Automatic Pattern Co-Location Detection in Video Streams-Real time implementation

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ABSTRACT
This paper offers a thorough analysis of automated co-located pattern detection in video streaming. Many flaws, including face recognition, pattern or object recognition, scene comprehension, co-located pattern recognition, etc., have historically developed as a result of pattern recognition procedures. In addition to presenting an exhaustive state of the art in the field, our review study also discusses several encounters and trials relating to its applications and system. Many applications are discussed in great detail in this study.

Keywords
Pattern Recognition, Co-location, Object detection, Frame extraction

1. INTRODUCTION
Images typically consist of enormous amounts of data that have been stored in a very high dimensional space, usually on the scale of 100,000 dimensions. Drawing conclusions from data with such large sample sizes quickly becomes obstinate. Therefore, employing patterns in pattern recognition criteria, many of these issues, such as face identification, pattern or object recognition, scene understanding, co-located pattern recognition, etc., have historically been handled.

The ability to look at raw data and classify it into one of the available categories is the skill of the pattern recognition. To do this, we must first choose a feature space to describe the data in a way that simplifies the categorization effort. After choosing the features, we must then use suggested models to characterize each class or category. We identify the classes of an unlabeled object from its data by determining which of these descriptions can best describe the importance of its attributes. Automating many activities, including scene analysis, fingerprint identification, face recognition, and optical character recognition, has advanced as a result of the problem of identifying, describing and recognizing visual patterns.

These strategies in conjunction with dimensionality reduction techniques have been extremely well-liked and effective in handling a variety of image processing jobs. Recently, there has been an increased interest in extending still images based recognition techniques to video sequences due to the development of low-cost, high-quality video cameras. Problems like face and gait-based person recognition, event detection, and activity recognition can all be addressed thanks to the added temporal dimension in these movies.

In this work, we attempt to explore automatic pattern or object identification in videos in view of tracking those co-located pattern such as tracking luggage's etc. are made driving the research community attention.

Perhaps subsets of spatial features that are frequently seen together in a geographic area are co-location patterns. In other words, these are groups of spatial items that are commonly found next to one another; if numerous biological species frequently coexist in the same area, this could indicate a pattern of co-location.

A series of patterns or items that co-occur more frequently than would be predicted by chance is referred to as co-location. A pattern or other object is also arranged or juxtaposed. Co-locating is defined as having two things, groups, military units, etc. positioned at the same site. Similar to that, it is the gathering of several entities in one spot.

Last but not least, co-location is defined by the Oxford Dictionary as the act of sharing a space or facility with someone else or certain resources. As a result, co-location would be practiced on military bases, college campuses, and other such locations. Here some of the few societal claims are possible to mention, where can judicially apply for co-location pattern recognition criteria.

In busy schedule people may forgot their belongings in places such as Airport, Railway station bus terminals corridor etc. In confrontation belongings may detaching without knowledge while they are moving in corridor or in a busy commercial or holy street. With this co-located pattern recognition concept conceivably help to identify the person or child who may be missing from his or her team or comrade or group in huge mob or busy places. It also may be extended to detect the valuables, mobiles, specks, glows and whether the shopping mall located with parking lot nearby etc. On other hand, in busy place disturbing the publics by placing the dangerous things thus sooner or later which create some explosion. In finding co-location pattern, this can assist us in making decision regarding the most difficult field test routes. The evaluation of a GPS-based method for accessing road user charges must take into account these field test routes. The evaluation of a GPS-based method for accessing road user charges must take into account these field test routes.

An instance of co-located pattern among comprehensive spatial feature namely road types, on an urban road map, Frontage is frequently present along highways in large metropolitan areas. Selecting test sites for testing in-vehicle navigation is made easier by identifying such co-location.

The main objects in space often have an effect of some kind on the things and places around them in space. For instance, noise pollution from motorways can be heard from blocks away. Additionally, manufacturers release pollutants that can have an impact on nearby residents. The important places are well protected due to societal cause such as areas around school and temples where liquor stores are prohibited.

In the general purpose of video processing, the scene without any interesting elements presents usually considered as a background element like people, things, or moving cars. It is made up of inanimate objects that hang around the scene passively. The background of a video about the environment as a whole can include both still and moving things. Walls, doors, and furniture in an indoor scene, as well as structures, plants, and ground surfaces in an outdoor scene, can serve as the stationary background items. Wavering drapes, moving fans, moving escalators, flashing water surfaces or computer screens, and many other moving background objects are examples of moving background elements.

