

Detecting Pornography on Web to Prevent Child Abuse – A Computer Vision Approach

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Abstract—This paper explores the sensitive area from social, ethical and technical perspective and discuss an automated computer vision system for identifying whether there is a human nude present in a video which is browsed on the internet. Pornography is neglected problem in the society and in researchers due to its sensitive issue. But it cannot be ignored due to Internet reaching every child in the society. Current methods are not sufficient and enough to track child pornography. Proposed system consists of three phases. Segmentation phase accept the input video stream and extract the key frames which are candidates for nude images detection. Amount of nudity will be detected from rapid moving object detection phase. In classification phases segregation of objectionable video will be marked porn or non-porn depending upon the judgment criteria, decided on multiple the audio and video features.

Index Terms— Computer Vision, Object Detection, OpenCV, Segmentation, Skin Pixel, Video Classification

1 INTRODUCTION

THE word “pornography” comes from the Greek “pornographos” literally meaning writing about prostitutes.

Apart from this one of the commonly accepted definitions of “pornography” in modern times defines it as sexually explicit material (verbal or pictorial) that is primarily designed to produce sexual arousal in viewers [1].

In very short period of time, internet has become readily available to educational institutes, organizations and homes. According to survey conducted by Internet and Mobile Association of India (IAMAI) and IMRB India’s Internet users crossed 100 million in Sep 2011 a growth of 13% against last year. In India children account for a forty two percent of the country’s population, have long been the victims of some of the most brutal sexual crimes. This issue is always on top most priority for law enforcement agencies since the beginning of digital trafficking of child pornography.

Images and videos are essential part of today’s Internet. Basically they are intended to capture user’s attention and make effective interfaces. But now they are contributing towards harmful contents to the child and teens. This brings a new risk to younger generation and to the parents. Indian Government along with law enforcement agencies are trying to develop strong legal framework to deal with cases of child sexual abuse. Filtering sensitive contents has become a field of research of computer vision, artificial intelligence and multimedia field. Currently for detecting offensive material and the individuals responsible remain relatively primitive, requiring much human intervention and time. There is an urgent need for parents and children of today to have tools like filtering software to prevent people, especially children, from adult

images watching effectively and efficiently. One of the most difficult challenges is the problem of identifying pornographic images and videos is its semantic content. Simple solution to this problem can be performed using IP address blocking of an obscenity site.

2 SIGNIFICANCE OF RESEARCH

The main objective of this research is to formulate a new stout method of video interrogation to classify as pornographic. Our trust is to have a low false positive and low false negative detection rate in multiple frames in the video, accuracy of detection of video being the primary objective for law enforcement agencies. Essentially pornographic video scene detection system is a kind of classification problem.

2 REVIEW OF EXISTING METHODOLOGY

Many researchers have contributed by developing different algorithm to detect adult images and videos. Most of the work related to pornography detection is based on images. Brief survey on web image content can be found in [2]. Forsyth et al. proposed a body plan that detected different parts of the body by their geometric constraints for detecting the naked people. Their system marks skin - like pixels using combined color and texture properties. These skin regions are then fed to a grouper used for grouping human figure using geometric constrains [3].

Lv and Yang applied change in optical flow volume to extract important key frames and later used skin color detection method to detect objectionable scene in video [10]. In [4] porn video is detected based on motion features using HMM. Feature vectors are extracted by calculating the direction and magnitude after obtaining motion vectors from compressed MPEG video. These motion vectors are fed to Hidden Markov Model for classification of 6 actions. Skin color is one of important cues for pornographic video’s detection. More contributing towards classifying objectionable contents based on images can be found in [5]. They try to classify objectionable contents based on spectral audio signal features such as bandwidth (BW), frequency centric (FC), spectral flux (SF), spectral flatness (FT) and roll-off frequency (RO). In [6] they transformed

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the color space, calculated Gaussian probability distribution and analyzed texture and noise to extract skin from a frame image, and then build a skin color mask. Finally algorithm analyzed the sensitive videos on the foundation of the current sensitive image recognition so as to understand them and shield the sensitive content.

NuDetective Forensic Tool [7] was developed in order to assist forensic examiners for conducting such analysis at the crime scene. Algorithm used for Image Analysis classifies each image as human nudity or not. The File Name Analysis verifies if files have suspicious names of child pornography. Erotic sound recognition for scene analysis based on Histogram Features and SVM is introduced for training and classification in [8]. Adaptive model to characterize human skin-color distributions for tracking human faces under different lighting conditions. The parameters of the model are adapted based on the maximum likelihood criterion. Detected skin regions are treated as blobs for extracting features representing pornographic images [9].

An array of image recognition techniques which includes face, nose, eye, mouth and upper body detected was used by [11] apart from skin detection. Work carried in [12] presents a technique for recognition of adult video using combination of skin detection features with motion information. Aim of using motion information is to select the appropriate color model that allows verifying pixels under different lighting conditions and other variations.

Objectionable video detection system presented in [13] uses hierarchical framework that consists three phases using multiple features in different temporal domains. Early detection is performed based on hash signatures prior to the download or play of a video in the first phase. Next phase consist of real-time detection which statistically estimates the degree to which the video may be objectionable by using single frame based features. Finally posterior detection is performed based on group-of-frame features reflecting the overall characteristics of the video. Fast and simple objectionable video classification scheme using temporal motion and color energy features (TMCEF) is proposed in [14]. Integrated system framework stated in TMCEF consists of key frame extraction, motion energy calculation, skin color energy calculation, and feature extraction based on statistical distribution metric using mean, standard deviation, and frequency analysis using discrete cosine transform (DCT). For verification the performance of these video-based temporal features, support vector machine (SVM) classifier is used.

