A HYBRID METHODOLOGY FOR MONITORING STUDENT ACTIVITIES IN A CLOUD BASED E LEARNING SYSTEM

Dr O.Pandithurai[1],Dr.M.Geetha[2] Sumaya Jabeen A[3], Swathi Priya V C[4], Swetha M[5]

AssociateProfessor[1,2],UG scholar[3,4,5],Computer Science and Engineering,
Rajalakshmi Institute of Technology, Chennai, India.
pandics@ritchennai.edu.in[1] , geetha.m@ritchennai.edu.in[2],zenithsumi26@gmail.com[3],
swathikeerthi37@gmail.com[4],
mswetha1996@gmail.com[5]

ABSTRACT

There is a rapid growth in technology and advancement of E- learrning systems . E-Learning is a network enabled transfer of skills that can enable people to learn anytime and anywhere. It is a platform that provides easy access to the upgradation of knowledge and skills. In this paper we are using cloud computing technologies and Intelligent video surveillance system in E-learning environment. Intelligent video surveillance system are widely used nowadays. They monitor the activities of a student in an e-learning environment. The intelligent surveillance system will learn the events itself by capturing the video and make a decision that whether the event is usual or unusual. The histogram of optical flow orientation, entropy and magnitude (HOFOME) and histogram of gradient are combined to preprocess the captured video frames. They classify the event based on the machine learning approach called Support Vector Machine (SVM).

Keywords: E-learning, Intelligent video surveillance; e-learning; abnormal event detection; HOFOME; HOG, cloud computing.

INTRODUCTION

E-learning systems are experiencing a very rapid development because of advancements in network and information technology. E-learning and Internet-based education have become an emerging technology where people can learn from their own places. The learners can learn at their own place at any time , learning materials are organized in one place and used by people all around the world to gain knowledge. Thus E-learning system is the formalised way of teaching to the individual user. E-Learning includes training and guidance from experts through video surveillance. Video surveillance approach is an intelligent E-learning system which monitor the persons who are learning in e-learning platform.

In E-learning system ,the teacher will monitor the events or activities of students from their place through video surveillance. Video surveillance approach can act as a virtual supervisor for online examinations, web-based online training. In E-learning system, teacher or course co-ordinator will be in one place who needs to monitor the events or activities of students in another place. When the student logs into the course session, the camera which is kept in front of the course learner will capture their activities.

Hence, in this paper a machine-learning algorithm is used for the detection of abnormal activities. If the user is outdoor the entities such as bikers, skaters, wheel chair, small carts are the abnormalities. In E-learning system, while attending the course session in virtual class room, the activities like bending , hand waving ,walking and paper passing are considered as abnormal events. The abnormalities are detected by using a hybrid model which extracts the shape and motion. The activities or events are classified into usual or unusual based on the training given to classifiers.

LITERATURE REVIEW

Vincent Tam[1] and et all considers a framework for cloud based e-learning games which is assessed through mobile devices inorder to enhance student's learning anytime and anywhere. This proposal is for highly portable and adaptive that can be easily customized to any existing cloud platform. This developed e-learning game system is generic.

NouhaAMMARI[2] and others proposes e-learning as a set of services, hosted according to Cloud Computing techniques. They based their work on a concrete industrial product. They aim to use Web services to integrate

 Copyright © The Online Journal of Distance Education and e-Learning

heterogeneous and remote application in SOA contexts. The main advantages are: i) the interoperability of the platforms and the applications. The Applications are considered as black boxes offering services without considering the way they are coded and their platform. ii) To take into account the new needs such as new lessons and add or modify lessons. iii)The lessons and exercises are accessible via Intranet, Extranet, Internet, via different devices like lab top, PDA, mobile phone.iv) This e-learning Architecture is distributed and each knowledge component is supported by one server independently .

Mohammad Nazim Kabiri and Muhammad Wannous[3] propose a solution based on cloud computing and mobile technologies to facilitate access to courses and learning materials anytime and anywhere. The solution consists of two parts: Google Course Builder (An Open Source e-Learning Platform) which customized and deployed on Google App Engine (GAE) and an Android Application which was developed for quick and easy access to learn contents on mobile devices. The major advantage was the main system functionalities, ease of use and usefulness were positively evaluated by the users. The drawback was the latency in service delivery and low performance at peak times due to the low speed Internet and using Google App Engine during free trial.

