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Retrieving Records of the Population of any Iraqi City Using Mango Database

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Abstract
In this paper, we worked on the data related to some population of Baghdad city as an example that can be applied to any iraqi city directly by just changing the dataset since Iraq is a famous, important and big country, and Baghdad is a famous historical city. In our paper, we have created a website for Baghdad city's Population that allows the user to view all the documents in the database, update existing document in the database, insert new document to the database, and delete one document from the database based on the case number field in the document. Furthermore, our website allows the user to search documents by year. Our website also provides some visualization to see the information of the records that are added each year to Baghdad city. The goal of this paper is to implement a prototype that visualizes some information about the records of the population of Baghdad city. The other goal is to design a NoSQL database using MongoDB and how to use the indexing method in MongoDB to provide the efficient and important queries that retrieve information from the database. Then, we have implemented some types of queries using pymongo.py. These quires are as follow: new, delete, find, find by year, update, count by year, and find by birthdate. Our database is huge because it includes a lot of documents.

Keywords: Database; NoSQL; MongoDB; Website; Visualization; Iraq; Baghdad

1. Introduction

Iraq is a famous, important and big country, and Baghdad city is a famous and historical capital and city, so in this paper, we used a dataset about the population of Baghdad city to create our database as an example that can be applied to any iraqi city directly by just changing the dataset. A database represents the set of data that can be reached electronically, organized, and saved [1]. The software that manages the database and the applications to analyze and get the data is called the database management system (DBMS) [1]. Additionally, the aim of a DBMS ID is to manage, define, create, update, and query the database [1]. The database can be divided into several types: the relational database management system (RDBMS) that most of its systems use SQL (Structured Query Language) to query the database [2]. The relational databases can arrange the data into one or more relations or tables, and each table in the database consists of rows and columns[2]. The columns are called attributes, and the rows are called tuples or records [2]. The table has a unique key that identifies each row [2]. The second type of the database is the NoSQL database. The NoSQL database defines as non SQL database or non-relational [3]. It can be used with the real-time web applications and huge data [3]. Examples of the NoSQL databases are MongoDB, GimFire, CouchDB, Redis, memcached, Cassandra, Hazelcast, Mnesia, HBase, and Neo4j [4]. In this paper, we chose MongoDB to create the database. MongoDB is one of the NoSQL databases which is an open source document [4]. It consists of collections which equalize to the tables in the RDBMS, and each collection is a set of documents of MongoDB [5]. The document equalizes to the row (tuple) in the RDBMS [5]. The field of MongoDB equalizes to the column in the RDBMS [5]. After creating the database, we used a website to show the results of our database. The website is a set of related web pages that is identified by a domain name, and it is presented on at least one web server [6].

As a result, in this paper, we have created a website for Baghdad city as an example to any iraqi city that allows the user to view all the documents in the database, update existing document in the database, insert new document to the database, and delete one document from the database based on the case number field.

Moreover, our website allows the user to search documents by year. Our website provides some visualization to see the information about the number of borns that were happened each year in Baghdad city. The aim of this paper is to implement a prototype that visualizes some information about the borns that were happened. The other goal is to design a NoSQL database using MongoDB and to use the indexing method in MongoDB to provide the efficient queries that retrieve information from the database. We have implemented some types of queries using pymongo.py. These queries are as follow: new, update, find, delete, find by year, count by year, and find by birthdate. Our database is huge because it includes a lot of documents.

1.1 Paper Organization

We proceed as follows. We present the related work in section 2, and present the description of the problem in section 3. Finally, we conclude in section 4.

