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Movie Piracy Deterrence Using Infrared Transmitter and Steganography Technique

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Abstract: The cinema is a significant source of entertainment for people in the present era. To entertain people a lot of speculation is put on cinemas by the filmmakers. A small number of people who steal movie content are ruining the endeavors of filmmakers, and that is why piracy has grown exponentially. Piracy is the act of copying movies and making them easily accessible through cloud storage. They accomplish this by recording the film using a handheld camera, uploading it to websites, or pitching it to individuals. The theft of camcorders has a significant impact on the film industry nowadays. This provides us with a tremendous opportunity to see a solution to this enormous issue and raise theatre attendance, which reduces the losses caused.
The objective of the research is to design a technical anti-piracy system for the film industry using LSB steganography. Infrared LEDs are mounted behind the screen or along the four corners of the theatre, and the layer of IR rays that is produced helps to prevent tampering. The information displayed on a screen is all that a viewer sees when looking at it, they are not aware of the infrared rays that are also being shown. Despite having IR filters, video cameras intended for capturing information on a screen are unable to eliminate IR rays from interfering with the recording process and generating a foggy effect. A GSM-based immediate alert is sent to the relevant authority to inform them of the piracy location using GPS if unauthorized access is identified.

Keywords – Camcorder, LSB Steganography, piracy, GSM, GPS, IR LED, secret key, camera.

I. INTRODUCTION

Major changes have occurred as a result of the internet's present rapid development. It is simple to obtain any type of information, and copyrighted materials are also freely accessible. Theater piracy is the key issue in this instance. Camcorder piracy is the main factor behind movie piracy in theatres, which is a severe problem for the film business. Our project's main goal is to reduce movie piracy. Film piracy often entails using a camera to record a movie being shown in a theatre, altering the footage, and enhancing the visuals.
Our endeavor aims to prevent people from making videos of movies being shown in theatres in order to lessen and stop movie piracy. Even while we can't totally remove it, we can reduce the harm its spread causes. We use infrared radiation to achieve this since it can be seen by cameras yet is invisible to human sight. So, we use this unique property of infrared to prevent the camera from capturing the film. To stop this kind of fraud, infrared LEDs are placed throughout the display of the screen. In contrast, in movie presentations, infrared (IR) photons are released by IR LEDs that distort the video footage because they are not visible to humans but are sensitive to the camera lens internally. It is possible for movies to be pirated well before their official announcement, so a technical solution is required to stop this. LSB steganography is used to embed a secret key into any pixel of the movie. When someone attempts to play a video, an alert message is sent to the owner with caution, if the authorized person enters the right key, the video is then allowed to be viewed.

II. LITERATURE REVIEW

Nanditha L et., a1[1]" A Novel Approach to Develop a Movie Piracy Prevention System". In this paper, the author states that as our eyes are particularly sensitive to IR and UV radiation and cameras may collect the rays and produce a hazy look on the recorded video, this method makes use of the property of light. utilizing the projector's integrated, powerful Infrared beams. The movie film is also subjected to the steganography technique using MATLAB; information about the recipients of the message is concealed in the video frames. a GSM-based mechanism to alert the appropriate authorities of ongoing recordings and incorrect password entries.

Mahmoud M. Mahmoud and Huwaida T et., a1[2] "Enhancing LSB Using Binary Message Size Encoding for High Capacity, Transparent, and Secure Audio Steganography—An Innovative Approach". The author describes a proposed system, in which a secret message or code is encrypted in an audio file using adaptive-audio steganography, which conceals files like WAV, MIDI, AVI, MPEG, and MP3 using the LSB technique with (BMSE) Binary Message Size Encoding. This process makes it possible to conceal a secret message in the audio file by compressing it without changing the original audio. Using the Huffman algorithm to decompress the audio file, decrypt it with AES-128 to reveal the hidden message.

A.M. Prasanna Kumar et., al [3] "A survey on reduction of Movie Piracy using Automated Infrared System". The author states that piracy has been a major issue. It not only reduces tax collection but also results in job losses. In this work, they exploit a characteristic of light that cameras can detect but human eyes cannot. They use an IR burster that is incorporated into the projector, and these IR pulses disrupt any camcorder's ability to record, specifically interfering with the pirates' recordings of motion pictures. Also, they have introduced password authentication, which only works when the user's secret key and the frame number they entered the match, turning on the movie.

Sheeja Agustin et., a1[4] "Tracking of Video Piracy using Unique Identifier". The author of this paper disseminated that watermarks were added to movies by the filmmakers to identify videos that contained their trademarks and to identify the file's origin. Python programming serves as the foundation for this steganography method. Utilizing 8-bit binary coding with ASCII values to conceal communications or distributor-related information. Also employing the earliest approach, "Caesar Cypher," on the frames where Cipher text is concealed in a numeric form and is decoded according to the necessary shifting methodology. The victim of movie piracy will benefit from this technique.

