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Compare Process of some clustering algorithms of data Mining.

[Jamal Mbarki] [Sidi Yasser El Jasouli]

***Abstract*— The aim of this paper is to create a process that compare time response of some clustering algorithms in data Mining , the subset of this experimentation is a data set stored in Teradata . In this paper, we present a novel hierarchical clustering algorithm called CHAMELEON that measures the similarity of two clusters based on a dynamic model. We present also k Means as representative of Partitioned ones, and DBSCAN as part of Density Based.**

Keywords—component; data mining; Clustering ; response time ;

I. Introduction

Data mining is a multi-disciplinary field which uses the three main scientific components: statistics, machine learning, artificial intelligence and database technology. It's commonly known by its acronym KDD: Knowledge Discovery in Database, and refers to all methods and algorithms used for data exploration or prediction in large data bases volumes, Data mining is very important in various fields such as sciences, business and other areas deal with a large data set (J. Mbarki. 2014).

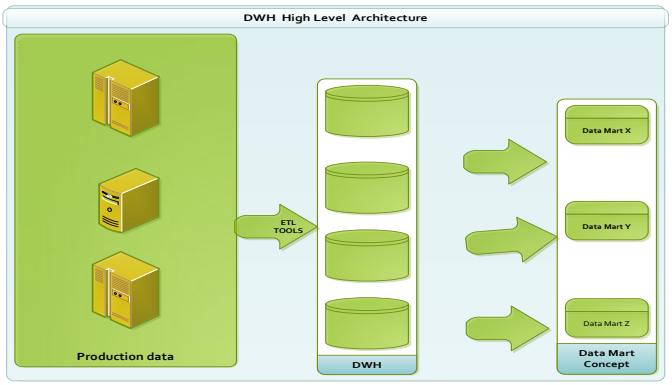
II. Data warehouse

It's a large reservoir of detailed and summary data that describes the organization and its activities, repartitioned into a various business dimensions. The customer dimension remains the most challenging dimension within DWH (J.Mbarki at all, 2014), DWH is a collection of what is commonly known data mart "(Inmon, 1996), data mart is subject oriented , each topic is stored separately.

Jamal Mbarki
Laboratory of Computer Science Research (LARI), Faculty of Sciences, University Mohamed Ier, Oujda,
Morocco

Sidi Yasser El Jasouli
Integrated & Efficient solutions IT.sprl
Belgium

Example: CDB: Customer Data Base contains typically information on customers, while Billing contains information on invoices. The Data mart enables the business user to report and provides decision support in organised manner. data mart is built to allow a quick and easy use of data.



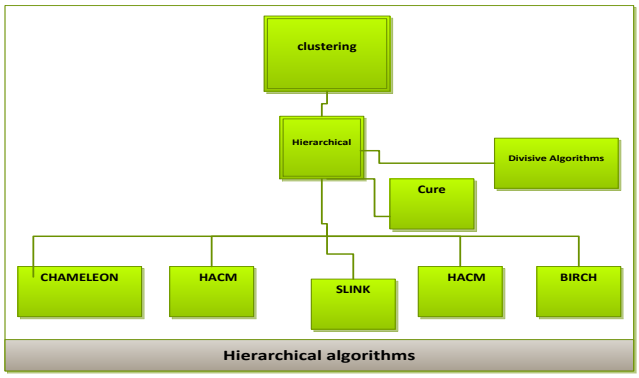
III. Clustering

The learning problems may be classified into 2 main components ; either supervised or unsupervised. In supervised learning, the objective is to predict the value of a variable called predictor based on a number of input variable called most of the time descriptors; in unsupervised learning, there is no outcome measure, and the goal is to describe the associations and patterns among a set of input measures.
Clustering is one the most important task of unsupervised learning; a cluster is a subset of data which are similar. Clustering (also called also segmentation) is the process of dividing a dataset into groups, where the members of each group are as much similar (close) as possible to each other. However, groups are as dissimilar (far) as possible from the each other. Clustering can uncover previously undetected relationships in a dataset. There are many applications for cluster analysis. For example, in business, cluster analysis can be used to discover and characterize customer segments for marketing purposes.

