffers. These issues are highlighted from the presented survey of previous work. The proposed system can be divided into two parts as follows.

A. Methodology

Due to the diversity of data sources related to tourism, it is essential to ensure the maximum use of this information, by collecting, processing and classifying raw input data to improve the quality of services and its ease of management. In this work, we explore the most appropriate classification algorithms that can be enhanced to deal with huge and different data types in the sector of tourism to extract and archiving knowledge that can be useful to serve tourist or the respective authorities that using web or mobile application. Fig. (1) Explains the essential layers of the tourism systems based on IoT technology and big data concepts. The layer of intelligence management that is highlighted with red color is the core of proposing the new classifier. This classifier can deal with different types of data. It is important to note that the clustering is used as a complementary part and there is no further action to be taken.



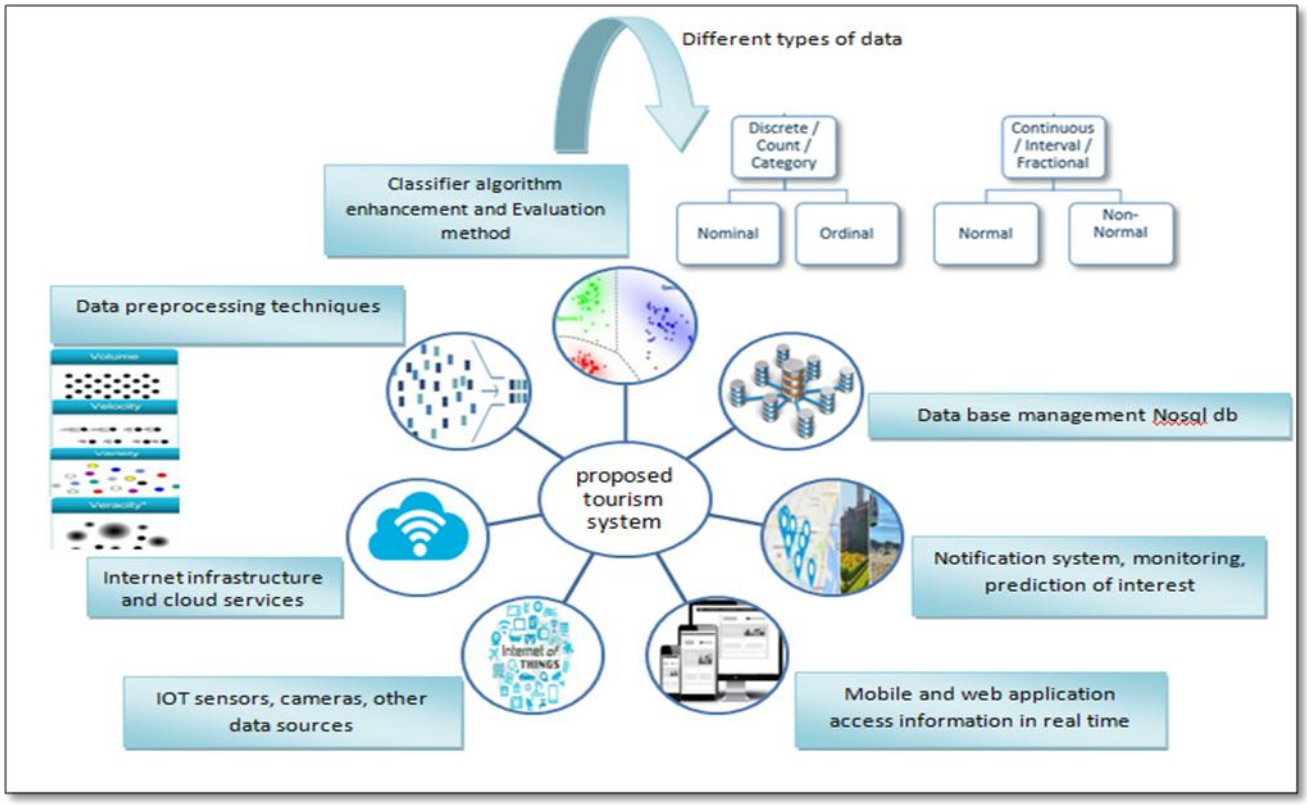


Figure (2): Block Diagram of the Proposed Tourism System

B. The Proposed Tourism System

With the huge developments in the new world in terms of technology and systems, the tourism fields starting from booking process till return home. As mention earlier in the presented review of previous work, the current tourism systems suffer from different issues. The most important issues are appeared in the using of data mining methods. This can include the complexity data classifiers and data accessing in addition to clustering. The other issue is the performance evolution of the adopted classifiers. The proposed solution is formed to produce a classifier that can deals with different types of data with accepted complexity instead of using different classifiers for numeric data types. Moreover, it introduces evaluation method, in which most of classifier can be included with high efficiency. The proposed solution is also introduced to tackle the problem of database management, in which the accessing time and complexity are reduced. For solving the problem of data clustering, the proposed idea can adopt the modification of current algorithms to come up with a new schematic that can overcome the mentioned issues. At the other hand, the proposed system include web and mobile based applications to enable the tourist from identifying the underlying area. In addition to obtain the required information regarding the accommodation (hotel and motels), restaurants, historical places and locations, available technologies, the weather, Geographic Position System (GPS) and so on. This needs to allocate different types of sensors and data sources under the Internet of Things (IoT) techniques and methodology. Therefore, the proposed system can be represented as a guide for tourist regardless the requirements.

The android based mobile application that uses data mining concepts is proposed to access useful information in real time. It will depend on tourist country origin and current GPS location to provide notification feedback system that suggests going to specific locations (where those locations are near tourist and tourists from same origin country are interested in). Fig. (2) Illustrates the block diagram of the proposed system. It explains the proposed ideas that can solve the current problems, such as data management and complexity.

V. CONCLUSION

A survey on the previous research works of tourism systems was presented to allocate the issues that can limit the abilities of such systems. Different ideas have been introduced as a proposed tourism system for solving the highlighted issues, particularly data management in IoT technology and data mining classifiers with bid data problems. The data classification technique that can deal with many types of data was considered. In addition, a new evaluation method can be proposed to tackle the problem of evaluation of some types of classifiers. In order to ease the deal with the proposed system, web and mobile application can be introduced with full exploring of available facilities in the proposed system.

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