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Interactive selection of Multivariate Features in Spatio-temporal Data and its Change depends on the selection of Object, Event, State and its 3C's

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***Abstract*—** In this paper we can introduce the three metrics of the spatio-temporal database which can scrutinize the data and give us the result. And large number of applications of real world is depending on the object, event and states that are changes in day to day life. The combination of the three metrics with the vent state can convert the quantity in to quality so we can use the control point selection method. The whole process of conversion is known as appropriation. Spatio-temporal data easily become massive, either because the spatial domain contains a lot of information (satellite images) or many times the steps are available (high resolution sensor data) or both. This vignette shows how data residing in a database can be read using spatial and temporal selection and the combination of these two databases can make the output more innovative and useful.

***Keywords*—** Spatio-temporal data ,time series, trajectory, coverage,RANSAC, data metrics

I. INTRODUCTION

Change in life is a fact and these facts can be described in various forms, In spatio-temporal database the change can occur in raster and vector forms . These events and states can be found in various applications and in various domains such as air traffic control, pollution control system, environmental system, land use/cover data etc. The previous database i.e. classical database models don't have the way to represent both the spatial and the temporal data in an effective way. So the object relational database which is more accurate and give better result to describe the whole scenario. The spatio-temporal database is always changes so we need different models to describe these changes because change occurs not only in one phase it will be transfer from one phase to another and these changes can affect the parameters. Temporal database support the time series whereas the spatial database support the space series. When both the data are clubbed they can give the better results and the new concept will introduce i.e spatio-temporal database. The temporal database uses the different normal forms of database and and can relate with the images which we get from spatial database.[2]

The process of change detection of man-made objects consists of three major steps: image registration, feature (object of interest) extraction and detection of geometric differences in the extracted features from the temporal images of the same location. Various techniques are available for precise image registration.[1] Detecting temporal changes in the state of remotely sensed natural surfaces by observing them at different times is one of the most important applications of Earth orbiting satellite sensors, because they can provide multi-date digital imagery with consistent image quality.

This paper proposes a spatio-temporal concepts using their different features .We can analyze the climate trends which is change after a certain period of time.

II. SPATIO-TEMPORAL DATA METRICS

The real world information is basically surrounded by time and space. In technical terms the entity time is related with temporal and the entity space is related with spatial. Consequently the researchers can put a lot of efforts to make the spatio-temporal approaches successful. Now a day's many application demand for spatial and the temporal support. The Spatio-temporal data is basically depends upon the three metrics i.e. coincidence, concentration and continuation (3C). [3]

These three metrics are general among both the spatial and the temporal domain. These metrics also give the quantitative feedback to user.[4] The combination of these 3C can be helpful in the following ways:-

- The user can judge the properties that which is interesting and can also identify the weak and strong feature from the application.

- Enabling users to identify and group features that are inherently co-related and analyze them simultaneously for better result to the user.

We can capture the spatio-temporal phenomena exhaustively with three of them:-

- Time series:-we fix the time and control the space
- Trajectory:- we fix the time and control the theme
- Coverage:-we fix the space and control the time

Object, events and states play a vital role in the interpretation of a spatio-temporal data. Object is an identifiable entity over time and event is an episode on the time that may relates to one or more objects. State describe the whole scenario happened on that place regarding time and change can occur.[9]The observation can be obtained from the site which can give us the raw data and this data can be distributed in to three levels that time series defines the incident which is happened at that interval and trajectory define the movement of the data from one state to another and coverage of the whole process can be done which store the whole incidents and all these things are happened in spatio-temporal database and after that they can define the state which consist of object and event. They plays a vital role in the interpretation of a spatio-temporal data

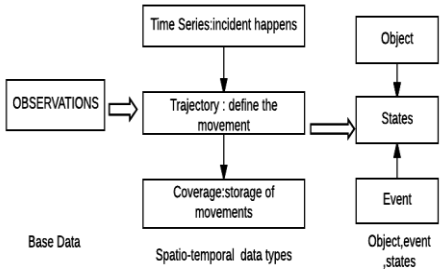

Fig.1:-Flow of Data in Spatio-temporal Database

An object can be change over time but the event cannot be change over time because if the event is stable then everything will go according to that event as shown in Fig.1.