Abderrahim El Mhouti[4] and et all proposes a work to exploit the potential of Multi-Agents Systems (MAS) and cloud computing to improve students collaboration in LMS (Learning Management System). This work is an interactive and collaborative e-learning platform which combines the advantages of LMS, MAS and cloud computing. The platform is implemented as a cloud-based LMS integrating with MAS permitting to collect, store and manage data and information about student's activities. Also, it allows to track the progress of students and their level of collaboration and productivity to provide tutors with information about the realization of student's activities. Thus they interact and communicate to support the various activities of students and tutors using cloud. Future enhancements include implementation of the proposed platform using Moodle as cloud-based LMS and the JADE (Java Agent framework for Distance learning Environments) platform as a MAS framework development. And also we have planned to propose other analysis methods of data collected about student's learning activities.

Hosam F. El-Sofanyand Samir A. El-Seoud[5] focus on the research of the application of cloud computing and mobile computing in the in E-learning environment.Themain objectives are: 1) to identify advantages and disadvantages associated with running cloud based applications on mobile devices. 2) to evaluate the performance and features from the use of cloud based application on a mobile device and what effects it will have on the device that runs 3) to analyze the results that can occur when using cloud based applications on mobile devices. They used Cornbras' alpha to measure the validity and stability of the study contents. In addition to that the spearman correlation and stepwise multiple linear regression analysis was also used to determine the impact of the dominating practices such as educational level, gender, age, and major on the variables of using cloud based applications on mobile devices.

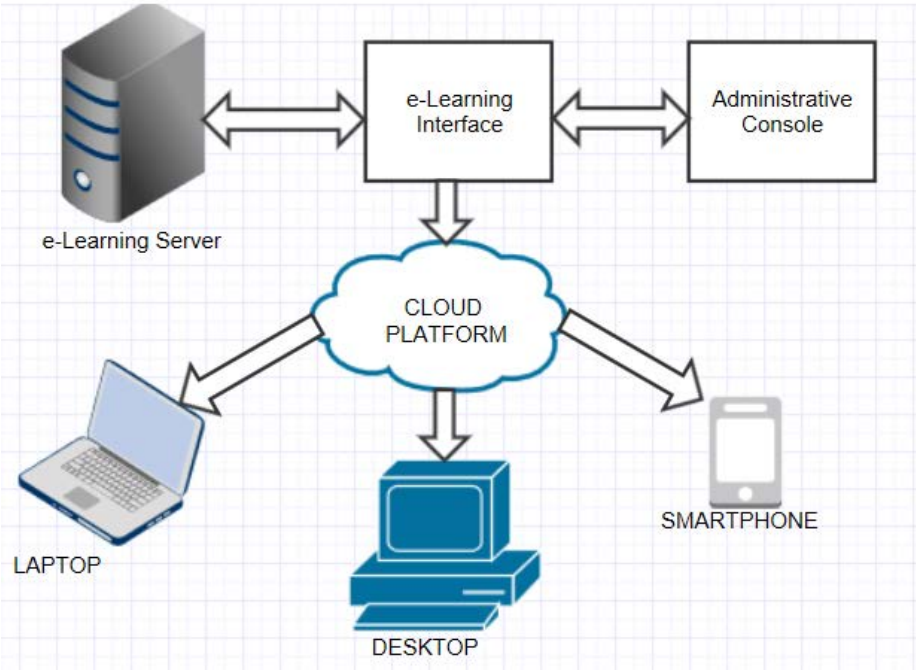
PROPOSED MODEL

Architecture

The system architecture of cloud-based e-learning system, contains following components:

a) E-Learning Portal
b) Administration Console Portal;
c) E-Learning Server running on the Cloud platform
d) Mobile Devices including smartphones or tablet PCs such as the iPad.

