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A HYBRID APPROACH FOR INFORMATION RETRIEVAL USING BIG DATA ANALYTICS

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ABSTRACT

Digital world is growing very fast and become more complex in the volume (terabyte to petabyte), variety (structured and un-structured and hybrid), velocity (high speed in growth) in nature. This refers to as 'Big Data' that is a global phenomenon. NoSQL databases are better solution for the Big Data demands. Because the users want to analyze this data together, the integration of relational and NoSQL databases becomes necessity.

A vast amount of research work has been done in the multimedia area, targeting different aspects of big data analytics, such as the capture, storage, indexing, mining, and retrieval of multimedia big data. It also aims to bridge the gap between multimedia challenges and big data solutions by providing the current big data frameworks, their applications in multimedia analyses, the strengths and limitations of the existing methods, and the potential future directions in multimedia big data analytics.

In this paper discuss two approaches to data integration between relational and NoSQL databases: native and hybrid solutions explained on the example of integration transactional data from Oracle databases with data stored in MongoDB

Keywords: *NOSQL, ORACLE, MONGODB,BIG DATA etc.*

I. INTRODUCTION

In the past few years, the fast and widespread use of multimedia data, including image, audio, video, and text, as well as the ease of access and availability of multimedia sources, have resulted in a big data revolution in multimedia management systems. Currently, multimedia sharing websites, such as Yahoo Flickr and YouTube, and social networks such as Facebook, Instagram and Twitter, are considered as inimitable and valuable sources of multimedia big data. YouTube users upload over 100h of videos every minute in a day, and 255 million active users of Twitter send approximately 500 million tweets every day[1][2][3] .Another statistic shows that the Internet traffic through multimedia sharing has reached 6,130 petabytes every month. With the emergence of new technologies and the advanced capabilities of smart phones and tablets, people, especially younger generations, spend a lot of time on the Internet and social networks to communicate with others to share information and to create multimedia data. Multimedia analytics addresses the issue of manipulating, managing, mining, understanding, and visualizing different types of data in effective and efficient ways to solve real-world challenges. The solutions include but are not limited to text analysis, image/video processing, computer vision, audio/speech processing, and database management for a variety of applications such as healthcare, education, entertainment, and mobile devices.

II. PROBLEM STATEMENT

In the current big data era, new opportunities and challenges appear with high-diversity multimedia data together with the huge amount of social data. Multimedia big data analytics has attracted a lot of attention in both academia and industry in recent years[1].

The main challenge of big data analytics is how to reduce the computational time and storage capacity, while maintaining the results as accurate as the ones from the small datasets.

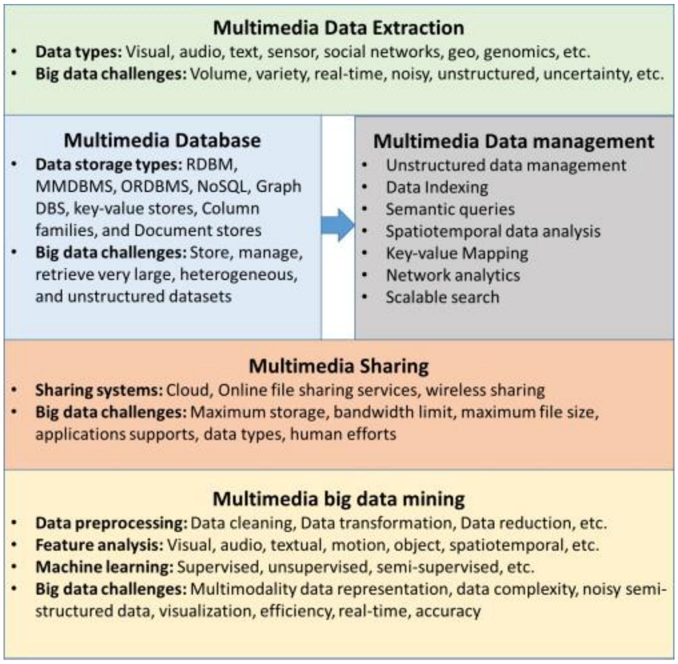
Multimedia Data Extraction
Data types: Visual, audio, text, sensor, social networks, geo, genomics, etc.
Big data challenges: Volume, variety, real-time, noisy, unstructured, uncertainty, etc.
Multimedia Database
Data storage types: RDBM, MMDBMS, ORDBMS, NoSQL, Graph DBS, key-value stores, Column families, and Document stores
Big data challenges: Store, manage, retrieve very large, heterogeneous, and unstructured datasets
Multimedia Data management
Unstructured data management
Data Indexing
Semantic queries
Spatiotemporal data analysis
Key-value Mapping
Network analytics
Scalable search
Multimedia Sharing
Sharing systems: Cloud, Online file sharing services, wireless sharing
Big data challenges: Maximum storage, bandwidth limit, maximum file size, applications supports, data types, human efforts
Multimedia big data mining
Data preprocessing: Data cleaning, Data transformation, Data reduction, etc.
Feature analysis: Visual, audio, textual, motion, object, spatiotemporal, etc.
Machine learning: Supervised, unsupervised, semi-supervised, etc.
Big data challenges: Multimodality data representation, data complexity, noisy semi-structured data, visualization, efficiency, real-time, accuracy