Chandana. P.S et., al [5] "Movie piracy Reduction using Automated Infrared Transmitter Screen System and Steganography Technique". In this paper, the author proposes a technical approach to lessen camcorder piracy, which occurs when cameras are used to capture movies in theatres. They are also copied from physical CDs or digital downloads before being cracked and released. The quality of the captured video is distorted in this study because IR rays are projected from the screen. When an unauthorized person tries to play the movie, they also employ RFID tags, which is helpful. In this situation, GSM and GPS are used to send an urgent alarm message to the relevant authority.

B.P. Arjun et., al [6] " Movie Piracy Tracking system using video steganography". The author disseminated knowledge about using video steganography, a method for locating pirates, and is only able to do so by encoding special information in the video steganography. Here, IR rays, which distort recorded videos, are used to combat piracy. The GSM transponders serve as a tracking tool that identifies the person who is pirating movies in theatres.

Sanju. D.J et., al [7] " Movie piracy prevention using Automated Infrared Transmitter Screen". In this paper, the author stated that in order to prevent the theft of movies, they have proposed a technique utilizing LSB steganography, a technology used to conceal a message in a multimedia file. After turning on the webcam, the distributor receives an email with the person's image. If the authentication is unsuccessful, an IR transmitter screen is designed to prohibit video recording in movie theatres. An immediate GSM-based warning is being issued to the appropriate authority to tell them of the GPS-based piracy position.

Lan Zhang et., al [8] "Kaleido: You Can Watch It But Cannot Record It". The author has described a method using LSB steganography, a tool for hiding a message in a multimedia file, to stop the theft of movies. The distributor receives an email including the person's image after activating the webcam. An IR transmitter screen is intended to prevent video recording in movie theatres if the authentication is unsuccessful. The proper authority receives an immediate GSM-based warning to inform them of the GPS-based piracy position.

Divya Rani et., al [9] "Movie Piracy Tracking System". In this paper, the author describes an algorithm for audio marking, an RFID tag, and temporal psycho-visual modulation to prevent movie piracy. This technique is intended to boost security while using little money, and energy, and having high precision. To discover the most cameras using picture preparation computation, night vision goggles employ a mechanism called temporal psycho-visual modulation. Copyright information provides two-level authentication and includes information about the person who is accountable. The security of the film is the main topic of this essay.

Yuanchun Chen et., al [10] "Movie Piracy Tracking using Temporal Psychovisual Modulation". The author stated that in order to combat camera theft in theatres, this paper examines a prototype that draws on the differences between the image production processes of the human eye and a screen. TPM is also used in watermarking systems that can provide time, location, and date-specific information about infringement.

Venkata Kishore Kumar Rejeti et.. a1[11]" Preventing Movie Piracy". The author of this article disseminated knowledge about how to stop movie piracy using image processing by scanning the theatre area to find recording cameras while simultaneously turning on the IR Ray on the watching screen. The devices' recordings will become tainted as a result. An alert message stating there is an active recording camera in the theatre will be sent to the management.

Anusha C.R et., al [12] "Review on Movie Piracy Reduction using Infrared Transmitter screen, Steganography Technique, and GSM based alert system". The author proposes a technical method created in MATLAB employing steganography technology for an anti-piracy screening system. The recorded video is intended to be rendered worthless by an IR-based screen, and immediate communication is sent to the relevant authority through GSM to alert them of the situation with the piracy.

Sowmya Sreenath et., al [13] "Movie piracy Reduction using Automated Infrared Transmitter screen system and steganography technique". The author disseminated knowledge about a method to prevent movie piracy. In this study, the system uses two levels of authentication, the first of which is carried out by the theatre officer using a smart card, and the second of which is carried out by the microcontroller. A method known as LSB steganography is used to embed a secret key in a specific frame. They have presented a color-detecting technique to include the secret key in the video's cover frame. To verify the authorization of the person attempting to play a movie in a theatre, they have installed an RFID reader.

Savita CH et., a1[14] "Anti-Piracy Screening System". The author describes a method using IR and RFID to stop movie piracy in theatres. This paper describes a system that, by interfering with every camera making an unlawful recording in a theatre, successfully prohibits the revealing of private and personal information through unauthorized recording screens. The way this technology

operates is that a smart card is used for authentication, and one component flashes an infrared light in a specific pattern.

