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A Unified Process of Big Surveillance Video Data by Smart Monitoring Cameras using Big Data Management

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Abstract—Cities which use data for making the places faster, secure and intelligent are called modern cities. The data-driven activities can be anything like terrorist attacks, controlling traffic garbage utilisation, dynamic speed limiter etc. Smart cameras replacing with the normal Closed-circuit television (CCTV) can make a huge impact on the city. smart cameras with the intelligent processing system integrated to it can recognise any activities which are not normal. In this paper, we will be proposing an approach which can be used for monitoring important places in a city like Hospitals, hotels, public places, secluded places etc. Since in order to achieve this we need a huge amount of data for which we need a structure or an architecture to store data. Since Hadoop distributed file system can store huge amount of data and at the same time can process it in a very intelligent way.we choose Hadoop architecture to process and get insights into our data.

Keywords:Modern cities, Smart cameras, Intelligent processing, Hadoop distributed filesystem.

I. INTRODUCTION

Security is the primary concern for a modern city. Cities play a major role in deciding the entire country's economy and integrity. There are infinite possibilities that can happen to the city on any particular day. This possibly can be anything like a traffic-accident, terror attack, train robbery etc. Technology can play a major role in world cities for improved efficiency and quality of life for people living there. Smart monitoring cameras can play a major role in controlling these harmful activities the video surveillance system can help police at an investigation for collecting ideas, getting proofs, generating leads and even at the forensic level.

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United Nations made an estimation that 50% of the world's population is living in urban areas and the population growth in these areas are drastic. The technology integrated with these cities can make people live creative, healthy and secured. Providing security to these cities is a big challenge for any individual.

To ensure protection of city we can use the data recorded by the surveillance system as a major component, in cases of emergency we can even use the geographic information system which can give us a clear insight of what are all the things which are going on that particular area with which we can use the data for providing the emergency response and getting a clear assessment of situation. With this insight, we can plan the required action to control the emergence of an emergency situation and get an idea of the resources required to tackle the problem. The videos which are recorded by the smart cameras are given as an input to the HDFS system which was created by Shavachko at al. The hdfs system makes sure that there is no redundancy in the data stored and also resolve the problem of large space. The videos are generally collected by many Smart surveillance systems. Individually which uses cloud storage and multimedia surveillance backend system which take the data from different cameras split media files, metadata and store the resultant data in a segregated way in the cloud which gives us a rapid retrieval while using the system. We use collective Matrix factorization hashing which transforms data into a binary representation with low storage cost and High–speed processing. For detecting the abnormal activities we can use a template known as normal behaviour template which was proposed by Kim at al. This normal behaviour template consists of a series of behaviours or activities which can be reconstructed by the video clip database. Any activity which cannot be reconstructed by the normal behaviour template can be considered as an unknown activity. Otherwise, this activity belongs to normal behaviour. Chen at al proposed an algorithm which can detect abnormal activities in a crowd based on speed or movement of a particular person in the crowd. This algorithm can be used for detecting a particular target with an abnormal activity which helps the investigation proceedings to be done effectively and faster. A group of smart monitoring cameras captures and integrates the live Real world data simultaneously. Combination of data from different cameras can help to identify an abnormal activity more effectively.

The data which is collected by the smart monitoring camera can be integrated on the cloud by an end to end process or value chain. Integration may also bring together the information which is in an unstructured way. The analysis which we perform on the integrated data must give us new insights and help us to find the abnormal activities effectively. The insight in data can help the investigation and create a better ecosystem. We can also perform predictive analysis of the activities and control the situation more effectively. The remainder of this paper proceeds as follows the section 2 of this paper consists of the related and the previous works done on the smart monitoring cameras. The section 3 consists of a proposed approach, The Section 4 consists of various modules present in our project, section 5 proceeds with the modules present in our system, section 6 consists of conclusion and ends with acknowledgement. In this paper, we will be proposing system which can be used to find abnormal activities in a particular area with the help of smart monitoring cameras with Hadoop distributed file system integrated and various algorithms which are used to perform analytics over the data to drive us greater insights over the situation. Thereby making the ecosystem peaceful.

