ARTIFICIAL NEURAL NETWORK BASED ON APPROACH FOR COMMERCIAL DETECTION

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Abstract: TV commercials show the business value for the host company of the specific commercial. From the business point of view a system is required that can automatically detect the commercial for third-party for business analysis. Review of the work about detection of TV commercials guide that the work is done for specific videos supported by frame level with high computing cost. This paper proposed a system that works on TV broadcast/Online videos to automatically detect commercials. Instead of relying on frames we are trying to detect commercials with the information of shot-level. The first module works on shot detection other works on its classification. Videos data is split into shots and classify in commercial class and noncommercial class. For shot feature extraction we are using ANN and SVM classifier is trained to complete the classification of specific shots. Using a traditional technique of the commercial detection with Artificial Neural Network enable to handle a variety of program types, unclear commercials, and result good precision and recall not only in TV broadcasting but also it work for online videos.

Key words: commercial detection, Artificial Neural Network, TV videos.

1. INTRODUCTION

Marketing via TV commercials is an important marketing strategy, its also a method to create a corporate image. That's why commercial analysis of the corporate can help us in collecting information about companies and trends. That is the fact which yield need to create an automatic system of commercial detection to collect information from TV broadcasting. This will also include the duration of the commercial and broadcast time also. It is also an important part of the multimedia analysis systems which includes avoiding commercials for video recording and also for views [1]. It is also a major need to sort out that commercials for TV views which they really dislike to see, especially those who use digital TV boxes set to record

their favorite programs [2]. By getting different video series recording led them to an extensive analysis of content which show that they work on video cutting strategy on silences between commercials and black frames, similarly high audio and high cut rates are not remain valid yet [3].

Research communities and marketing industries are recently attracted to the automatic detection of TV. Current commercial detection approach categorized into two types: Feature-based approach; Identity-based approach [9].

TV commercial detection from long streaming video and fetching matched and significant commercial from central database of web and desktop interface are the critical problems that are highly related video processing methodology, as like video segmentation, feature vector organization, feature extraction, fetching and indexing [6][7]. With audio information, audio streams in real time unknown Ads can be recognized. As this approach is highly dependable on audio information restored in video commercials so it becomes unworkable in the situation where videos are without audio or with distorted audio information [8]. In this paper we applied ANN application with audio feature extraction which performs well on commercials.

2. PROBLEM STATEMENT

Program and commercial paper describe an investigation into the issue of commercial recognition to the differences between the video segment cannot understand the contention the computer, it's hard, it's very easy. We dealt with the issue of a specific TV program stream (News) or if a commercial block was how to determine. The human eye, the difference between them like humans do TV. Therefore, without relying on the content of the video segment, TV programs and commercials to find a way to distinguish between was necessary. Since a TV commercial has some special characteristics, we will investigate ways to measure features and their proper integration for successful commercials recognition. The main focus is on how commercial recognition system based on feature extraction can perform well with the application of ANN.

3. PROBLEM SOLUTION

Video data is considered for research work. The proposed system contributes as follows:

i) unlike prior work use typical visual features, we are working with ANN to extract establishment feature from an image. Our work improved the efficiency of calculation.

ii) We are working on defining a new method of shot boundary detection. It supports in reducing complexity.

iii) Our system overcomes the limits of video type and sample amount. It can detect commercials from various videos precisely, possess excellent abilities of learning and generalization and get precision 93% and recall 95% in handy TV programs.

In recent days video advertisement on live or online video streaming websites take attention of the marketing agencies and giving mass business. the proposed method works on saliency detection and human face localization along with an algorithm works on the reorganization of scene changes with the study of visual significance map that helps in finding out the different stable areas of the advertisement [7].

4. METHODOLOGY

Our Proposed Methodology worked on shot level rather than working on frame level it results in high computational cost. Unlike from previous work using traditional visual features, we used ANN to extract activation feature from image this approach improved the calculation efficiency. The frame work relies on boundary detection of shot that helps in reducing the complexity of calculation. Our system overcomes the limits of video type and sample amount. It can detect commercials from various videos precisely, possess excellent abilities of learning and generalization and get precision 93% and recall 95% in realistic TV programs. **Datasets creation for research:** Dataset is created with the help of recorded tv broadcast videos. It's difficult to collect the videos from TV broadcasting so we collect them from internet videos. Due to slow internet speed we approach one unit video splitting technique. We considered 24-hour videos (i.e. 0 o'clock to 24 o'clock), by decomposing them we have 31224 shots. For training of the model, these shots are categorized as commercial and non-commercial. Finally, 3619 commercial classified as shots and 27506 are classified as non-commercial shots from 24-hour videos.