Fig. 1. Multimedia big data modules and challenges

Fig 1, most existing research in multimedia big data exclusively focuses on a specific area or challenge. Some surveys purely concentrate on big data management and related tools, while others discuss the multimedia challenges in a particular task and framework without considering the fast increase in the amount of unstructured multimedia data.

III. OBJECTIVE

Multimedia big data analytics. It targets the most recent multimedia management techniques for very large scale data and also provides the research studies and technologies advancing the multimedia analysis in this big data era. In other words, it aims to bridge the gap between multimedia challenges and big data solutions by providing current big data frameworks, their applications in multimedia analysis, the strengths and limitations of the existing methods, and potential future directions in multimedia big data analytics.

IV. PROPOSED TECHNIQUE

Big data techniques for large-scale multimedia data

Multimedia data are extremely large in nature, and storing several copies of such big data, including audio, image, and video, can be very time consuming and may cause a serious waste of storage.
With the advent of new technologies and the explosion of digital multimedia data, users are expecting that their data in different formats are accessible in an efficient manner and in a cost-effective storage system. Oracle lists the benefits of digital asset archive of multimedia data[4][5]

Multimedia data are less prone to loss as they are stored digitally.

- Computers and robots can easily utilize this kind of archival storage without human intervention.
- Digital asset archive can speed up the retrieval of media files due to quality check removal.
- As metadata are stored in the digital databases, it is more convenient to find a multimedia file.
- Data can be quickly exchanged using the networking of data servers and archives.

- Sharing of media content from several different sources is possible due to interoperability with various media devices.

V. EXISTING SYSTEM

Relational database systems have been the standard storage system over the last forty years. Recently, advancements in technologies have led to an exponential increase in data volume, velocity and variety beyond what relational databases can handle.

VI. MOTIVATION

Multimedia big data analytics, including the management and analysis of the large amount of data, the challenges and opportunities, and the promising research directions. To serve this purpose, we present this survey, which conducts a comprehensive overview of the state-of-the-art research work on multimedia big data analytics.

It also aims to bridge the gap between multimedia challenges and big data solutions by providing the current big data frameworks, their applications in multimedia analyses, the strengths and limitations of the existing methods, and the potential future directions in multimedia big data analytics[3][4]

VII. BACKGROUND

There are two trends that bringing these problems to the attention of the international software community:
1. The exponential growth of the volume of data generated by users, systems and sensors, further accelerated by the concentration of large part of this volume on big distributed systems like Amazon, Google and other cloud services.
2. The increasing interdependency and complexity of data accelerated by the Internet, Web2.0, social networks and open and standardized access to data sources from a large number of different systems.

VIII. LITERATURE SURVEY

Big data refers primarily to group of data which have become extremely voluminous (petabytes and terabyte) consisting of various data types (structured, semi-structured and unstructured) and of real time availability (velocity) such that it is not efficient to be stored or processed with traditional tools or means such as conventional database systems.

Fig 2 Big Data

Fig 2 Big data is not limited to data volume but also incorporates other attributes such as Velocity, and Variety. These three attributes describe the primary properties of big data known as the 3 V's of big data[1][2][7];

Volume: This is sometimes taken to be the ultimate attribute of big data. It depicts very large and ever growing amount of data ranging from terabyte to petabyte.

Velocity: Velocity refers to real time availability of data for processing. Big data is also characterized by instantaneous arrival of enormous data for processing. It entails the rate at which data is circulated within the system e.g. the velocity upon which data is derived out of internal and external operations and sources such as interactions with machines, humans, social media etc

Variety: This represents the diverse format of data in a data set. Big data is made up of data derived from various sources such as emails, machines, social networks, business transactions, mobile devices etc. Data from different sources assume different forms such as spread sheets, photos, videos etc. Variety as a property of big data describes divers forms of data derived from diverse sources[1].