II. RELATED WORK

In recent years many systems arrived concerned with providing security and safety that arose in an urban city currently. There is a wide range of video surveillance systems that are used at traffic management, secluded places, etc. Providing security to a city is a very challenging topic. Surveillance systems, big data platforms are presented in this area with help of service-oriented architecture (SOA) technology. we can connect various devices within a city and analyze the data which leads us in reducing the cost for manufacturing new components. Whan at al proposed a system with which we can identify people clearly with help of infrared video at night, he also proposed an algorithm to classify people in a crowd based on objects which they carry. With help of the general Instinct, where people who tried to cover their face while performing an abnormal activity we can identify them with help of SCR models. These models were developed extensively by lin at al and Kim at al. The SCR based methods are used to adopt various skin models, colour information, and skin ratio. With the combination of ellipse fitting and the skin area ratio, we can find whether the face is covered or not. They also use AdaBoost to combine skin colour detection and face templates matching to produce a classifier. These are effective when we use them at Bank automatic machine teller (ATM) application. The major drawback of these systems is that they cannot detect faces which are not in the range of 5 meters which make them difficult to use in the intelligent surveillance system.

In the HDFS architecture, metadata and application data is stored separately. Metadata is stored on a dedicated server called namenode and application data is stored on a dedicated server called data node. These servers can communicate with each other with help of TCP/IP protocol we have other distributed file system lustre and PVFSwhich use mechanisms like raid for data protection. Hdfs does not follow that mechanism but uses another mechanism in which file content is replicated on multiple data nodes for reliability this mechanism ensures data durability, data transfer bandwidth multiplication and local computation.

III. PROPOSED APPROACH

In this paper, we represent a methodology with which we can detect abnormal behaviour in an environment. First, we will be creating a database known as an abnormal database in which we will be storing the warnings in case of emergency. In order to save the storage space, the warnings will be divided categorically and the recorded data will be stored in a particular category. By, doing this the video clip which has to be retrieved can be found preferentially.

In order to find the abnormal activities from the normal activities, we use the historical data as an input to differentiate between them. Besides historical data, we have many factors to decide abnormal behaviours such as the duration of a person, the frequency of occurrence and wandering. The abnormal behaviour database consists of metadata. The metadata has a description which consists of information like a suspicious target, monitoring site, camera ID and so on. The database is updated continuously with the activities which are happening in real time. All this information can be used for analysis. The information which has to be analysed from the abnormal database must be monitored once again because incidents like traffic accidents are not in the benefit of multi-point correlation analysis.

Once, the database is constructed then the historical data is examined collectively on the incident with temporal autocorrelation which is based on duration or occurring frequency. If the activity in the temporal autocorrelation is greater than the threshold value of historical data then consider the activity as abnormal. If abnormal activities have been triggered then the activity will be shown as a warning to the user. Then, starting the temporal correlation between the historical data to the current data by which we get the category of abnormal activity.

Once, the abnormal activity is confirmed then we can proceed with multipoint analysis. Here, we move with an assumption that the people trying to perform this activity are not generally limited to one member. Instead, there will be a group of people who are trying to execute this abnormal task. Here we try to find out the pattern from the historical data to find the other people in the group and also the vulnerable place for the activity to happen. This will make the system pre alarming more logical.

Practical examples of identifying abnormal activities

1 If a pedestrian is wandering, in multiple places with spatial relevance simultaneously then the system will find the frequency of occurrence within a time period and calculate its temporal autocorrelation with which we can find the relevance. If a couple of people with wandering events are detected then the activity is considered as an abnormal activity with more risk attached.

2 Same person appearing in different sites: We try to identify whether the same person with the same behaviour with relevance to time and space is wandering. Once, the detected person performing this kind of activity is found then with the help of person re-identification technology with relevance to space and time we perform temporal correlation analysis and if it is greater than the threshold value then we can consider the activity as abnormal. With the approaches given above we can identify an abnormal activity from a set of activities. The architecture diagram which is given below gives us an clear idea about how the system works.

Intially, the video which is recorded by the smart cameras are stored and then classified based on the operations performed upon them which will be secluded, corporate, crowded places .Then the value obtained will be compared with the threshold value and with that we can alarm the officer for more focus over specific location.