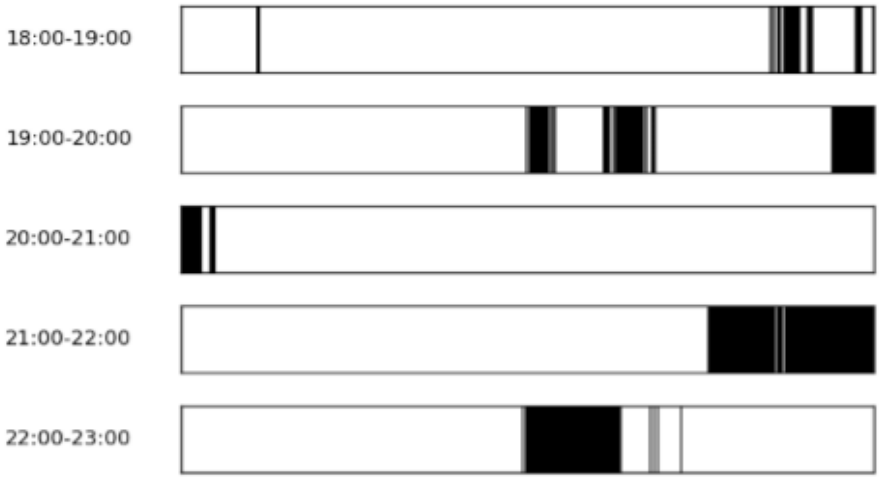


Fig. 1. Commercials Shot Distribution

Figure 1 graphically shows the splitted results of recorded videos; here Black blocks are identifying the commercials shots and other parts shows the noncommercial shots.

4.1. Calculations for Shot Boundary Detection

Popular method for picture similarity is the coloured histograms calculation of the adjacent frames is important to put a threshold, so we calculate the mean values of RGB colour spaces called mean intensity. It helps to get feature vector. Than we calculate the Manhattan distance. The next step will be to calculate the difference of Manhattan distance. We will define a thresh hold by taking the mean of the Manhattan distance. Threshold T was defined to detect boundary frames. When Manhattan distance > T, it is regarded as boundary frames.

Algorithm of shot boundary detection: is described as following algorithm.

Input: The consecutive frames of video

Output: Shots of video

i) Decomposed videos into frames;
ii) Calculate feature vector F of frames;
iii) Calculate Manhattan distance M according to F;
iv) Calculate difference of Manhattan distance DM according to M;
v) If DM greater than threshold T;
vi) If separation between start frame and end frame exceed 5 frames;
vii) Return shot.

4.2. Commercial Detection

Proposed commercial detection removes the flaws of traditional methods. It lowers computation complexity and performs well. For this purpose, we trained the ANN for better results.

Algorithm of commercial detection:

Step-1: feature extraction by sampling representative frames

Step-2: input these frames into ANN model

Step-3: calculate the Feature Vector dimension of frame is reduced by principal component analysis (PCA).

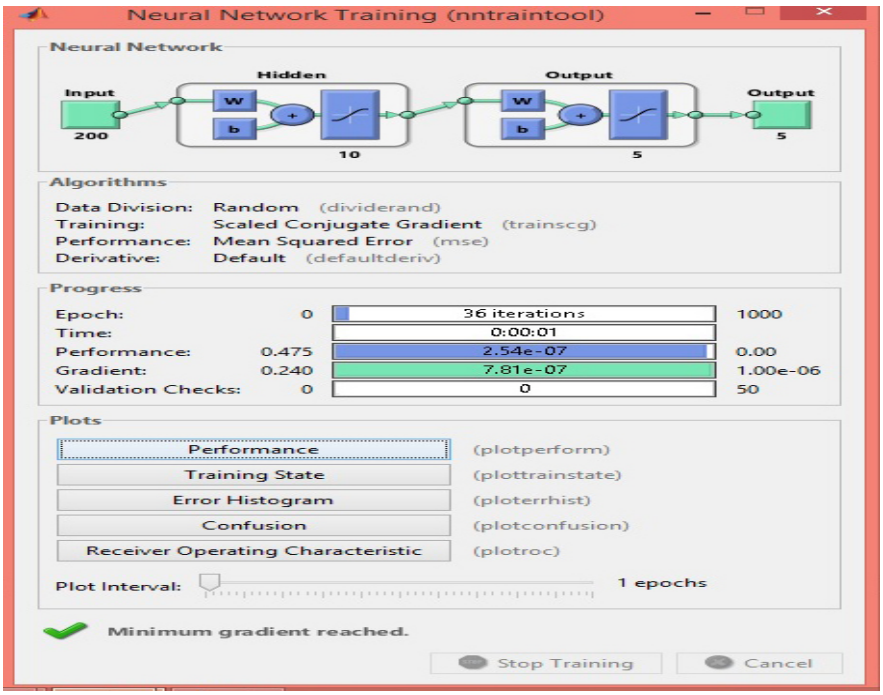
Step-4: to end with calculate means of four frame in one shot and get feature vector of shot.