The Launch of new product/service uses the customer segmentation. There are other fields where these technics are used such scoring in Finance, or in biology, for classification of plants and animals.

A. *Hirarchical*

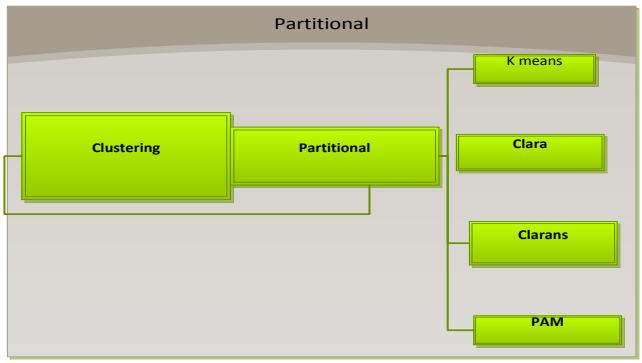
This way of segmentation implies to specify a measure of dissimilarity between (distinct) groups of observations, based on the pairwise dissimilarities among set of data in the two groups. This method, produce hierarchical representations in which the clusters at each level of the hierarchy are created by merging clusters at the next lower level. At the lowest level, each cluster contains a single observation. At the highest level there is only one cluster containing all data. The following picture is giving an inventory of the actual used algorithms:



B. *Partitional*

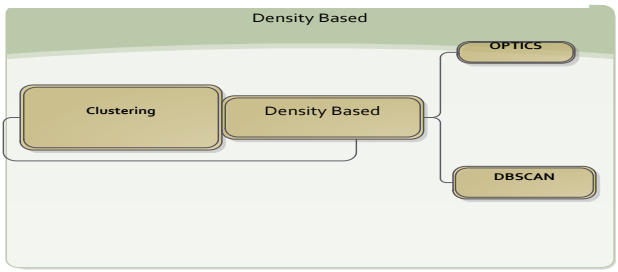
The aim of this group of algorithms is to construct various partitions and then evaluate them according to some criterion;

It's implying most of the time to specify the k number of wished partitions; the following view is illustrating the main used processes:



C. *Density Based*

This group of algorithms are based on connectivity and density functions. Typical methods: DBSACN, OPTICS,



IV. DEPLOYMENT OF A DATA MINING PROJECT

To put in production a data mining project there are many important guidelines, these rules are summarised into 4 main steps:

1. Data choice: it's consisting of data treatment + data cleansing, outliers' analysis and treatment…
2. Similarity choice ;
3. Algorithm choice;
4. Deployment & evaluation.

A. *Similarity choice some definitions*

- Data Matrix:

$$\begin{bmatrix} a_{11} & \dots & a_{1f} & \dots & a_{1p} \\ \dots & \dots & \dots & \dots & \dots \\ a_{i1} & \dots & a_{if} & \dots & a_{ip} \\ \dots & \dots & \dots & \dots & \dots \\ a_{n1} & \dots & a_{nf} & \dots & a_{np} \end{bmatrix}$$

Where *aij* is the value of the attribute *Yij* called also descriptor

- Matrix of similarity

$$\begin{bmatrix} 0 & & & & \\ d(2,1) & 0 & & & \\ d(3,1) & d(3,2) & 0 & & \\ : & : & : & & \\ d(n,1) & d(n,2) & \dots & \dots & 0 \end{bmatrix}$$

Let's consider 2 objects i,j from a certain classes, the distance between the 2 objects is expressing the similarity :

$$d(i,j) = \sqrt[q]{(|x_{i_1} - x_{j_1}|^q + |x_{i_2} - x_{j_2}|^q + \dots + |x_{i_p} - x_{j_p}|^q)}$$

This function is returning distance between i & j Called by definition distance of Manhattan for our experimentation q=1 ➔ so we will consider For our experiments the dissimilarity measure is taken to be squared Euclidean distance D(xi, xi').