 Copyright © The Online Journal of Distance Education and e-Learning



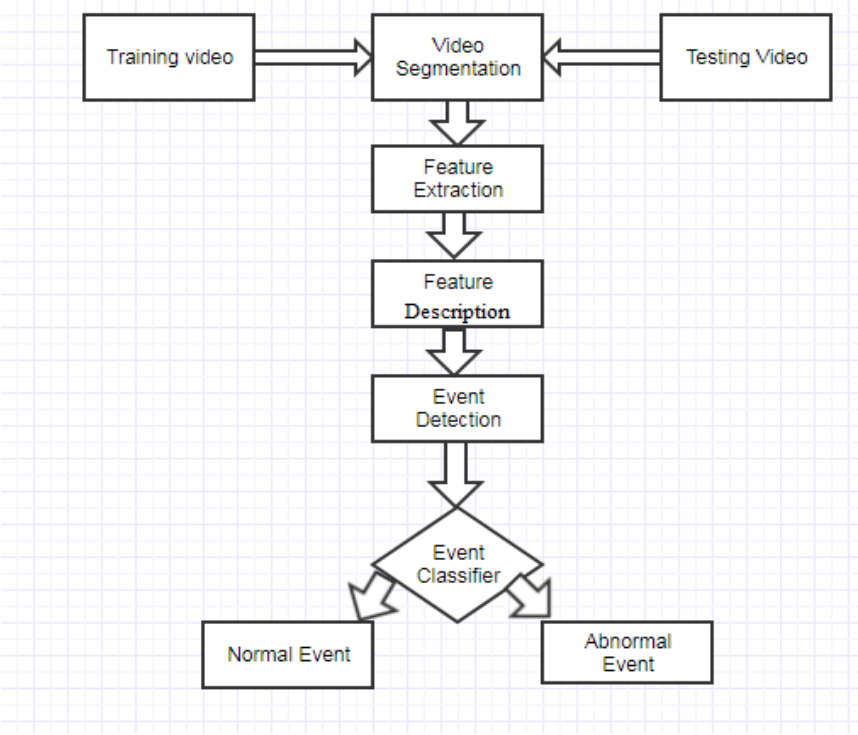
After registration, the user logs in our E-learning Server via the wireless network(3G, 4G or Wi-Fi)through the user interface loaded onto their mobile devices. During the schedule time, the E-Learning Server will have some lecture videos and each student has to take up the online lecture. The student will be monitored by the teacher via surveillance camera. While the student takes up the online lectiure there will be a surveillance camera (i.e) the camera attached to the mobile device(e.g webcam ,smart phone front camera) will start taking vedios of the student. This video will be uploded to cloud. Using machine learning technique the normal and abnormal activities of the student are classified and stored in the cloud. The student portal will have quiz session at the end of each lecture. Each student will have to take up the test. The server will display the correct answer for each question only when the student completes the quiz, the score of the student in each quiz will also be updated on the cloud. The teacher can login to the e-learning server and can cheack the performance and progress of the student. Thus the server side of our e-learning game platform requires data synchronization

Video Processing

For any video to be classified as normal and abnormal it should be preprocessed first.We use histogram of optical flow orientation magnitude and entropy (HOFME) to extract the motion information and histogram of oriented gradient (HOG) to extract the information on appearance and shape. The video is divided into a number of nonoverlapping regions.

Histogram of oriented gradient HOG is used to identify the object appearance and shape , using which we classify the normal and abnormal events. For greater accuracy the intensities of the image is measured across a large area which is called a block, and its normalized

 Copyright © The Online Journal of Distance Education and e-Learning



IMPLEMENTATION

The video is converted into a number of frames. The RGB color frame will be taken as input. This RGB image will be converted into gray scale image using MATLAB. By observing the intensity differences using Histogram of oriented gradient (HOG) and Histogram of optical flow orientation magnitude and entropy(HOFME) in the gray scale image, the normal and abnormal events are detected. The Histogram of optical flow orientation magnitude and entropy (HOFME) gives the motion information of the gray scale image. Histogram of oriented gradient (HOG) gives the appearance and shape information of the gray scale image. The HOG is plotted on the frame for visualization.

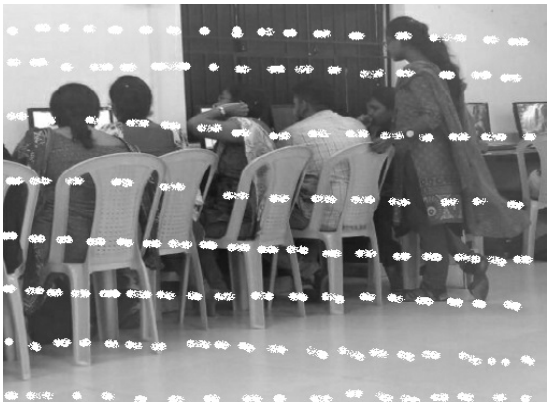
(a) Indoor E-learning classroom- RGB Gray Scale

(b) Indoor E-learning classroom-

 Copyright © The Online Journal of Distance Education and e-Learning

(c) Image with Abnormal Events

(d) Detecting Abnormal Events



ALGORITHM

Consider ,

$(\vec{a}_1, b_1)$, ……..$(\vec{a}_n, b_n)$

a_i,b_i – Training dataset of points

A hyperplane can be written as follows,

$\vec{w}.\vec{a}$ – y = 0

w - normal vector to the hyperplane. This is similar to Hesse normal form.