Smt. Manasa K B et., al [15] "Camcorder Piracy – IR Based Antipiracy Screen". The author stated that infrared radiation will be implemented behind the screen in this study's anti-piracy screen, which interferes with the quality of the recorded video since CCD sensors are used in the capturing devices. RFID tags will also be used as part of the anti-piracy screen. Additionally, it uses RFID tracking data to identify the piracy's perpetrator.

A.K. Veeraraghavan et., al [16] "Deterrence of Piracy Employing IR Transmitter and Steganography System". The author stated that without the filmmakers' consent, movies are pirated in the film business prior to their official release. Some people are destroying their efforts by pirating the movie's material. In order to render the acquired footage useless, it has been suggested in this study that an IR transmitter be put behind the movie screens or along the four corners of the movie theatres. The color identification algorithm, which finds the pixels in an image that match a particular color or color range, is explained in this article.

Abhigya Bhatnagar et., a1[17]" Piracy Prevention System for Movie Theatres and Auditoriums". The author stated that piracy is illegal, this system uses a water marketing strategy to add water to the movie footage at a pace of 20 milliseconds, where human eyes can detect a 40-millisecond speed. The technology scans the theatre before the film is shown, and once it begins by disregarding all reflections and detecting the likely camera, the authorities are notified that an unlawful recording activity is occurring.

Nitin Jain et., al [18] "Image Steganography using LSB and Edge–Detection Technique". The author of this paper proposes a system in which a message is embedded in the cover image by using the Least Significant Bit Insertion. This is image steganography, and it is implemented using edge detection and grayscale algorithms. Steganography allows for the addition of information that aids in the identification of offenders.

Pascal Bourdon et., al [19] "A Metamerism based method to prevent Camcorder movie piracy in digital theaters". The author states that the use of camcorder jamming, which helps to lessen the impact of infrared radiation rays on the human eye, is discussed in this work. Also, it describes the application of the metamerism-based technique, which, when compared to temporal/spatial light modulation or infrared techniques, offers robustness to pirate countermeasures.

TITLE OF THE PAPER	PUBLISHED BY	YEAR	METHOD/ ALGORITHM	OBJECTIVE ACHIEVED	OBJECTIVE NOT ACHIEVED
A novel approach to develop a movie piracy prevention system.	Nanditha L et., al	2022	The video steganography technique using MATLAB.	The IR is designed to avoid movie recording and the concerned authority receives an alert messageby GPS in case of a grey market.	Modulation technique can be used to generate flicker that cannot be detected by HVS but creates noise while recording the movie.
Enhancing LSB using binary size encoding for high capacity, transparent, and secure audio steganography-An Innovative.	Mahmoud M Mahmoud et., al	2022	The proposed system uses a method known as LSB-BMSE.	This method helps in achieving a very high level of security and maintains the robustness of the secret key.	The secret data is embedded in a deterministic way which gives attackers a chance to access the hidden data andthe LSB method is very sensitive and can lose the data in any way.
Deterrence of piracy employing IR transmitter and Steganography system.	A.M.Prasanna Kumar et., al	2021	Color detection algorithm.	The digital watermarking technique is used to detect video piracy.	Defeating the camcorder piracy by Temporal Psychovisual Modulation (TPVM) technique.
Tracking of video piracy using a unique identifier.	Dr. Shreeja Augstin et., al	2021	A method of steganography and caesar cipher is implemented.	The source of piracy canbe identified when decrypting the movie from a third-party site, thereby tracking the user account details.	The location tracking of the pirates is not achieved.