Audio data: Another data type widely seen in multimedia applications is audio or speech data. Social media, industrial machines, and medical devices are a few examples of the big data sources that need real-time audio analytics. With the rapid growth of mobile technologies and applications, as well as producing longer battery life and faster processors, we are now capable of analyzing thousands of different acoustic data, including music, speech, and bodily sounds, in an efficient manner. Audio analytics refers to the procedure of retrieving meaningful information from unstructured aural data[1].

Text data: As well as visual and aural information, multimedia data may include textual data such as metadata, web pages, social network feeds, and surveys. Text data may be embedded within structured or unstructured data. Traditional database management techniques like relational databases can be easily used to extract information from the structured data.

Sensor data: Nowadays, there are millions of sensors almost everywhere that not only sense and capture the data but also process the min real time. With the advent of new technologies such as the cloud, cheap storage, and fast processors, sensor data have increased tremendously, which causes huge analyzing and processing challenges

IX. PROPOSED SYSTEM

The aim of the proposed system is to design a Hybrid Database System for the storage and management of big data. Our hybrid system is made up of MySQL database and MongoDB which are the most popular relational and NoSQL (non-relational) database servers. Data is grouped into structured and unstructured data category, structured data is channeled into the MongoDB database, while the choice of database for the unstructured data depends on the mode in which the application runs in; this could be MongoDB for hybrid mode and Oracle for SQL mode[1].

In proposed system is mainly focus on visualize data, including images ,audio and videos , are the most common and challenging multimedia data due to their rich information and semantic contents which form almost 80% of all unstructured big data. Video and image analytics is the process of extracting meaningful concepts and information from unstructured visual data.

The main challenge of visual data is their huge size compared to structured or textual data, which is why the big data solutions are being used. In recent years, visual data have been generated exponentially due to mobile technologies, high performance cloud computing, and low-cost storage and sharing websites. Video surveillance systems, autonomous vehicles, video and image retrieval systems, and healthcare are few applications of visual data analytics.

Our contribution

- Development of a hybrid database system for big data storage and management.
- This approach improves on the use of Oracle and MongoDB database for big data storage.
- The study establishes the possibility of having the flexibility and scalability of NoSQL database and also the stability and transactional ingredients of a relational database in one database management system.

X. DESIGN COMPONENT OF PROPOSED SYSTEM

System design shows the components that make up a system. The proposed system consists of the following basic components; ORACLE database, MongoDB database.

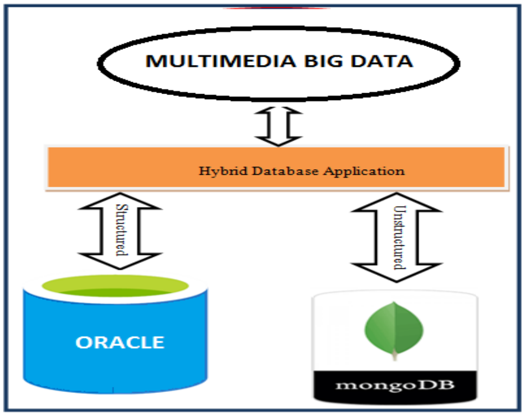

Fig 3 Proposed Architecture

These components are further discussed in detail and the architectural design of the proposed system given in figure 3 shows the connections amongst these components.

- SQL Component: contains the storage engine which handles data storage in **ORACLE** database. The storage engine is made up of a transaction log file and data file groups which could be hierarchically broken down into data files table, indexes, extent and page which is the smallest unit of storage in relational databases. The transaction log file component of the storage engine is used to achieve and maintain data integrity and recovery in the database. It records the start and end of each operation and also every modification performed on data in the database[4][6][7].
- MongoDB Component: MongoDB uses replication to ensure redundancy and consistency. Influx of data from different destinations and in different format are broken down and equally dispersed to a collection of non-static extensible terminals called shard. Data describing other data within the cluster are saved in configuration servers. Every of these servers contain replica of all metadata for the purpose of redundancy. When client request is made, it forms one of the routing processes which are used to check the configuration servers to know the position of the request[4][5].