The background might be changing over time in the meantime. One is the subtle alteration brought on by changes in natural lighting. The abrupt changes are the other. This could result from changes brought on by turning on or off certain lighting, altering the camera's field of view, or removing or adding background objects. Additionally, the foreground object could change into a background object, like a car pulling into a parking space. A background pixel may occasionally have different states, such as sceneries with the sun and clouds. As a result, many background elements for a complex environment should be specified using various feature types.

In this research work, we are attempting to propose a model for both static and dynamic co-located pattern recognition in a scene from a sophisticated, real-time video through the spatial, frequency and hybrid framework. These frame work perhaps smart enough to classify the main and co-locate pattern and track their trajectory from a broad feature vector is created from this. The statistics of various feature vectors are being learned and maintained in the meantime using an efficient data structure. Two different sorts of characteristics are used to model the complicated background made up of both stationary and moving objects based on these. The statistics of the most significant tiny or co- occurrences patterns are used to characterize the motion items that are co-located in the background, while the statistics of the most significant invariant feature are used to describe the stationary portions of the backdrop.

2. PROPOSED ARCHITECTURE

For the tracking process to get started, object detection is crucial. Every frame continuously applies it. To start the tracking process, a standard method for object detection is necessary. Every frame continuously applies it. Using temporal information derived from a series of photos, such as by estimating underframe differences, learning a static background scene model and comparing it with the present scene, or identifying high motion areas, is a typical technique for detecting moving objects. Sliding a window over the image and classifying each local window as containing the target or background is another common method for object detection. Instead of considering every possible sub window, local interest points can be retrieved from the image and then each of the regions around these spots can be classified.

Change detection is the process of identifying changes in a pixel's state by comparing appearance values between groups of video frames. Frame differencing, background subtraction, motion segmentation, and matrix decomposition are a few of the most used changed detection methods.

Here the processing of video information would able to receive distinct instructions, which could then be processed on the same data item. Thus, proposed strategy, perhaps possible to achieve through analysis of video frames, in view of searching co-located object or pattern in a video file and same is shown in the Figure 1.

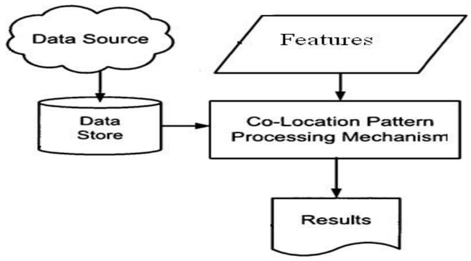

Fig1.Proposed Architecture

3. LITERATURE ASSESSMENT

Currently data recognition using co-location are achieved in the field of mining the co- located synchronized data for numerical or textual, etc. This has been thoroughly examined in in-depth publications by the current scholarly community.

Preponderance of content-based image is occupied in bright, automated processing of pattern or thing. There are writers who have pinpointed some of the latest developments in pattern and co-pattern analysis and co-located pattern retrieval through proposed conventional or data mining technique, they remunerated meticulous concentration to the methods by which significant information about pattern. There is dearth in relevant literature based on the conventional and state-of art algorithm approaches to represent and retrieval of primary and associated pattern data.

The work of Jin Soung et.al[1,4] attempts to address the co-located pattern searching through the co-location of spaces represent the subsets of features via an instances lookup approach for join-less co-location mining instead of expensive spatial instances join operation. They also warm-upped to demonstrate a neighborhood-based partial join technique for spatial data and experimented over the synthetic as well as real world data sets. Here author has made attempt to explore there are various methods for discovering co-location instances, instance join clique partition, and space partition.

The other approach, described by Hui Xiong et al.[2], depicted a full framework for finding co-location patterns in data sets with extended spatial objects. It described through motorways and frontage roads. These are subsets of spatial features that are typically grouped together in space and supported by a more general transaction free technique to mine extended spatial objects as well as control the costs associated with related geometric computation. This was calculated using a neighborhood definition based on buffers. The main extensions that follow are to geometric filter and refine approach and prevalence based pruning strategy. The author has attempted to identify line-string co-location patterns in this work, which drive to infer the choice of the most difficult field test routers. To put it another way, these field test routes are crucial for assessing a GPS based method to accessing road user charges.