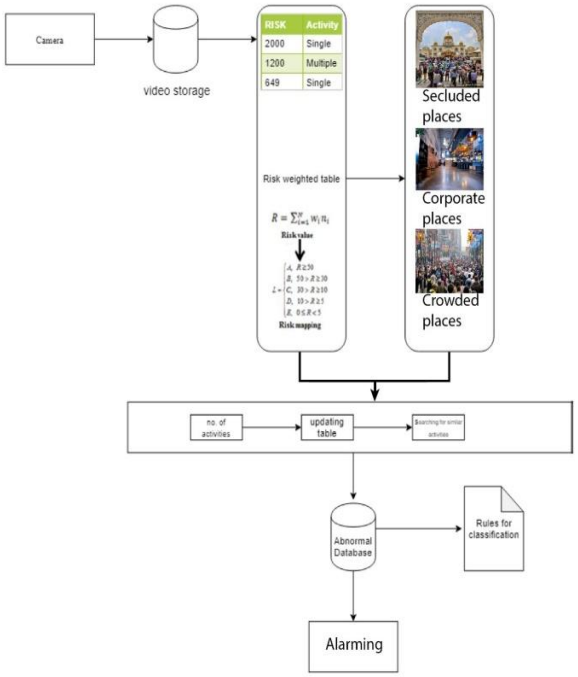

Figure 1 Architecture diagram

IV. MODULES FOR VIDEO STRUCTURED DATA

1 video data modelling
First video data is converted into visual knowledge by defining a set of rules in the description. Secondly, the knowledge obtained from the above step has to go through the process of refining low-level features and getting the semantic information. From the knowledge obtained in the above steps, the machine should define a structure in itself by keeping a view on the logical relationships between the different entities present in the data.
2 Video data understanding
The main objective of this module is to obtain high-level semantic information. For this, we have to perform two major tasks. Firstly, identifying the objects in the image with respect to the scenario. Secondly, the scenario has to be described and understood well based upon the process done through the above steps. In the object identification step, we try to explain the scenario with the prior knowledge which was given to the system. By using semantic knowledge model and video description we get our insight into the data.
.3 Knowledge representation
First, we have to get an instance of the video knowledge models which has both syntax and metadata sets. Metadata is the fundamental component of knowledge obtained and syntax which defines the structure of visual knowledge. Once the metadata and syntax are determined then we can represent our knowledge in Extensible markup language (XML), Resource description framework(RDF) which have a powerful definition language. Secondly, Obtained knowledge should not be distilled with the video clips. It has to be optimized for a function model with a special description task.

4 knowledge database

XML is a description file format for the video description. XML has a set of rules for encoding documents in machine-readable form. Organising the data in XML will determine the systems further applications for retrieving and data mining. If we have any special file format then it must be designed properly to be compatible with the different applications in the system.
5 Semantic data retrieval
Retrieval of data i.e, the video is the most important application of video structured description. Our surveillance system can have better insights towards the data when compared to traditional content-based image retrieval system. In the surveillance system proposed in this paper, we extract insights based on semantic models. The semantic models can help in semantic retrieval of data too. With help of the semantic model, the search engine can perform logical reasoning to understand the users intent during each step of the search.
In the figure 2, we will be looking at the five steps where data can be converted into valuable insights. For this the data undergoes a
Process consisting five steps known as collecting, converting, storing, accessing and retrieval.

Figure 2 video data understanding

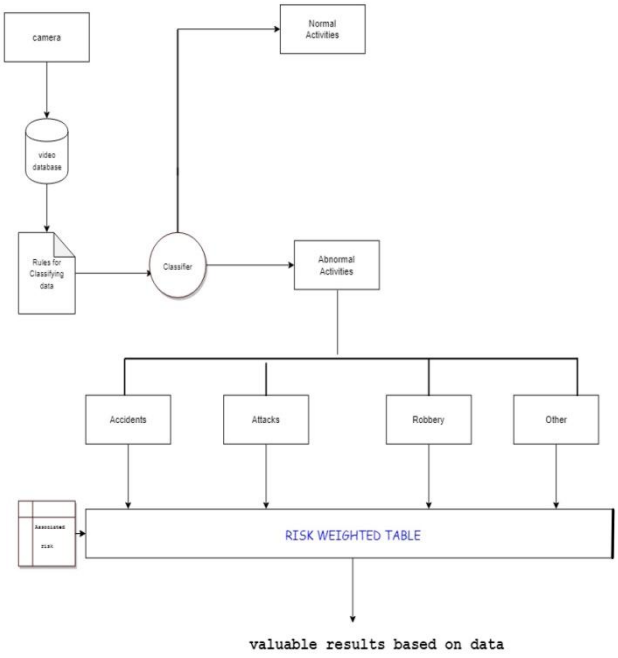

Figure 3 Classification of data

V. RESULTS AND DISCUSSION

In the terror attack, cases happened previously terrorists usually watch the place of attack carefully. By watching the place carefully they could plot the plan with more accuracy and cause devastation effectively. The behaviour of a terrorist is different from a normal person in that place. They wander in the area aimlessly, repeatedly they try to avoid all the cameras capturing them or the cover themselves by some means of a cloth or by hand they will be entering and leaving the place repeatedly without minding their business. The figure shows the terrorist watching the area before the attack the places which are marked in red are the places where terrorist Wandered.