2. Related Work

Chang Glasgow et al. [7] showed how to create and generate a website, and the basics that each website needed. They presented the style of the website, and how to create the template of any website [7]. Furthermore, they explained how to edit the pages of the website [7]. In [8], they studied the steps of the website creation to generate a successful website by starting from the low level until reaching the advanced study of the website creation. Mike Garcia [9] showed the creation of a simple webpage by using the basics and the principles of the HTML and CSS. Moreover, they explained in their work [9] the paragraphs and images insertion into a webpage. Sumitkumar Kanoje et al. [10] discussed the pros and cons of MongoDB that are used in the social networks because the importance of the social networks, and they are the biggest networks used recently. They are needed huge storage of data. Therefore, they considered MongoDB as a good choice to be used in the social networks at some points, whereas it is not good at other points [10]. Zhu Wei-ping et al. [11] used the NoSQL database instead of the relational database, and they compared between the two types of the databases. They explained that MongoDB as a NoSQL database is more efficient than the relational database in terms of query big data [11]. Dipina Damodaran B et al. [12] showed the performance of the relational (MySQL is an example) and non-relational (MongoDB is an example) databases in the field of super market management system. Comelia GYORODI et al. [13] and Sushil Soni et al. [14] also studied the comparison between the relational and non-relational databases by choosing MySQL and MongoDB as examples of each type of the databases. Furthermore, they presented in their study MongoDB is more efficient than MySQL [13, 14].

Our work is completly different from all the previous works. The most closely related work to ours by Alsaedi et al. [15] where they created a website that shows the crimes of Chicago city using Mongo database. We have created a website that any iraqi city can retrieve the records of the population by using MongoDB. This website allows the user to view all the documents in the database, insert new document to the database, delete one document from the database based on the case number field in the document, and update existing document in the database. Moreover, our website allows the user to search about the documents by year. Our website also provides some visualization to see some statistical information about the borns that were happened in Baghdad city. The goal of our work is to implement a prototype that visualizes some statistical information about the borns that were happened. The other goal is to design a NoSQL database using MongoDB and using the indexing method in MongoDB to provide the efficient queries that retrieve information from the database. Then, we have implemented some types of queries using pymongo.py. These queries are as follow: new, delete, find, find by year, update, count by year, and find by birthdate. Our database is very big. It has a lot of documents.

3. The Description of the Problem

Our idea is gotten from the fact that Iraq is a famous, important and big historical country. Therefore, it is interesting to work with the big data of population.

In our work, we have got the population dataset. Our dataset is huge (it has a lot of records, and each record represents one person with 18 fields). We used MongoDB to create a database called Population, which contains one collection with around 8000000 documents (one document for each person). To improve

the performance of the queries, we have created two indexes in addition to the default index. The first index is based on the case number field, and the second one is compound index which is based on (Year and region fields). Here are some figures presenting our work.

Figure 1 shows the edit page that allows the user to edit specific document from the collection. This page allows the user to use the case number; after that, the system will automatically find and return the intended document from the collection; then, it presents the values of all the variables of that document. The user can modify the values and submit the changes to the system to update the document.

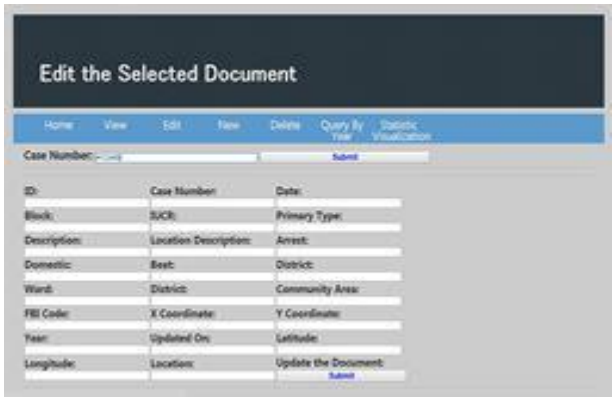

Figure 1: edit page.

Figure 2 shows the query by year page. In this page, the user enters the specific year in the year text box and click the submit button. The system will present a table which includes all the people that were born in the inserted year.

Figure 2: query by year.