A Xiangye xiao et.al [5,9,11,12,13] glimpse over using density based co-location pattern discovery, we may identify classes of spatial objects that frequently appear together. There are species commonly reside in close proximity to one another, which can be recognized as a co-localized pattern. In the literature most of the methods are highlighted based on generate-and-test strategy, which is generate a candidate and test them to determine whether it is a co-located pattern. In test step author extended the effort to identify instance of candidate to obtain its prevalence to reduce computational cost, which is costlier in general.

The notation of the impact of visual and haptic space co-location on from judgement, which tries to offer information under both stereo and non-stereoscopic visual conditions, is proposed by Gunner Janson et al in their study [3]. Here, the participants goal was to assess the degree of the sphere form distortion by contrasting each of its Y and Z dimensions with its SX dimension. The co-location had a significant impact on Z dimension under stereo conditions when the case difference was measured. This idea recognizes that the co-location pattern has advantageous effects on how in-depth object perception is perceived.

The ample amount of research literature [1,4,19,20]related to a pattern or co-pattern recognition system is meticulously observed. As per our observation, in depth literature profiles are stipulated mostly to detection of main pattern or traditional way of solving the problem. On the other hand there is dearth of contribution from similar research community. There are some authors shown enough effort to comment critically over the performance and response time of the system.

Moreover, the highly appreciated commercial and computational aspects are well addressable through performance and response time of the strategy. Hence we are able to accomplish this through the proposed architecture based on spatial, frequency and hybrid system frame work.

The volume of literature [15, 16, 17, 18] produced by the current research community, as well as their contributions and experiences, are pertinent to patterns or objects in video streams that are more closely related to string, text, or numerical data mining. In other words, there is a severe lack of highly relevant, cutting-edge literature on automatic recognition, co-location pattern extraction, or object extraction of understood attributes.

In the larger scope, we are interested to develop robust algorithm for retrieval of entire co- located pattern. Eventually, this research work concentrates on automatic object or pattern detection in a video stream.

4. PROBLEM SPECIFICATION

One of the main challenges that co-located information retrieval faces is performance and other challenges are the dearth of standard collection of object or pattern that is nearby video footage against which each research community could test its techniques, thumbs down homogeneous sets of performance, and non-available consistent evaluation metrics. Subset of spatial elements that are frequently found together in geographic space are called co-location patterns. The modelling of the neighborhood and interactions between spatially co-located items, as well as the management of associated geometric computing costs, are major problems.

This research work attempts to address the challenges mentioned above, through proposed strategies of co-located pattern identification. Here proposed criteria would be fast algorithm is even faster than the fastest state of the art sequential or traditional approaches.

The available literature, particularly on co-located pattern identification or extraction of invariant features, along with the other co-located pattern or object also necessary to consider their existence in scene of video. So we are proposing novel methodologies for such pattern identification automatically and exclusively for Airport, railway station corridors and bus terminals and to construct an effective robust system based on its co- occurrence. We are also intended to extend our interest to strengthening of system in terms of its computational capability and response time.

5. OBJECTIVES OF THE RESEARCH SCHEME

The research work principally concentrates to develop strategies to automatically detect co- located pattern or object in the wider scene of video footage. As part of the work we are proposing following specific objectives.

- To track the motion of objects and find any unusual ones.
- It took pictures of the items, analyzed them, and recognized them.
- Extracting various frames for pattern identification.
- Inform the user who is keeping an eye on the object.

6. OUTLOOK OF THE ANTICIPATED CONSTITUTION

The intend work’s prime goal is to develop the tools and strategies for automated co-located item detection in video stream by means of time, frequency and hybrid domain. Subsequently, it proposes to improve the efficiency of existing approaches. For pattern or objects which are co-located pattern information representation and retrieval of invariant feature extraction from the video footage. We will like to formulate some of the strategies such as spatial based methods. We intend to use spatial, frequency and hybrid of spatial and complex domain function for invariants features extraction since it is computationally accurate and fast. The proposed work plans to employ general methods to extract features for complete process. In the section of co-located pattern object representation perhaps video summarization and retrieval of main pattern is quite suitable and later process can track the allied or co- located object or its feature effectiveness advantages can be useful.

Subsequently, comprehension of similarity measurement needs the structure. In view of this the important module in the work proposed is to identify co-located object similarity distance computation from main pattern or object in a video footage.

