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Piracy Prevention System for Movie Theatres and Auditoriums

Abhigya Bhatnagar¹, Ahire Vivek², Magar Pranjali³, Prof. Priyanka Gujarathi⁴

Student, Department of Electronics & Telecommunication, JSPM's Rajarshi Shahu College of Engineering, Tathawade,
Pune, Savitribai Phule University of Pune, India.^{1,2,3}

Department of Electronics & Telecommunication, JSPM's Rajarshi Shahu College of Engineering, Tathawade, Pune,
Savitribai Phule University of Pune, India.⁴

ABSTRACT: One of the most popular methods the movie pirates use to smuggle the movies out of the theatre involves recording the film using a camcorder or a high end mobile phone with a very good quality camera. Hence it is necessary to develop a system that addresses this conventional way of movie piracy. This paper proposes a solution to this problem. The proposed system makes use of image processing techniques over an image acquired from a camera mounted at a suitable location over the movie theatre screen. A similar system can be used to protect the exclusivity of programs held in auditoriums and presentation halls.

KEYWORDS: piracy prevention, movie theatres, image processing.

I. INTRODUCTION

Piracy is a wide spread menace in India these days. Illegal recording devices like mobile phones and hand held cameras are used for recording the film from movie theatres. Availability of low cost smart phones with decent camera quality has led to the inflow of theatre recordings at an unprecedented rate into the market. And due to availability of high speed internet on these hand held devices, such recordings are almost instantly uploaded on data sharing sites on the internet. This causes huge loss to production houses and the movie industry. Such losses are calculated by market researchers and are directly transferred onto the audience in form of increased ticket fare for the film. Thus, a system providing solution to the problem of piracy could revolutionize the tariff arrangements in the movie industry. Apart from the movie industry, various industrial organizations or companies suffer from industrial espionage. Many government agencies also suffer from leakage of secret/confidential data, a part of which is illegally recorded from symposiums. Intellectual property of organizations is in danger due to easy availability of recording devices such as smart phones. Hence, the governments as well as trade organizations need to take every possible step to secure their proprietary information and trade secrets. Such widespread availability of high end technology allows any individual to easily abuse this and share what is intended only for them to see or listen in mere seconds.

II. RELATED WORK

Piracy, being a widespread problem, various research works have been previously undertaken to control it. The scale of previous such efforts varies from simple water marking approach to an all-inclusive integrated privacy prevention system covering piracy through data sharing sites, direct streaming, usage of recording devices such as CDs and DVDs, etc. Research on prevention of online piracy has led to the development of a number of algorithms which would prevent illegal sharing of such files. In order to control illegal recording practices through recording devices such as camcorders, mobile phones, etc., visual water marking, audio water marking, surprise raids on vendors dealing in sale of CDs and DVDs are practiced. Audio water marking [1] is used to integrate ownership information in the form of audio which can be later used to enable copyright protection systems. Researchers have devised various audio watermarking techniques viz. spread spectrum watermarking, amplitude modification, replica method, dither watermarking and others.

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The device playing audio watermarked media file can verify and authorize the playing of such a file. Recent research into audio watermarking techniques has allowed researchers to correctly determine the position of recording device in the movie theatre using watermarked sound track [2][3]. Video watermark [4] is a signal or pattern which carries the information unique to the copyright owner. A video watermark helps to identify the ownership, trace the video dissemination source and thus discourage the practice of illegal recording. A video watermark may be visible or invisible. An invisible watermark would distort the video when recorded via a camera.

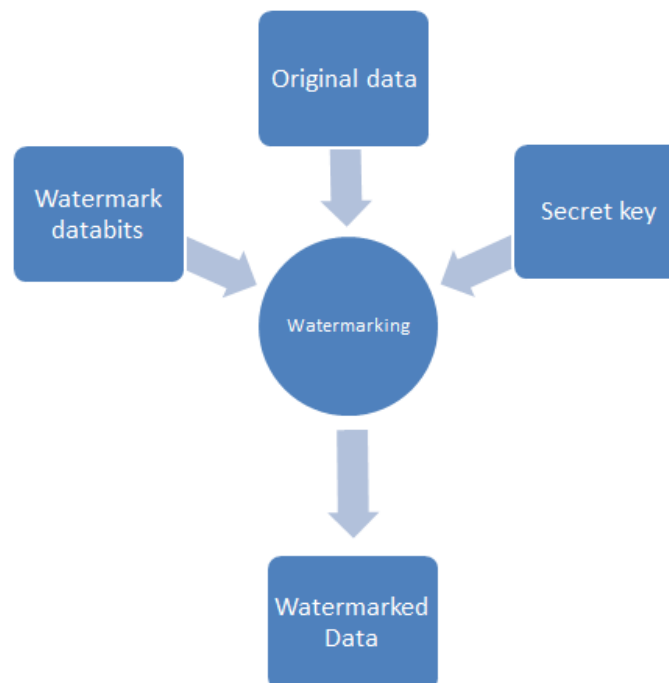


Fig.1. Watermarking Mechanism.

A product working for similar causes exists in the market. It goes by the name of "PIRATE EYE". The system works by using short time light impulses of 20ms duration. Human eye can detect a light impulse of 40ms and respond to it after 200ms. So the short light impulses used by the system go unnoticed by human eyes. However, when this system detects a probable camera, it hits the target with a strong beam of light so as to capture a clear image and then verify the presence of a camera using visual confirmation. This system, although effective, requires a very dedicated costly hardware and this is one of the main reasons of this system's limited market presence.