Step-5: support vector machine (SVM) is used for classification the data into commercial and non-commercial.

5. RESULTS AND DISCUSSION

Proposed method can detect commercials from various videos precisely, possess excellent abilities of learning and generalization and get precision 93% and recall 95% in handy TV programs.

5.1. ANN Training



200 is the number of neurons in the input layer. In unseen layer 10 neurons are used.5 output neurons are used in output layer.

Inception V3 is used for feature extraction and transfer learning is approached as its take less data for training rather as much data is consumed in traditional approaches for training, because ANN neurons works in layers so transfer learning help to reduce the complexity and computational cost. This combination of ANN with inception v3, PCA and SVM provides the novelty to our work as it provides good results with high precision and recall.

5.2. Performance

Because of the uncertainty of model, the classification result s changes slightly even p does not change. As it shows that we get best classification result when p between 0.5 and 0.7, so we select p = 0.6, and get the dimension of fp is 84.

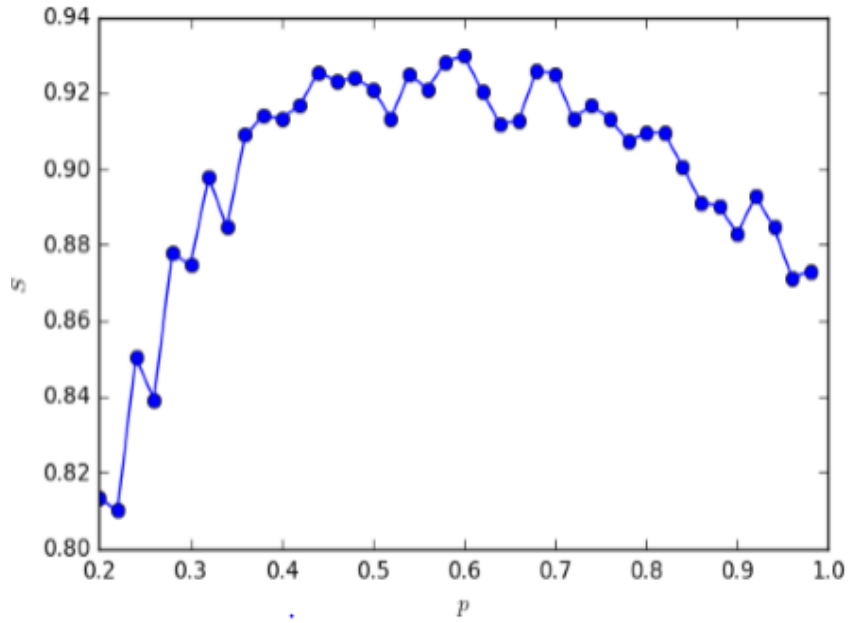


Fig. 2. Relationship between principal proportion and classification

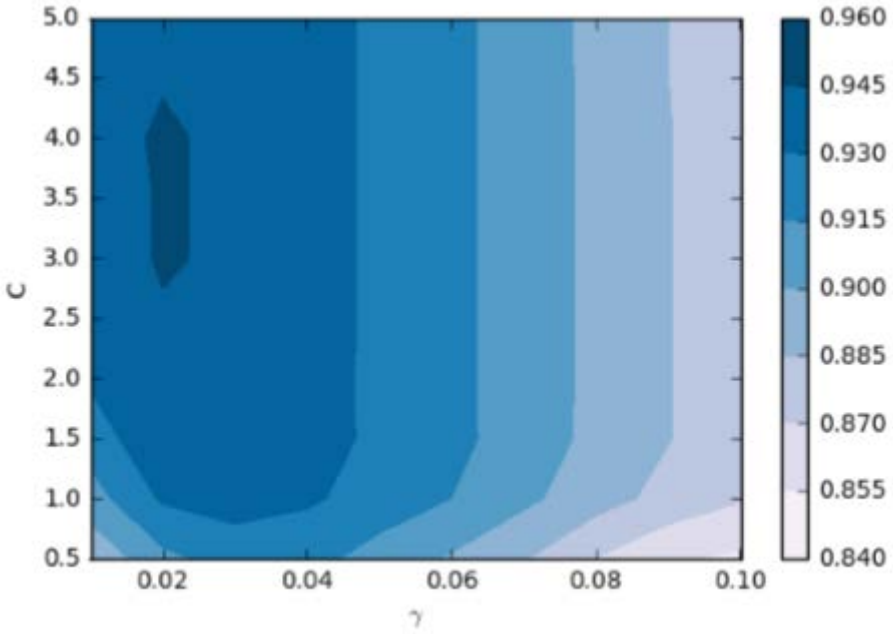


Fig. 3. Results of Adjacent parameters
(when C=3.5, γ=0.02, SVM classifier gets best result)

6. CONCLUSION

In this paper, we design and implement an automatic commercial detection for TV broadcasting. Our system is calm two modules, shot boundary detection module and shot classification module. Functions of first module are calculating difference of Manhattan distance of frame and detecting shot boundary by compare the value of DM and threshold T. Functions of second module are extracting features of shot by ANN and training a SVM classifier with those shot features to classify shots into commercial or non-commercial. Different from previous works, our system combines the state-of-the-art artificial neural network with traditional machine learning techniques, works on realistic broadcasting video, including many types of programs and possesses excellent abilities of learning and generalization. On our video broadcasting data crawled from TV station, our system obtained detection result at precision of 93% and recall of 95%.

REFERENCES