A Margin seperates two different classes of data (ie) normal and abnormal events. It can be represented as follows,

$\vec{w}.\vec{a}$ – y = 1 and

$\vec{w}.\vec{a}$ – y = -1

The distance between these hyperplanes is $\frac{2}{||\vec{w}||}$,

The distance between the planes should be maximum.

$||\vec{w}||$ should be minimum.

The data points should come under any one of the planes but not on the margin.

$\vec{w}.\vec{a}_i$ – y >= -1 if $b_i = 1$

or

$\vec{w}.\vec{a}_i$ – y <= 1 if $b_i = -1$

 Copyright © The Online Journal of Distance Education and e-Learning

These constraints state that each data point must lie on the correct side of the margin.
This can be rewritten as:

$b_i(\vec{w}.\vec{a}_i - y) >= 1$ for all 1 <= i <= n ------(1)

This can be put together to get the optimization problem:
"Minimize $||\vec{w}||$ subject to $b_i(\vec{w}.\vec{a}_i - y) >= 1$ for all 1 <= i <= n^n

The $\vec{w}$ and *y* that solve this problem determine our classifier, $\vec{a} \rightarrow \text{sgn}(\vec{w}.\vec{a} - y)$.

An easy-to-see but important consequence of this geometric description is that the max-margin hyperplane is completely determined by those $\vec{a}_i$ which lie nearest to it. These $\vec{a}_i$ are called *support vectors.*

The points obtained from the histogram are plotted across a SVM graph. This graph classifies the normal and abnormal activities. In the graph fig12. H1 does not classify the normal an abnormal event, whereas the classifier H2 and H3 classifies the normal and abnormal activities. The support vector machine (SVM) classifiers are trained with training frame features and an unknown frame is given for test to classify it as normal or abnormal case. There are two methods to classify the normal and abnormal activities they are C-tree and SVM. we use SVM because it yields better results compared to Ctree. The area under the curve of ROC of SVM is 77.99%.