III. WORKING

Empty hall is scanned first. This initial scan would record reflections caused by permanent hardware like chairs or speakers. It would provide us the reflections from the stationary parts of theatre. These reflections would need to be eliminated later. The locations of these reflections will be stored, if system finds reflections in any of the stored locations, then such locations will be eliminated, i.e. these locations will not be recorded in later scans. Thus, elimination at the very early stage reduces unnecessary computation. After this, the system is ready to locate the camcorders inside the hall or theatre.

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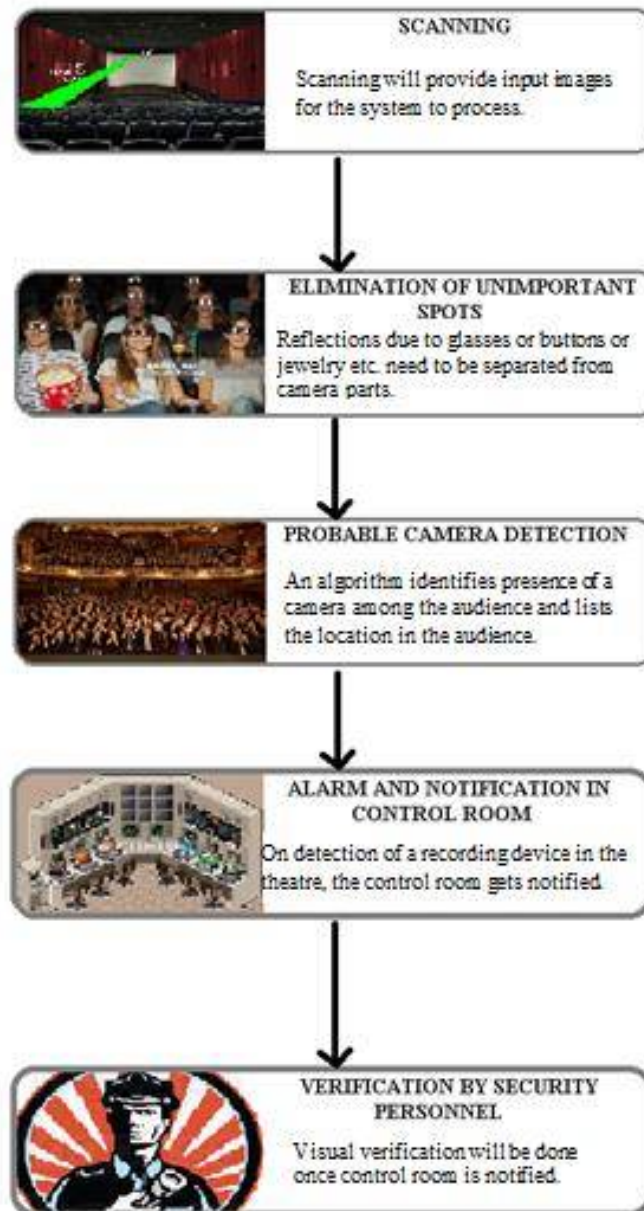


Fig.2. System Flow Diagram.

A. THE SYSTEM WORKS IN FOLLOWING WAY:

The seating area inside a theatre is divided into smaller grids. First scanning of all the grids is done. Scanning is done few minutes after the starting of cinema. This will provide the captured images of all the grids, to the processing unit.

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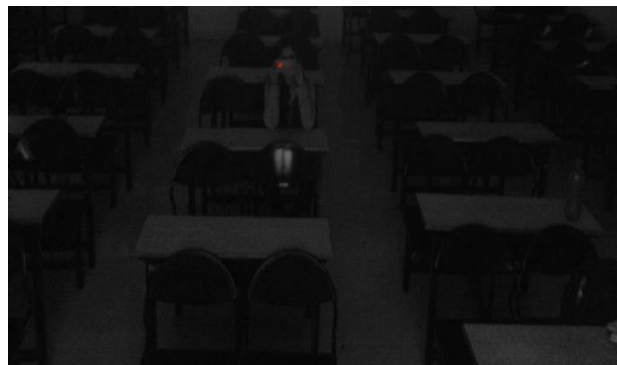
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Fig.3. Scanning.

Using these images, probable locations are determined. It is done by using the locations provided after detection of reflections.



**Fig.4. Finding out reflections which can be probable recording device and locating them.
(here, reflections are shown by red colored “*” sign)**

To make sure the presence of camera, these probable locations will be scanned again several times after some time interval. If the location of the probable recording device does not change for several no. of scanning, then control room will be notified using alarm along with the location. Then authorized personnel will personally confirm whether device

is present or not. This can be done by either of the following:

1. The personnel will go there and check personally, or
2. The image of the determined location would be provided to the authority. The personnel will visually check the image for presence of recording device.

IV. EXPERIMENTATIONS

In order to test and demonstrate the proposed system a classroom was prepared to simulate a movie theatre. The windows were covered with dark paper sheets and an overhead projector to simulate theatre projector was used. The classroom used had dimensions of 30 ft. x 25 ft. and projector of “View Sonic” make was mounted at a height of 7 ½ ft. The camera used in the set up was a cellphone camera of 5 MP resolution. The experimental system thus developed was able to clearly identify and record the position of any recording device in its view angle. The algorithm

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was also able to calculate and indicate a seat number for the detected camera. Better results could be obtained with a good quality camera. The system performed satisfactorily enough to encourage further study of the subject.

V. FUTURE WORK

In order to practically implement the system inside a theatre, following recommendations need to be considered.

1. In order to protect the privacy of audience the faces need to be blurred at the very beginning of the process.
2. In order to have an additional proof, audio watermarking technique to identify the position of recording device in a theatre can be added with the proposed system.
3. Moving platform needs to be designed to effectively scan the seating area of the theatre.

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