[1] Zhang, B.O., Feng, B., Ding, P., & Xu, B. TV commercial detection using constrained viterbi algorithm based on time distribution. *Proceedings of the 2012 9th International Conference on Fuzzy Systems and Knowledge Discovery*, Chongqing, China , May 2012, pp.2010-2014.

[2] Liu, N., Zhao, Y., Zhu, Z., & Lu, H. Multi-modal characteristics analysis and fusion for TV commercial detection. *Proceeding of the 2010 IEEE International Conference on Multimedia and Expo*, July 2010, pp. 831-836.

[3] Gomes, A., Queluz, M. P., & Pereira, F. Automatic detection of TV commercial blocks: A new approach based on digital on-screen graphics classification. *Proceedings of the 2017 11th International Conference on Signal Processing and Communication Systems (ICSPCS)*, December 2017, pp. 1-6.

[4] Jia, Y., Shelhamer, E., Donahue, J., Karayev, S., Long, J., Girshick, R. & Darrell, T. Caffe: Convolutional architecture for fast feature embedding. In *Proceedings of the 22nd ACM International Conference on Multimedia*, November 2014, pp. 675-678.

[5] Xia, Q., & Tang, G.. Research on TV advertisement detection base on video shot. *Proceedings of the 3rd Int'l Conference on System Science, Engineering Design and Manufacturing Informatization*, October 2012, Vol. 2, pp.245-248.

[6] Li, Y., & Luo, S. A TV Commercial detection system. *International Conference on Web Information Systems and Mining*. Springer 2011, Berlin, Heidelberg, pp. 35-43.

[7] Liang, Y., Liu, W., Liu, K., & Ma, H. Automatic generation of textual advertisement for video advertising. *Proceeding of the 2018 IEEE Fourth International Conference on Multimedia Big Data (BigMM)*, Sept. 2018, pp. 1-5.

[8] Awad, G., Over, P., & Kraaij, W. Content-based video copy detection benchmarking at TRECVID. *ACM Transactions on Information Systems (TOIS)*, 3, (vol. *32)*, 2014, pp.14.

[9] Mizutani, M., Ebadollahi, S., & Chang, S. F. Commercial detection in heterogeneous video streams using fused multi-modal and temporal features. In *Proceedings (ICASSP'05). IEEE International Conference on Acoustics, Speech, and Signal Processing*, March 2005, Vol. 2, pp. ii-157.

[10] Wu, X., & Satoh, S. I. Ultrahigh-speed TV commercial detection, extraction, and matching. *IEEE Transactions on Circuits and Systems for Video Technology*, 6 (vol. 23), 2013, pp.1054-1069.

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