The research methodology through proposed figure 2 depicts the architecture of the co-locate object retrieval system, which primarily consists of two subsystems: testing and cognition and later stage comprises of recognition or training module. There is an effort to pool the standard collection of video file keeping in mind the interest of research community. In the subsequent stage with the help of suitable data structure in order to compute invariant features of main and co-located pattern or object information with help of some complex domain invariant feature such as pitch, rhythm, amplitude etc., is discussed. However, the credible outcome of training phase is to accommodate comprehensive and abstract information of main and co-located object or pattern document in the name of knowledge base. In the testing phase computation of co-located pattern information futures is replicated and attempt to compare with knowledge base using appropriate thresholds in order to substantiate the accurate retrieval of co-located pattern.

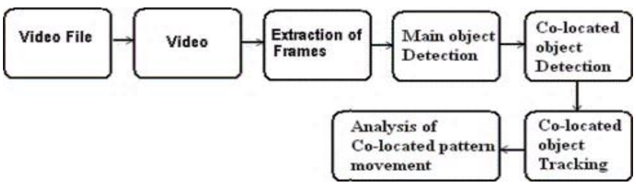

Fig 2. Broader process of identification of Co-located pattern

7. CREDIBLE CONSEQUENCES

The upshot of the proposed research work would be an intelligently co-located pattern feature extraction and retrieval through erected criteria. Perhaps this has lot of commercial applications. Further, the technology can be extended to systematically analyze broader categories of several co-located video stream pattern.

8. METHODOLOGY

Segmentation techniques separate an image into its component elements or devices. Self-sufficient segmentation is typically one of the more challenging tasks in digital photo processing. I believe that a tough segmentation process moves us closer to a successful resolution of imaging problems that call for the identification of objects. On the other hand, segmentation algorithms that are shaky or unpredictable virtually invariably result in failure. The more accurate the segmentation, the more probable it is that recognition will win out in general. Background subtraction is used in the segmentation process to remove the heritage component.

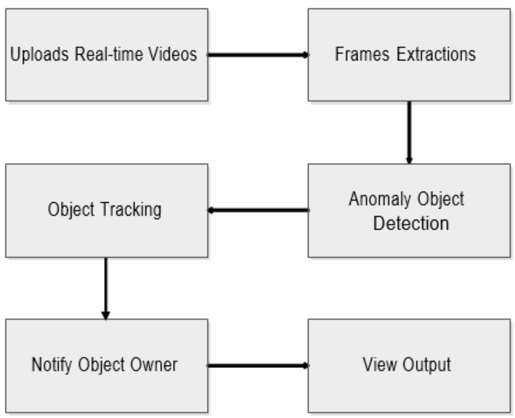

Fig 3. Block Diagram of Proposed System

9. IMPLEMENTATION

A collection of programming functions called OpenCV (Open source computer vision) is primarily focused on real-time computer vision. It was first created by Intel and afterwards sponsored by Willow Garage and Itseez (which was later acquired by Intel). The BSD license for open-source software makes the library cross-platform and free to use.

A free and open-source software framework called Tensor Flow is used for differentiable programming and dataflow across a variety of activities. It is a symbolic math library that is also utilized by neural network applications in machine learning. Google uses it for both research and production. The Google Brain team created TensorFlow for usage within Google.

Input video streaming: All video file data is compressed and transmitted to a requesting device in small pieces according to the same principles as data streaming. A compatible video player that connects to a remote server that holds a previously recorded or previously saved media file or live feed is often needed for video streaming. To enable transfer via a network or Internet connection, the server compresses the media file or data using certain algorithms. Each data stream's size is affected by a number of variables, including the size of the actual files, the bandwidth's speed, and the network's latency. The user or client player then decompresses and renders the streaming data, enabling a user to start watching the file before the complete video data or file is received.

Predicting The Objects: Here utilized the threading and multiprocessing python modules to run the object-detection API with my webcam in real-time. The stream from the webcam is read via a thread. A group of employees process the frames that are placed in a queue (in which TensorFlow object- detection is running). Threading is not an option for processing video since workers must scan every frame of the video before they can begin applying object detection to the first ones in the input queue. When the input queue is full, frames are not read. Perhaps having a lot of employees and long lines will help to tackle the issue (with a prohibitive computational cost) A framework developed on top of TensorFlow called the TensorFlow Object Detection API makes it simple to create, train, and use transfer learning-based object detection models.