B. Data choice

We create a table in Teradata representing

The data set for our experimentation

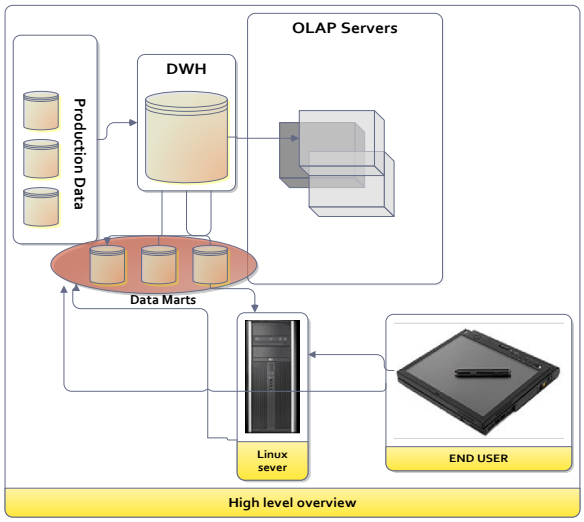
Where the attribute A5 is taken as descriptor .

The cluster_number is set to default value =0(before run , after the run of the process it's taking the value of the cluster ….

Below described the table creation statement:

```
CREATE SET TABLE Data_mart01.DM_fact_cluster01
,NO FALLBACK ,    NO BEFORE JOURNAL,
   NO AFTER JOURNAL,    CHECKSUM = DEFAULT,
   DEFAULT MERGEBLOCKRATIO
   ( A1  VARCHAR(3) CHARACTER SET LATIN NOT CASESPECIFIC,
   A2 VARCHAR(30) CHARACTER SET LATIN NOT CASESPECIFIC,
   A3 VARCHAR(15) CHARACTER SET LATIN NOT CASESPECIFIC,
   A4  VARCHAR(60) CHARACTER SET LATIN NOT CASESPECIFIC,
   A5 integer,
   Cluster_number integer)
PRIMARY INDEX ( A1 ,A2 ,A3 ,A4 ,  Cluster_number);
```

C. Process choice.



D. Steps for Creating and Execution Clustering Algorithms:

Step-1 Computational step: Create the shell script in the LINUX server *cluster.sh* according to clustering algorithm principle,

Where principle is according respectively: to

CHAMELEON, k Means, DBSCAN

Step-2 Create -a set of data representing respectively the input of each process.
Step-3 Execute Fast load tool in order to import data for treatment.
Step-4 Execute the *sh* script and load data into tables.

Step-5 Go to Teradata playground and select table to view its content.

E. Deployment & evaluation.

E. 1 CHAMELEON

Two-phase approach will be used:

Phase-I

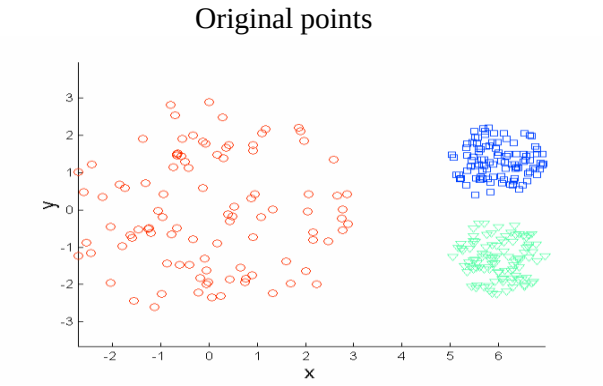
Use a graph partitioning algorithm to divide the data set into a set of individual clusters.