Figure 3 shows the visualization page of the statistical information that presents an interactive bar chart for the people that were born each year. In the bar chart, the x-axis represents the year, and the y-axis represents the number of borns.

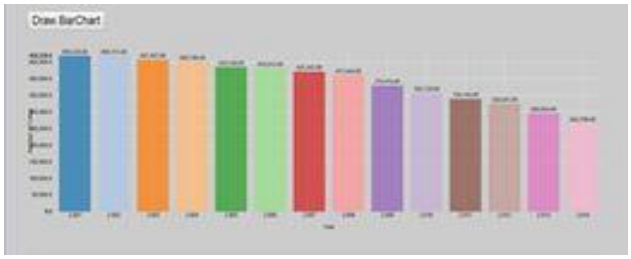

Figure 3: number of borns each year.

Figures (4 and 5) explain the stacked and grouped bar chart that can be used to compare between the number of borns and number of existing people per year. These two visualization tools are interactive (the name and the value of each bar can be shown by moving the mouse over the bars).

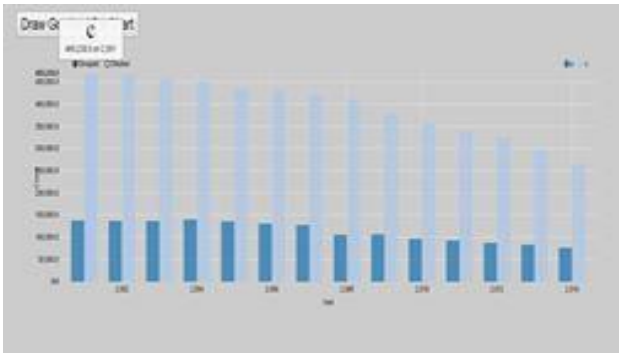

Figure 4: grouped bar chart.

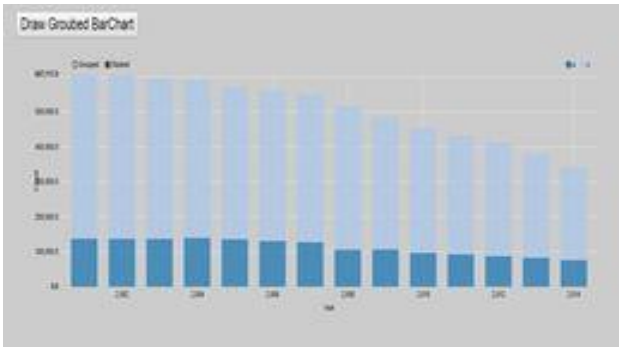

Figure 5: stacked bar chart.

Our database is very big. It has a lot of documents. This makes the work interesting to improve the performance of the queries by using multiple types of indexing for the database. In addition to that, the results of the queries were interesting because in one query as an example, we have found that the number of borns each year is huge compared with the number of existing people.

4. Conclusion

In our work, we used the dataset of the population of Baghdad city as an example of an iraqi city, and this can be applied to any iraqi city and every city in the world. Therefore, we have created a website that allows the user to view all the documents in the database, insert a new document to the database, delete a document from the database based on the case number field in the document, and can update an existing document in the database. Moreover, our website allows the user to search documents according to a year. Furthermore, our website provides some visualization to see some statistical information about the number of borns that were happened each year in Baghdad city as an example. Our work has two main goals. The first goal is to design a NoSQL database using MongoDB and to use the indexing method in MongoDB to provide the efficient queries that retrieve information from the database. We have implemented some types of queries using pymongo.py. These quires are as follow: new, delete, find, find by year, update, count by year, and find by birthdate. The other goal is to implement a prototype that visualizes some statistical information about the borns that were happened in Baghdad city.

We are planning to add more queries on our database for future work. Moreover, we are going to use other visualization tools to present the results of our queries. For example, we can use the heat-map to present the borns that were happened in each location in Baghdad based on the latitude and longitude fields that we have in the database.

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