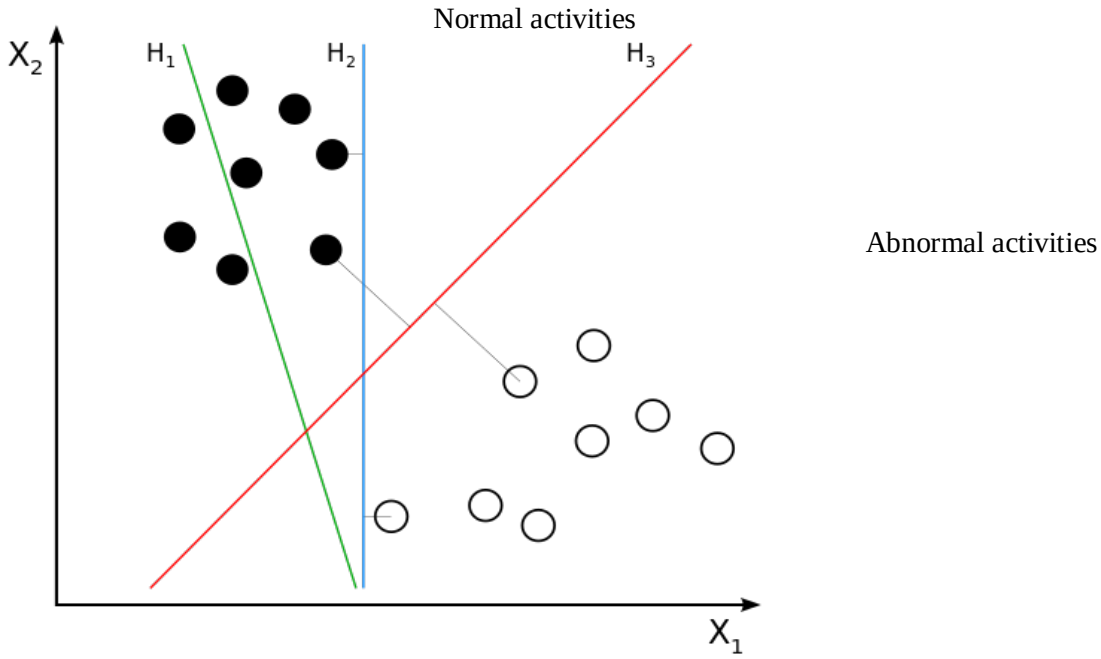


Fig 12a SVM Classifier

 Copyright © The Online Journal of Distance Education and e-Learning

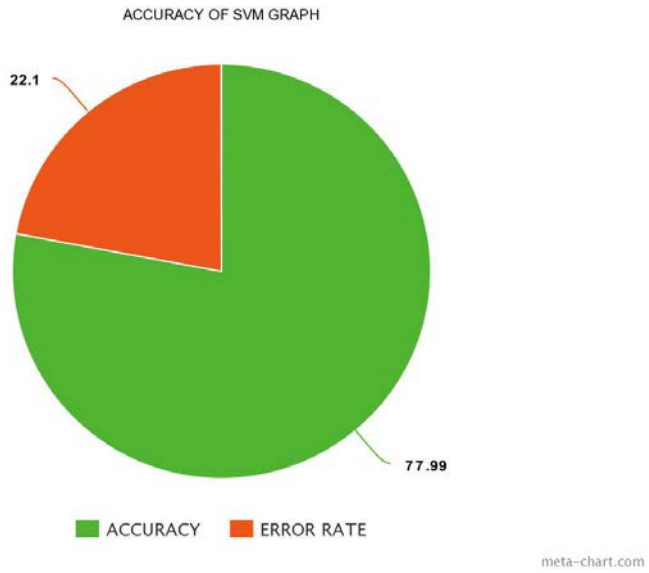


Fig12b Accuracy of SVM

CONCLUSION

This paper proposed an idea to classify the normal and abnormal activities of the student in an E-learning environment and reports it to the teacher. This method uses HOG and HOFME for video pre-processing. The points obtained are plotted against a SVM classifier graph and then the normal and abnormal events are detected. SVM yields a better result compared to C tree. The accuracy of SVM is 77.99%. An appropriate method can be used for video summarization in future for better results.

REFERENCES

Vincent Tam, Alex Yi, Edmund Y. Lam, Cecilia Chan and Allan H.K. Yuen. Using Cloud Computing and Mobile Devices to Facilitate Students' Learning Through E-Learning Games. 2013 IEEE 13th International Conference on Advanced Learning Technologies.

Nouha AMMARI, Fayssal FEHLI. Using SaaS and Cloud computing For "On Demand" E Learning Services. 2010 10th IEEE International Conference on Advanced Learning Technologies.

Mohammad Nazim Kabiri1a and Muhammad Wannous. The Use of Cloud Computing and Mobile Technologies to Facilitate Access to An E-Learning Solution in Higher Education Context Work in Progress. Proceedings of the 2017 IEEE International Conference on Applied System Innovation IEEE-ICASI 2017 - Meen, Prior & Lam (Eds).

Svitlana Agadzhanova, Andrii Tolbatov. Using Cloud Technologies Based On Intelligent Agent-Managers To Build Personal Academic Environment In E-Learning System. IEEE AICT 2017.

Abderrahim El Mhouti, Azeddine Nasseh, Mohamed, Jose Marfa Vasquèz, Using Cloud Computing and a Multi-Agents System to Improve Collaborative e-Learning in LMS. Intelligent Systems: Theories and Applications (SITA), 2016 11th International Conference on IEEE 2016.

Vivek Bhuttoo, Kamlesh Soman and Roopesh Kevin Sungkur. Responsive Design and Content Adaptation for Elearning on Mobile Devices. Next Generation Computing Applications (NextComp), 2017 1st International Conference. IEEE 2017.

Blanka Klimova, Petra Maresova. Cloud Computing and E-Learning and Their Benefits for the Institutions of Higher Learning. 2016 IEEE Conference on e-Learning, e-Management and e-Services (IC3e).

Sabina-Daniela AXINTE, Gabriel PETRICA, Ionut-Daniel BARBU. E-learning Platform Development Model. The 10th International Symposium On Advanced Topics In Electrical Engineering March 23-25, 2017

Jamilson Dantas, Rubens Matos, Jean Araujo, Danilo Oliveira, Andre Oliveira and Paulo Maciel. Hierarchical model and sensitivity analysis for a cloud-based VoD streaming service. 2016 46th Annual IEEE/IFIP International Conference on Dependable Systems and Networks Workshops.

N.Venkatesh Naik, Dr K.Madhavi. Cloud Computing Architecture for Collaborative Elearning System. Applied and Theoretical Computing and Communication Technology (iCATccT), 2015 International Conference

 Copyright © The Online Journal of Distance Education and e-Learning