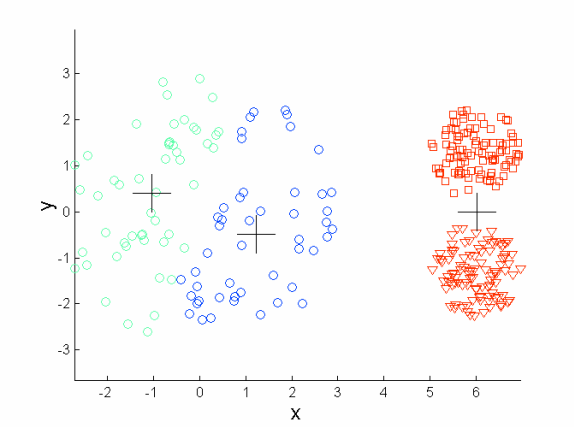
Phase-II

Use an agglomerative hierarchical mining algorithm to merge the clusters

E. 2 Kmeans

1. Divide set of objects into k not null;
2. Calculate centroid for each partition/cluster;
3. Assign each object to the nearest centroid /cluster;
4. Loop and go to 2, stop when all clusters are stables.





E. 3 DBSCAN

DBSCAN is a density based clustering algorithm

(Jain, A.K.)

- Density is number of points within a specified radius (*Eps*).
- A point is a *core point* if it has more than the Specified number of points (*MinPts*) within *Eps*
- Core point is in the interior of a cluster.
- A *border point* has fewer than *MinPts* within *Eps* but is in neighbourhood of a core point.

• A *noise point* is any point that is neither a core point nor a border point

E. 4 deployment in production

Before process run ;

```
select distinct Cluster_number from
Data_mart01.DM_fact_cluster01
```

⇨ Only one record is returned

Cluster_number
0

After script execution;

```
select distinct Cluster_number from
Data_mart01.DM_fact_cluster01
```

Cluster_number
1
2
3

✓ DBSCAN

⇨ Number of partition returned = 4

```
select max( Cluster_number) as partition from
Data_mart01.DM_fact_cluster01
```

partition
4

✓ CHAMELEON

Number of returned partition = 3:

```
select max( Cluster_number) as partition from
Data_mart01.DM_fact_cluster01
```

partition
3

E. 5 Time reponse of each process:

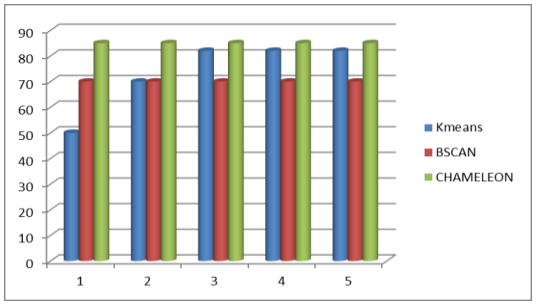
We will process many runs, by changing the record count of the input data set; and will calculate each time the time response value of the process. The following Unix command will be used:

Example:

```
real    0m25.491s
user    0m20.236s
sys     0m20.140s
```

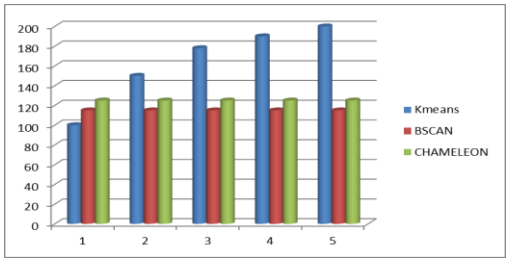
Below we display the results:

N=4000 record count of the input data set



Notice that the number of partitions remains the same for DBSCAN & CHAMELEON.

N=40000 record count of the input data set



V. CONCLUSION

It is widely recognised that clustering algorithms are for real world analysis. In this paper we have shown that the Dbscan and Chameleon algorithms represent the same trends and present the same realtime regardless the partition number, K mean algorthim show a dependency between the realtime and the number of partitions.

This process may be tuned for further use and analysis.

VI. REFERENCE

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