Feature Extraction Methodology

Proposed system. Features extraction methodology will be designed for multimedia input data. The features will be analyzed to extract meaningful information from the input. It can be analyzed by various methods like clustering, pattern mining, etc. to extract information. A parallel and distributed technique will be designed for feature analysis and information retrieval.

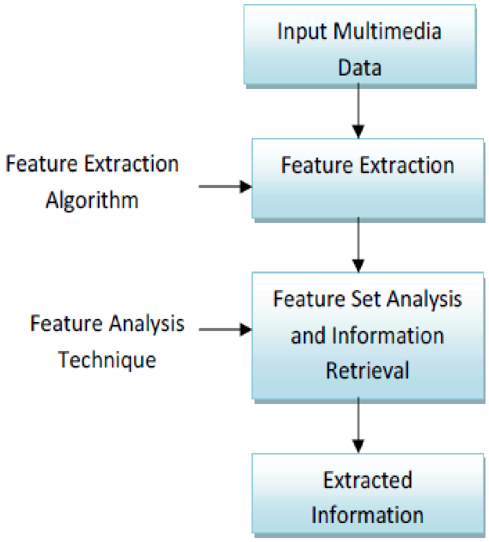
Input Multimedia Data
Feature Extraction Algorithm
Feature Extraction
Feature Analysis Technique
Feature Set Analysis and Information Retrieval
Extracted Information

Fig 4 Shows Feature Extraction Process

Feature Analysis. When the volume of multimedia data increases exponentially, complications and connections among the data increase as well. Finding the best attributes or features that characterize the data instances and discover the knowledge and relationship between them is an essential phase of data mining. The main purpose of feature extraction is to bridge the gap between multimedia data low-level characteristics and its high-level semantic content. As multimedia data contain various media types, extracting multi-modal discriminative information from data instances is imperative. In general, multi-modal features can be categorized into visual (e.g. image and video), audio, and textual features

XI. MULTIMEDIA BIG DATA MINING FRAMEWORK

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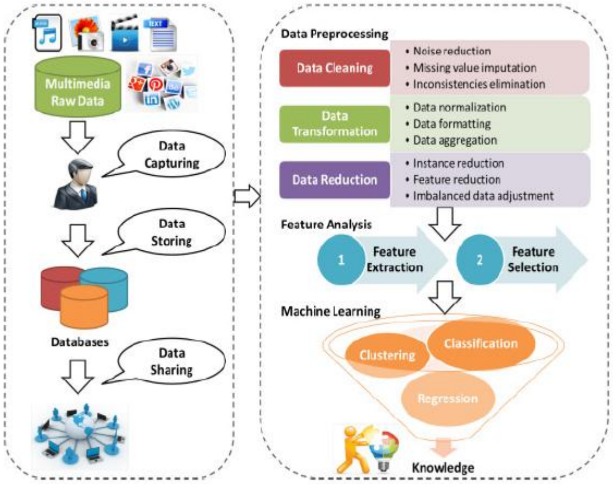

Fig. 5. Multimedia big data mining framework.

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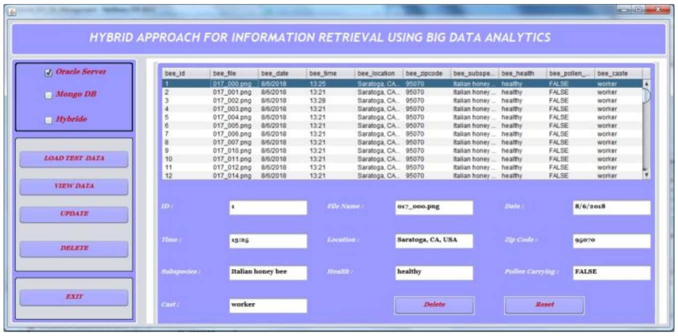
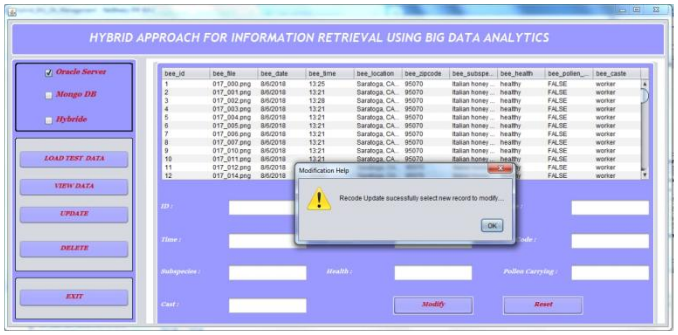
Fig 5 Multimedia Data Mining (MDM) combines two substantial areas: data mining and multimedia. It includes the process of analyzing multimedia data (e.g., text, audio, image, and video) to discover interesting patterns from them and enhance decision making.