Movie piracy reduction using automated infrared transmitter screen system and the Steganography Technique.	Chandana.P.S et., al	2020	Infrared transmitter and steganography.	A secret key is embedded by using the steganography technique. GSM is employed to indicate the concerned authority via SMS regarding piracy.	The tracking of the location is done after the pirated content is posted on torrent websites.
TITLE OF THE PAPER	**PUBLISHED BY**	**YEAR**	**METHOD/ ALGORITHM**	**OBJECTIVE ACHIEVED**	**OBJECTIVE NOT ACHIEVED**
Movie piracy tracking system using video steganography.	B.P.Arjun et., al	2020	Watermark method and Temporal Psychovisual Modulation (TPVM).	The Watermark technique helps in achieving detecting the piracy location. TPVM serves in achieving and revealing the one responsible for the camcorder.	No prior precautions or other techniques are implemented in order to prevent the pre-piracy of the movie.
Movie piracy prevention using automated infrared transmitter screen.	Sanju DJ et., al	2020	The LSB steganography technique is employed for embedding a secret message in a multi-media file.	If the authentication fails, automatically the webcam is enabled and the person's image is sent to the distributor's email. The infrared transmitter screen is designed to avoid movie recording.	Prevents the lens of confidentiality information from a private board meeting where electronic locks cannot be installed.
Kaleido: You can watch it but cannot record it.	Lan Zhang et., al	2020	The Kaleido method is implemented.	It exploits the subtle disparities between the screen eye and the screen camera link. It also proves that it can work on any kind of platform and is flexible enough to adjust to any screen.	The encoding efficiency is not achieved since the time delay is more for the audience. This method could not explain all the constraint factors in the video, and a suitable measure is not taken to achieve security.
Movie piracy tracking system.	Divya Rani et., al	2020	The audio watermark method, Temporal Psychovisual Modulation is employed and the RFID tag method is used for the purpose of authentication.	It proposes a system that requires two levels of authentication.	No prior information is provided to avoid the grey market and prevent the camcorder of the movies in the theatres.
Movie piracy tracking using Temporal Psychovisual Modulation.	Yuanchan Chen et., al	2020	Temporal Psychovisual Modulation (TPVM) is implemented.	TPVM method helps to overcome camcorder piracy by exploiting the difference in image formation mechanism between humans.	No prior precautions or other techniques are implemented in order to prevent the pre-piracy of the movie.
Preventing Movie Piracy.	Dr. Venkata Kishore Kumar Rejeti et., al	2020	Reduction of movie piracy using automated IR.	This method is used to protect against the illegal recording of the movie in theatres which results in huge losses to film producers and theatres and a GSM-based alert system is developed to indicate the authorized person via SMS.	No prior precautions or other techniques are implemented in order to prevent the pre-piracy of the movie.

TITLE OF THE PAPER	PUBLISHED BY	YEAR	METHOD /ALGORITHM	OBJECTIVE ACHIEVED	OBJECTIVE NOT ACHIEVED
Review on movie piracy reduction using an Infrared Transmitter screen, Steganography Technique, and GSM-based alert system.	Anusha CR et., al	2019	The steganographic technique using MATLAB.	A technique known as the LSB steganography technique is used to hide a secret key in order to avoid piracy. A GSM-based alert system is employed to indicate the concerned authority about the piracy position via GPS. A technical method known as steganography is implemented to hide a secret key.	Defeating camcorder piracy by Temporal Psychovisual Modulation (TPVM) technique.
Movie Piracy reduction using an automated infrared transmitter screen system and the steganographic technique.	Sowmya Sreenath et., al	2019	Infrared transmitter and steganography.	A secret key is embedded by using LSB steganographic technique which is embedded using a color algorithm. An infrared transmitter screen is developed to avoid piracy and a GSM-based alert system is developed to indicate the authorized person via SMS.	The tracking of the location is done after the pirated content is posted on torrent websites.
Camcorder piracy IR-based anti-piracy screen.	Smt.Manasa K.B et., al	2018	Identifying the pirates by exploiting the technology of RFID.	An infrared is being embedded behind the screen through which a layer of IR rays being generated aids in defecting the piracy.	The final copy of the movie content might get leaked before the official release of the movie by multiple teams.
A survey on reduction of Movie piracy using the automated infrared system.	A.K. Veeraraghavan et., al	2017	Reduction of movie piracy using automated IR.	The infrared transmitter screen is designed to avoid movie recording.	The prevention of harmful rays from not reaching humans for a longer duration is not achieved and the quality of the video is not maintained at its peak (resolution drop).
Piracy prevention system for movie theatres and auditoriums.	Abhigya Bhatnagar et., al	2016	Image processing technique over an image and video watermarking mechanism is implemented.	The video watermarking technique helps in identifying the ownership and traces the video dissemination source and thus discourages the practice of illegal recording.	Defeating camcorder piracy by Temporal Psychovisual Modulation (TPVM) technique.
Image steganography using LSB and edge detection technique.	Nithin Jain et., al	2012	LSB Steganography and Edge detection technique.	Using the LSB Steganography along with the Edge detection method leads to a very high level of security.	None of the authorization mechanisms is involved.
A metamerism Based method to prevent camcorder movie piracy in digital theatres.	Pascal Bourdon et., al	2010	The metamerism method is implemented to avoid the piracy of the movie.	Preventing the human eye from the effects of infrared radiation is also achieved along with preventing the movie from being pirated at the theatres.	No such method is deployed to look after the security and quality maintenance of the movie.

III. METHODOLOGY

For marketers, determining the precise impact of piracy is a crucial research question. The majority of piracy results from theft or negligence, although there is speculation in the media and among bloggers in the business that some piracy may be purposefully planned by marketers. Such intention leaks to piracy.