Identifying Main and Collocated Objects: Using an image segmentation method, instance segmentation is a computer vision technique used for item detection. At the pixel level, it recognises every instance of the items that are present in the photos or videos. When an image is segmented, the visual input is divided into groups of pixels that collectively represent an object or a portion of an object. In contrast to semantic segmentation, which classifies each pixel, instance segmentation detects each instance of each object depicted in the image.

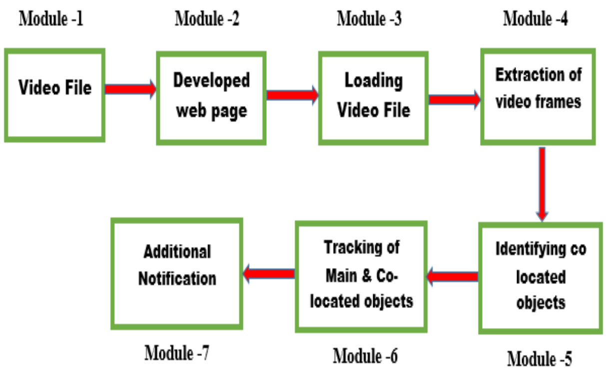

Fig 4. Process of identification and notification

- After the user uploads the movie, the frames are extracted depending on low-level or high-level features.
- Feature extraction reduces the amount of resources required to explain a huge data set by separating the feature from the object.
- A picture's anomalous items can be found and instances of objects from a particular class can be found using object detection.
- When applying the Comparison Model, which makes predictions about object categorization, a subject must swiftly assess whether a test object belongs to a specific goal category.
- Engage in behavioural analytic work in research or other contexts. capability or in a video of applied behaviour analysis, which applies research-based concepts to encourage changes in an object's behaviour.
- Item Anomaly Detection Using the retrieved frames, find the anomaly items and remove them from the backdrop. Then inform the appropriate person about the object.

10. TESTING RESULTS

Table 1. System Test cases

Test Case	Testing Scenario	Expected result	Result
TC – 01	Uploading the correct format video (MP4)	It should only accept videos	Pass
TC – 02	Processing the video uploaded by extracting the frames	System should process and extract frame	Pass
TC – 03	Identifying the dataset and creating cluster to identify the objects.	System should process the dataset and should give result	Pass
TC – 04	Anomaly object tracking from the video	System should track anomaly objects	Pass
TC -05	After anomaly object tracked, Should notify the respective object owner.	System will notify the respective object owner.	Pass