3 WARFARE TOWARDS CHILD PORNOGRAPHY ON WEB

Protecting children from the red light districts of cyberspace parents could use the available resources on net. Handful of commercially developed products aimed at protecting children from inappropriate content on the Internet. Net Nanny uses real-time web content filtering and scans a website for pornography and other mature content and blocks them. Blocking pornography is important to prevent accidental exposure to inappropriate images.

Solid Oak Software's CYBERSitter brings internet filter software for protecting kids online. The program will only block the specific categories of content that are selected. Cyber Patrol, combat filter content, such as adult sites and unwanted computer programs, and to restrict kids' access to chat rooms and instant messaging, protecting them from cyber bullies and online predators. Limiting the time

your kids spend online is an added feature.

WebAllow is a parental and access control utility that restricts viewing all but selected websites. List of "approved" websites are predefined by the user. Even if a link is leading to another page on another domain is clicked, this software will block it if is not on the "approved" list.

Safe Eyes parental monitoring software falls in the category of Internet parental control software. Safe Eyes is a flexible set of tools that allows anyone to determine the type Internet usage that is appropriate. This monitoring tool includes content, program, time usage controls. Many parents wish to control the content their family views online, but the tools to date have been some time complex, inflexible, and costly. Blocking procedures followed by filter companies are awful, often capricious, and occasionally outright negligent. CYBERSitter, Cyber Patrol, and SurfWatch do not make their lists of blocked sites publicly available

4 PROPOSED SYSTEM FOR DETECTING PORNOGRAPHIC VIDEO

One of the gravest concerns of browning of obscene material on internet is to prohibit kids to get abused at later stage, intentionally or un-intentionally. We proposed new integrated computer vision approach to detect obscene and pornographic videos from internet, which will help parents to stop child pornography.

Adult and pornographic video contains large amount of movement information, contract changes from lenses from frequent zooming and tilting. These features can be used to detect obscene video. Erotic sound is another feature which is combined to get greater accuracy in detection process. In our proposed work we divided the entire system in three phases as shown in the Fig 1. Segmentation phase accept the input video stream and extract the key frames which are candidates for nude images detection. Amount of nudity will be detected from rapid moving object detection phase. Classification of objectionable video will be marked porn or non-porn depending upon the judgment criteria.

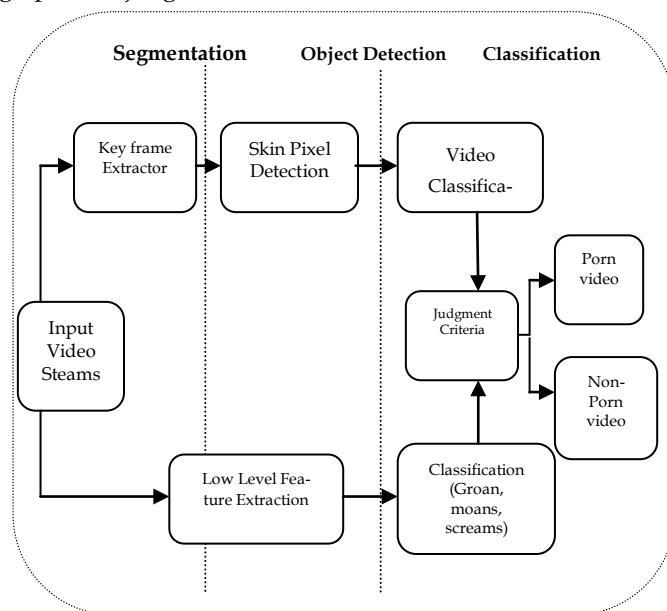


Fig.1 Block diagram

4.1 Segmentation and Skin Detection

If human skin color information is used efficiently for different lighting conditions then it can become an efficient tool for identifying facial and body features. Since it is invariant to rotation and partial occlusion, these features can be used for detection and localization. 2D histogram based segmentation will be used after key frame extraction for possible task of filtering adult content in the video.

4.2 Audio Based Classification

Detection of adult video will be carried on both visual interpretation and audio signal. Non-explicit sexual activity includes sound on an audio track, such as the kinds of groans, moans, and other sounds that to a reasonable person would imply sexual activity was taking place. Judgment criteria agent will have the patterns of audio signals for guessing such activities.

4.3 Video Based classification

Intel's OpenCV library is used to detect and classify video objects. Such pornographic video recognition process consists in extracting features that discriminate adult video and non-adult ones. Since uncovered skin distribution is of the almost importance for the detection of such videos, we take up the method to detect maximum skin pixels below abdomen. We know that sensitive body image has the larger area of bare skin than the normal image, calculating percentage of bare skin visibility makes up to judgment criteria.

5 CONCLUDING REMARKS AND PROGRESS OF WORK

Parents and children are using Internet based technology for teaching learning and other purposes. This work is coordination between computer vision techniques to solve a social problem of pornographic/adult video detection. Detecting such obscene video at browser level itself would be perfect to avoid intentional and un-intentional viewing of adult material by children in their teenage. Having established that existing research into tradition pornography is not enough to confirm the existence of child pornography. Therefore combination of computer vision techniques may develop one significant step towards for parents and assisting law enforcement agencies to locate evidences and prosecute possible criminals. We are interested in evaluating the performance of our system after implementation when tested with non-child pornography datasets consisting of legal pornography. System will be tested in the laboratory with online websites.

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