By using the method proposed in this paper, if a person is wandering in the same place we can use person re-identification technology. If a person tries to cover his face repeatedly we can use SCR algorithms in order to detect their faces and also the alarm the officer that he is being wandered and covering his face continuously. The person makes himself suspicious and can be observed first purposefully. By using high spatial correlation and multispot identifying analysis we can observe that the same person is not only behaving in this way in a particular area, but also in multiple areas. Thus making the person risk higher and can be prevented before the final attack.

There were few places near the place of the attack where the terrorists wandered and planned. Those places are marked in red colour on the map. When monitoring these places if people performing these activities are found then the risk table for them will increase its value. Thereby, storing the data in the abnormal behaviour database. This can pre-alarm the officers and can help them to take action immediately. It also helps the officer to get his job done by keeping the focus on a particular activity without focusing on normal and unnecessary activities.

Actually, at the time when the Paris attack happened, they had only normal surveillance systems installed. So for the investigation to proceed they had to check around 500 video clips from all the cameras. A huge force of labour was involved to perform this task and identifying target was hectic and needs a lot of patience. By using the analysis method proposed in this paper we can save all the huge labour by reducing it to a few target moments. If performed well it could also prevent the attack to get happen.

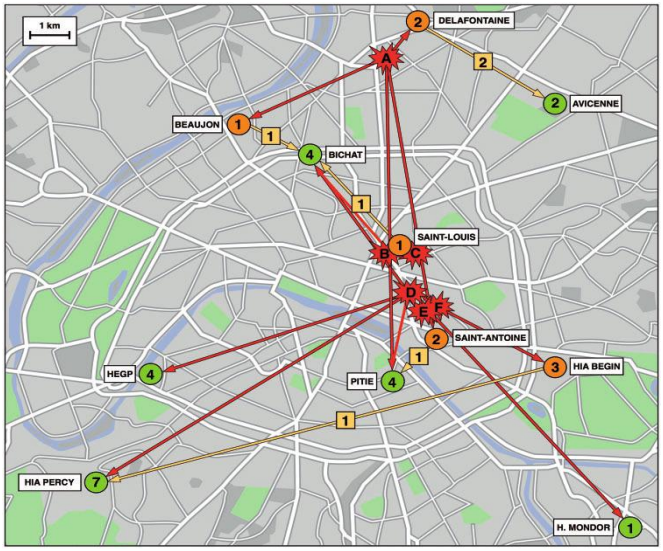

Figure 4 Paris terror attack map

Approach	area under ROC
SRC[1]	0.978
local statistical aggregates[3]	0.985
MDT[9]	0.995
Social Force[6]	0.96
Chaotic Invariants[5]	0.99
FMAE	0.97

Table 1 Data set in UMN

The above table consists of data set occurred in UMN which has a set of normal and abnormal activities. The reviver operating characteristics consists of the ratio of total positive frames to total negative frames. With the value which we get in ROC we can detect the accuracy of abnormal activities and with this, we can find an anomaly in the situation effortlessly.

VI. CONCLUSION

The conclusion of the proposed system is that we can detect abnormal activities in secluded places, vulnerable places, highly populated areas and so on. The proposed system is completely different from the traditional surveillance systems where they cannot differentiate between normal activity and abnormal activity. As a few examples stated in this paper, it is proved that it can outperform the traditional surveillance system in detecting the abnormal activities.

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REFERENCES

1. 1 Zhenfeng Shao, JiajunCai, Zhongyuan Wang "Smart Monitoring Cameras Driven Intelligent Processing to Big Surveillance Video Data" IEEE transactions on bigdatavol 37.
2. M.Dbouk, H.McHeick "CityPro; An Integrated City-protection Collaborative Platform "*Procedia Computer Science*, vol. 37, pp. 72-79, 2014.
3. 3 IBM Corporation, A Smarter Planet Overview. [Online]. Available: http://www.ibm.com/smarterplanet/us/en/overview/ ideas.
4. 4 Konstantin Shvachko, HairongKuang, Sanjay Radia "The Hadoop Distributed File System" Yahoo! Sunnyvale, California USA.
5. 5 P. H. Carns, W. B. Ligon III, R. B. Ross. "PVFS: A parallel file system for Linux clusters," in Proc. of 4th Annual Linux Showcase and Conference, 2000, pp. 317–327.

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