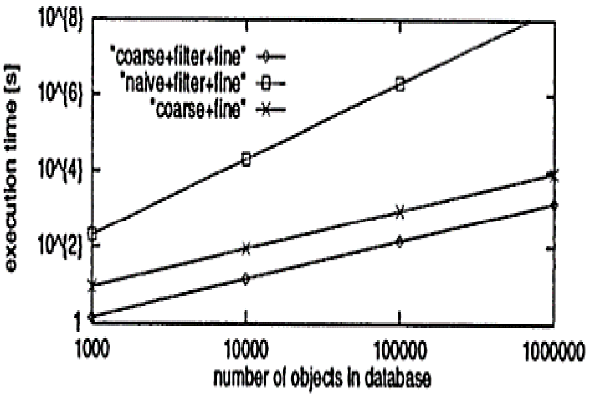

Fig 5. Execution Time

11. RESULTS AND ANALYSIS

Fig 6. Command Prompt with URL

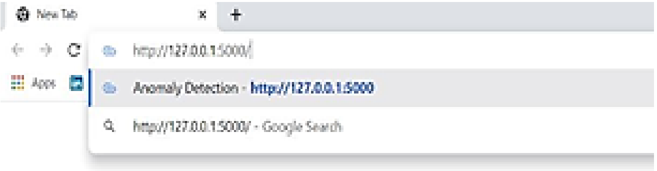

Fig 7. Running URL in the Browser

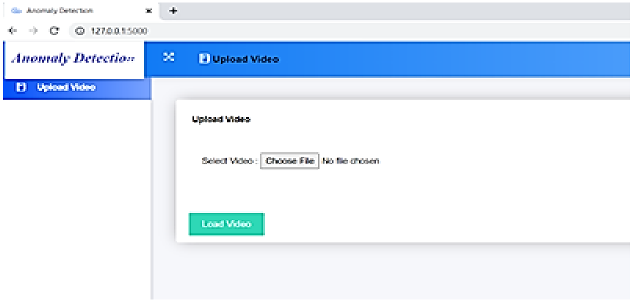

Fig 8. Web Page for Uploading Video File

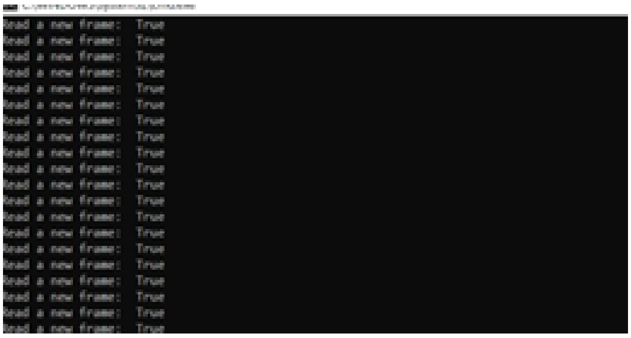

Fig 9. Extraction of Image Frames

Fig 10. Object Detection

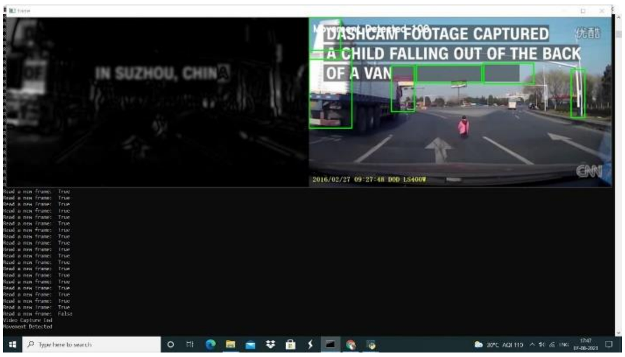

Fig 11. Main Object Detection

Fig 12. Co-located Object Detection

Fig 13. Main and Co-located Object Detection

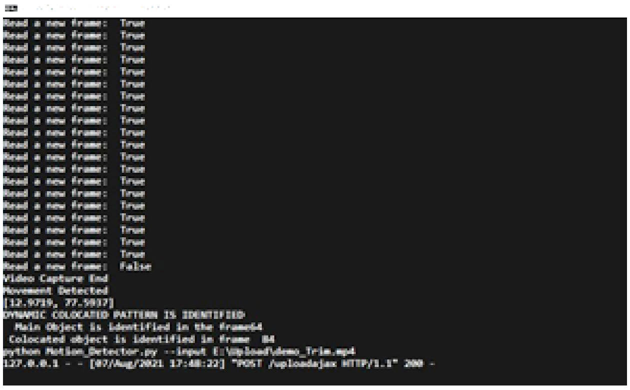

Fig 14. Object Frame Numbers Detection

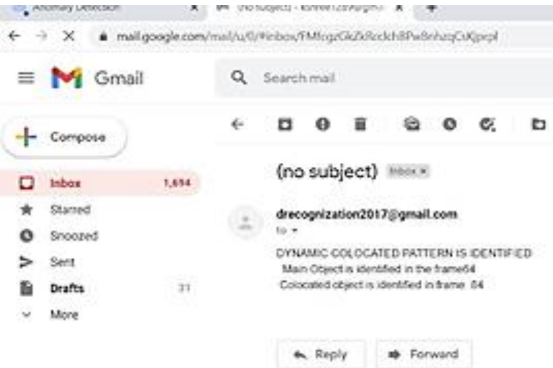

Fig 15. Notifying Registered User

12. CONCLUSION

A dynamically co-located pattern feature extraction and retrieving employing pre-established criteria would be the result of the proposed study endeavor. So we are proposing novel methodologies for such pattern identification automatically and exclusively for Airport, railway station corridors and bus terminals and to construct an effective robust system based on its co- occurrence. This method is may also use in a wide range of industries, including security, transportation, home automation, health care, entertainment, and entertainment. A key starting point in geographic data mining, spatial co-location pattern can support decision-making in a variety of fields, including biology, mobile services, earth science, ecology, public health, and GIS (Geographic Information System). The use of numerous co-location pattern mining techniques based on association analysis is advised. We are also intended to extend our interest to strengthening of system in terms of its computational capability and response time. This has a wide range of business applications. It is possible to develop a more sophisticated variation of the technique to systematically examine bigger collections of several co-located patterns in streaming video.

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