XII. PROPOSED OUTPUT SCREEN



bee_id	bee_file	bee_date	bee_time	bee_location	bee_zipcode	bee_subspe...	bee_health	bee_pollen_...	bee_caste
1	017_000.png	8/6/2018	13:25	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
2	017_001.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
3	017_002.png	8/6/2018	13:28	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
4	017_003.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
5	017_004.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
6	017_005.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
7	017_006.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
8	017_007.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
9	017_010.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
10	017_011.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
11	017_012.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
12	017_014.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker

ID : 1
File Name : 017_000.png
Date : 8/6/2018
Time : 13:25
Location : Saratoga, CA, USA
Zip Code : 95070
Subspecies : Italian honey bee
Health : healthy
Pollen Carrying : FALSE
Cast : worker



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2	017_001.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
3	017_002.png	8/6/2018	13:28	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
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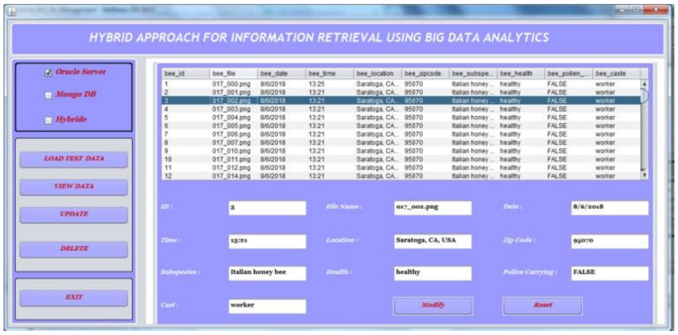
8	017_007.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
9	017_010.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
10	017_011.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
11	017_012.png	8/6/2018						FALSE	worker
12	017_014.png	8/6/2018						FALSE	worker

Modification Help

Recode Update sucessfully select new record to modify....

ID :
Time :
Subspecies :
Health :
Pollen Carrying :
Cast :



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4	017_003.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
5	017_004.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
6	017_005.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
7	017_006.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
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9	017_010.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
10	017_011.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
11	017_012.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker
12	017_014.png	8/6/2018	13:21	Saratoga, CA...	95070	Italian honey ...	healthy	FALSE	worker

ID : 3
File Name : 017_002.png
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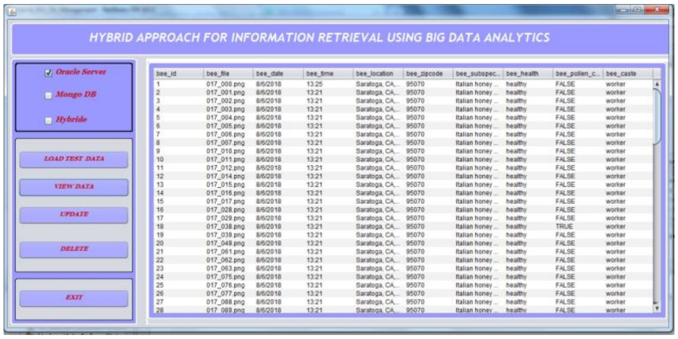
Location : Saratoga, CA, USA
Zip Code : 95070
Subspecies : Italian honey bee
Health : healthy
Pollen Carrying : FALSE
Cast : worker



bee_id	bee_file	bee_date	bee_time	bee_location	bee_zipcode	bee_subspec...	bee_health	bee_pollen_c...	bee_caste
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11	017_012.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
12	017_014.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
13	017_015.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
14	017_016.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
15	017_017.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
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19	017_039.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
20	017_049.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
21	017_061.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
22	017_062.png	8/6/2018	13:21	Saratoga, CA,...	95070	Italian honey ...	healthy	FALSE	worker
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XIII. CONCLUSION

In Proposed paper, discuss two approaches to data integration between relational and NoSQL databases: native and hybrid solutions. These solutions are explained on the example of integration transactional data from Oracle databases with data stored in MongoDB.

XIV. FUTURE ENHANCEMENT

In spite of all the challenges, ever-increasing multimedia big data provide great insights into human behaviors and sentiments, which in turn leads to great opportunities to making great progress in many fields.

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