III. SPATIO-TEMPORAL DATA ANALYSIS WORK FLOW

From a largely analysed approach we generalize that how the spatio-temporal analysis can done. The main aim of spatio-temporal data analysis is that we can get the quality information and to assess that the data is appropriate and can give better results. Prediction and description these are the primary goals of spatio-temporal .Using these two goals of spatio-temporal we can distinguish the quantity and quality of the data. [5]

The spatio-temporal data can be classified in two forms i.e supervised data and the unsupervised data. The supervised data can be generated from human being and the unsupervised data can be generated from computer

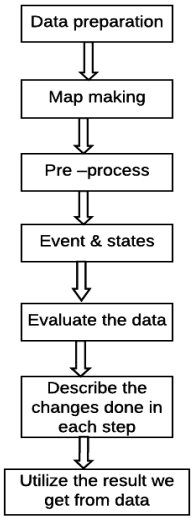

Fig.2 Work Flow of Spatio-temporal data

This unsupervised data can be divided into states and events in which the programmer can scrutinize the data in the form of events and denoted the time interval at which the incidence can take place as shown in Fig.2.

IV. ALGEBRA INVOLVED IN TEMPORAL DATABASE

A temporal database can use the operators to retrieve the data on time

- Selection
- Union
- Join
- Difference
- Intersection

These are the relational algebra which is used to extract the data from the database and then it can be relate with the spatial database and make a connection between the spatial and the temporal database.[6]

V. CHANGE OF DATA IN SPATIO-TEMPORAL DATABASE USING THE DATA POINTS

The change can take place in real world .This change can be monitored using the image concept because it can give the exact change of the space and these images can be taken using the spatial database because spatial data is related with the GIS. The photograph which is taken is static but after some time the change can take place and will show the changes. This whole procedure can be achieved using the RANSAC algorithm [10]. The RANSAC can set the rules and these rules can be divided into various modules to

enhance the performance of the picture. The detection of these key factors can differentiate the quantity in to quality.

The basic algorithm which can summarized the image using the control point selection:

1. Select randomly the minimum number of points required to determine the model parameters.
2. Solve for the parameters of the model.
3. Determine how many points from the set of all points fit with a predefined tolerance Ɛ.
4. If the fraction of the number of inliers over the total number points in the set exceeds a predefined threshold τ, re-estimate the model parameters using all the identified inliers and terminate.
5. Otherwise, repeat steps 1 through 4 (maximum of N times).

RANSAC is a resampling technique that generate candidate solution by using the minimum number of observation (data points) required to estimate the underlying model parameters. RANSAC uses the smallest set possible and proceeds to enlarge this set with consistent data points. The number of iterations, N, is chosen high enough to ensure that the probability p (usually set to 0.99) that at least one of the sets of random samples does not include an outlier. Let us represent the probability that any selected data point is an inlier 1 and v=1-u the probability of observing an outlier. N iterations of the minimum number of points denoted m are required, where 1-p= (1-um)/N and thus with some manipulation=log (1-p) log (1-(1-v)m).

From the two images Fig.3 & Fig.4 we conclude that data in the first image set the control points and these control points can make a difference.

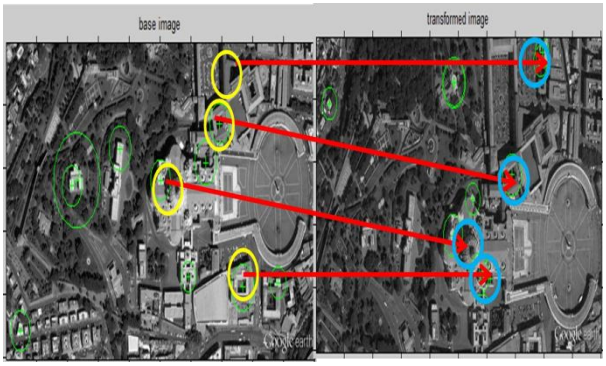

Fig.3 image showing the feature matching process

Fig.4 Output of feature matching process

The input to the RANSAC algorithm is a set of observed data values, a way of fitting some kind of model to the observations, and some confidence parameters. RANSAC achieves its goal by repeating the following steps:

- Select a random subset of the original data. Call this subset the hypothetical inliers
- A model is fitted to the set of hypothetical inliers.
- All other data are then tested against the fitted model. Those points that fit the estimated model well, according to some model-specific loss function, are considered as part of the consensus set.
- The estimated model is reasonably good if sufficiently many points have been classified as part of the consensus set.
- Afterwards, the model may be improved by re-estimating it using all members of the consensus set.