- However, there isn't any scientific evidence to support these theatres, and the most common empirical finding has been that overall, piracy hurts sales.
- The proposed methodology is made to anticipate piracy at the initial stage, and in an effort to stop piracy, the location of the theatre where the piracy is occurring has been identified in order to notify the person in control when an unauthorized individual attempts to access the movie. The system also warns the operator about the piracy attempt in the theatre.
- It would be in line with theoretical models that contend piracy can boost earnings because of sampling, network effects, advertising, and piracy prediction competition.
- After switching the microcontroller, the system waits for input from the operator before handling it.
- LSB steganography is used to correctly incorporate movie data such as theatre location, show timings, movie name, and operator details.
- The IR LEDs installed behind the screen or along the four corners of the theatres turn on, once the movie is shown on the screen and the relays are triggered following the password's successful authentication.
- If the verification is unsuccessful, the movie is not shown and an alert message is sent to the individual through GSM and location via the GPS module.
- The architecture plan for the suggested methodology is depicted in the figure below.

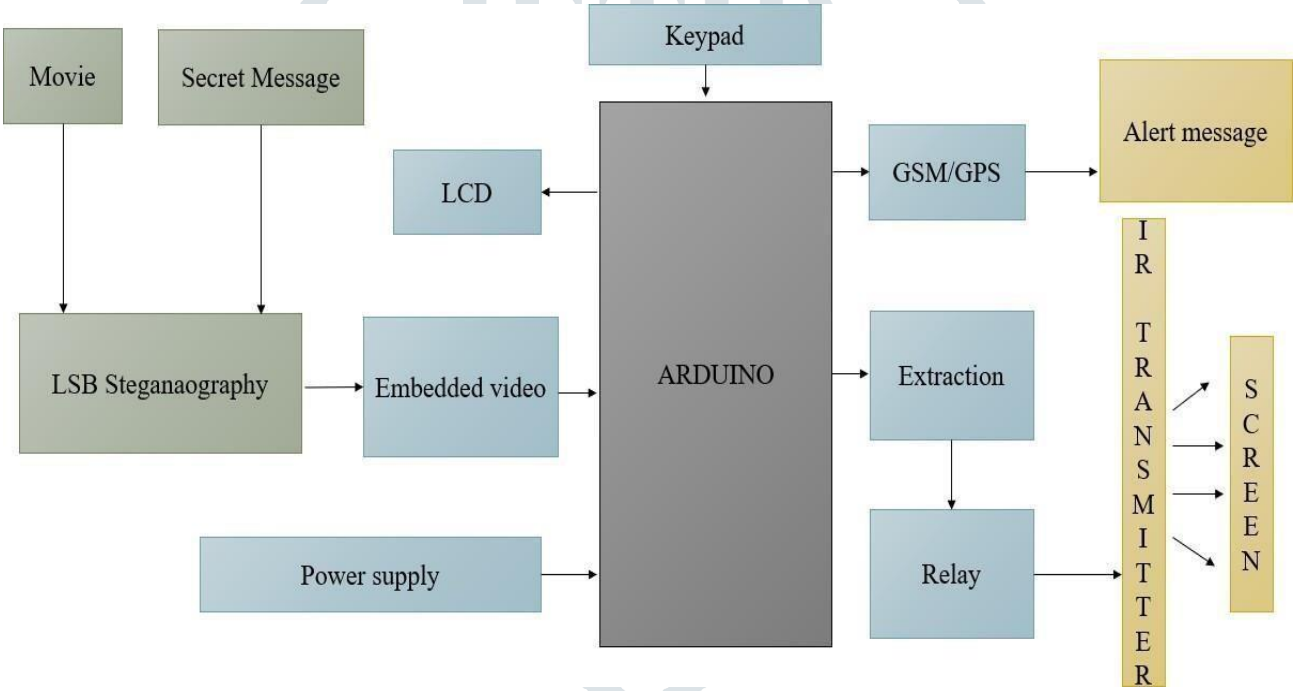

Fig.1 Architecture design of the system.

IV. CONCLUSION

To stop illicit movie leaks this device can monitor online videos and spot any infringement in order to prevent unauthorized movie leaks. The proposed methodology allows the use of IR LEDs and the concept of LSB steganography to prohibit unlicensed video recording of movies in theatres. They are focusing on the black market for piracy as a result. The IR emitters render the collected videos ineffective. The objective of LSB steganography is to conceal the secret message within a collection of video frames.IR transmitters for the such device are installed along the edge of the movie screen. Compared to visible light, infrared light exhibits longer wavelengths. Although the human eye cannot see this wavelength range, a variety of cameras can. As a result, these lights wouldn't distract spectators.

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