This procedure is repeated a fixed number of times, each time producing either a model which is rejected because too few points are part of the consensus set, or a refined model together with a corresponding consensus set size.We can take the base image as a referred image as shown in Fig.5.

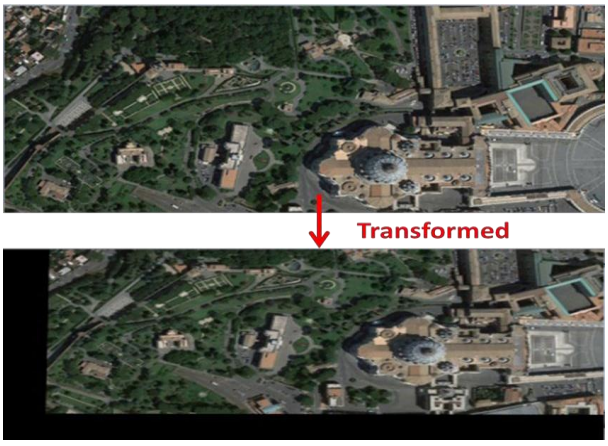

Fig. 5. Base image transformation

Once the referred image is transformed, both images are overlapped as shown in Fig.6. Referenced image and

transformed images are blended together.[10] Different weights are given to images so that it gives a feeling of blending or transparency.

$$\text{Dist.} = \infty .\text{img1} + \beta .\text{img2} + \lambda$$

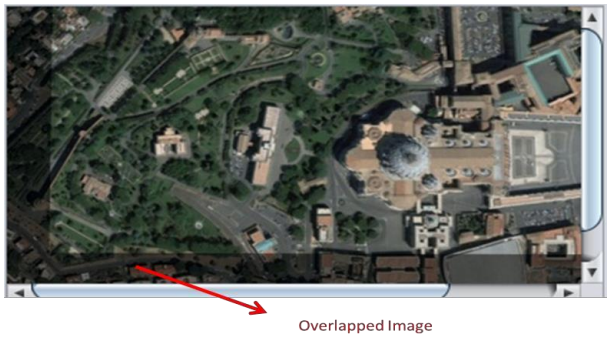

Fig. 6 Final Result

VI. CHANGE DETECTION IN STATE AND OBJECT

Change detection is the process of identifying differences in a region by comparing its images taken at different times. It finds applications in several fields such as video surveillance, medical imaging, and remote sensing (using satellite imagery i.e GIS). Several change detection applications using satellite images are in the areas of land use and cover analysis, forest or vegetation inspection, and flood monitoring. Especially for remote sensing applications, manually labelling and inspecting changes is a cumbersome task. Also, manual inspection is prone to errors and highly subjective depending on the expertise of the inspector

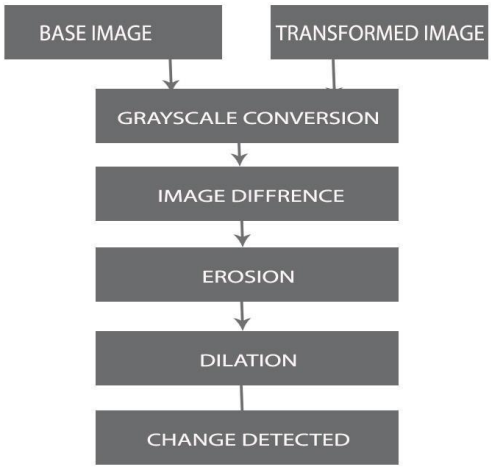

Fig.7. Flow diagram of change detection process

Change detection is a process of identifying differences in the state of object. After accurately registering the image, change detection can be analysed correctly. The transformed image is subtracted from the base image, IS(subtracted image) IS is eroded to remove the noise in the image . After erosion is performed IS is dilated to smoothen the changes.[7] The process involved in the analysis of the change detection is described in the fig.7.

VII. SPATIO-TEMPORAL APPLICATION TYPE

The data which is managed in spatiotemporal database can categorize the whole data in three different applications:[8][11]

- Motion:-The movement of object in different region may be continuous and can change their position with time according to their requirement. Example of a moving car in which the motion of the car changes but the shape of the car is stable
- Object:-In this application the object is located in space in which the change can take place discretely Example of rivers , landparcels etc.
- Motion and Object:-In this application the change can take place regarding motion as well as shape. Example storm is measured as a moving phenomenon which changes properties and shape over time .

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