

# Table of contents

Volume 1131

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◀ Previous issue    Next issue ▶

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Rahul Pradhan, Kanishk Bharadwaj, Aman Saxena and Vikram Rajpoot

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Jitesh Kumar Bhatia

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**Impact of Hidden Dense Layers in Convolutional Neural Network to enhance Performance of Classification Model**

V L Helen Josephine, A.P. Nirmala and Vijaya Lakshmi Alluri

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012008

**Statistical Measures for Trending Video Analysis using knowledge pre-processing and preliminary knowledge Analysis**

Rahul Pradhan, Akansha Saxena, Divyanshi Bansal and Ananya Jain

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An Automated Optimize Utilization of Water and Crop Monitoring in Agriculture Using IoT

Sanwta Ram Dogiwal, Pankaj Dadheech, Ankit Kumar, Linesh Raja, Abhishek Kumar and Mahender Kumar Beniwal

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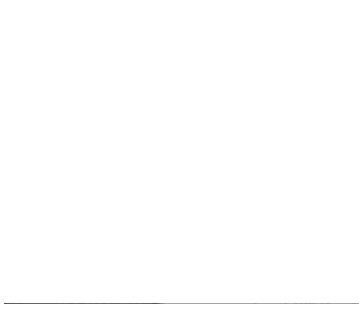
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# Multiple Watermarking Scheme for Video & Image for Authentication & Copyright Protection

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**Abstract.** Watermarking has been used frequently to authenticate the accuracy and security of the image and video files. In the world of computer technology, several watermarking strategies have developed during the past 20 years. Integrate a picture of identity that is not always concealed, such that no detail is not possible to delete. A monitoring code can also be used to deter unauthorized recording equipment. Another application is the watermark copyright control, which works at stopping the creator of the image from stealing photos unlawfully. A watermark is a promising option for the copyright transcendence of multi-media files, as embedded messages are still included. Due to the limits of fidelity, a watermark may be implemented in a small multimedia data space. There is no proof that Automated Watermarking technologies will fulfil the ultimate purpose of the cleaners of all sorts of copyright security operations to gather knowledge from the data they obtain. Relevant situations may be deemed more fairly expected with the usage of automated copyright marking technologies. A perfect device will not be able to add a digital watermark without the limit, which does not supply the whole object with details. In this work, a modern technique for watermarking includes injecting two or more messages or photographs into a single picture for protection purposes and repeating a similar procedure for N-frames for authentication in the film.

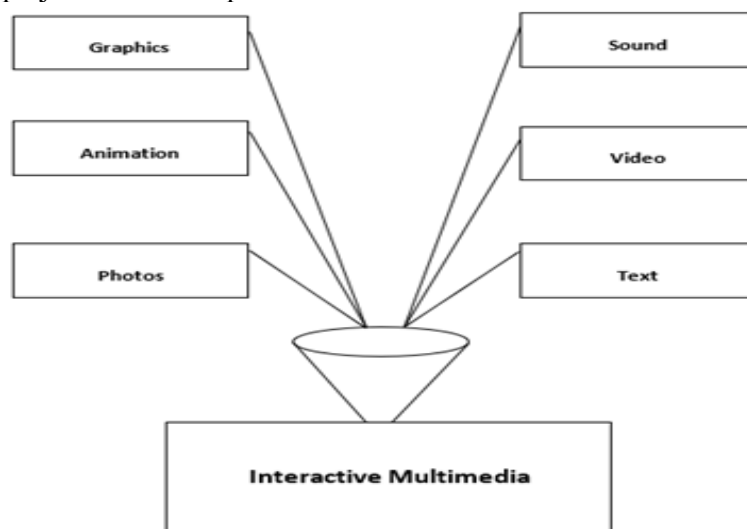
**Keywords:** Digital Watermarking, Video, Authentication, Temper, Copyright, Protection, DCT.



## 1. Introduction

There are many interactive items in one. The basic definition of multimedia is "the fusion of two or more media." The media in multimedia are displayed in several ways: graphics, image, text, sound effect, audio, voicing, etc. Both symbolic and functional purposes, each serves as an effective medium for communication. The media will have a more diverse and interactive experience when melded together. In the event of collaboration and communication between the different media elements the subsequent steps can be strengthened even further. The famous sentence, "The medium is the message", has been used by Marshall Mc Luhan as a leading and prominent media relations theorist. According to him the attention should not be on the information or what is being said, but the mechanism by which it is provided. He felt it was the way that forms and governs the size and form of human association and behaviour. The topic is not meaningless, but the format of transmission is significant in the way the message is conveyed. This is where multimedia has the incredible power and impact. Media is the plural medium by choice. The word 'facilitates or links contact' has evolved, whether by a phone, the internet, the TV or another instrument. It is instant and does not require consultation to talk openly to those on one side. This is the purest mode of contact. A medium's function is to enable the message to be conveyed. We call multimedia, whether or not it's computer-based, when we use more than one form of media. At the moment, the media used news and information mostly in the press to transmit to the masses. Now there are a number of ways of contact in the media.

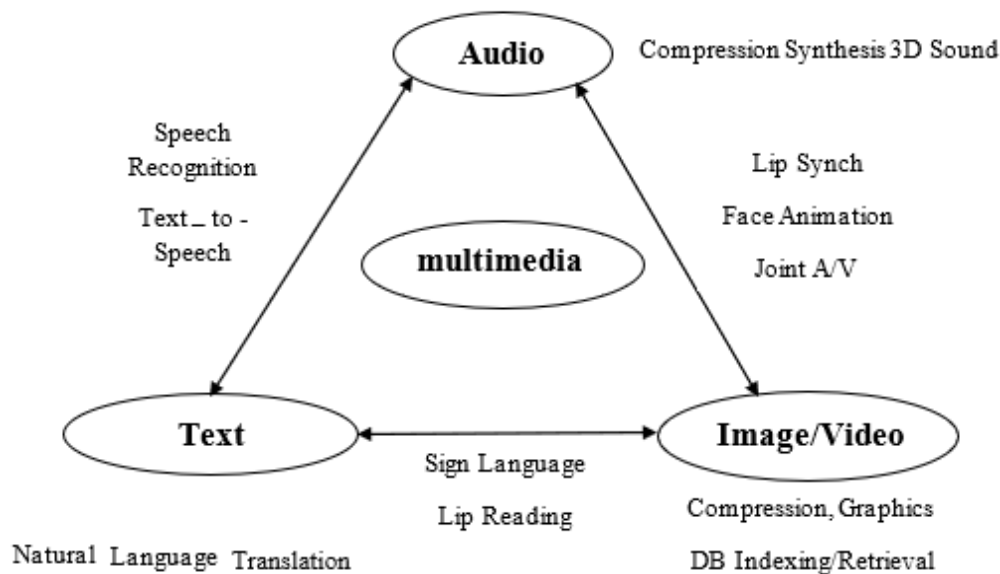
Multimedia is a synergistic process in which many elements of the media operate together to strengthen and unify a whole. A combination of media adds wealth and offers a total sensory experience. Multimedia was once the simultaneous replay of a slide and a tape storage unit. As an example, 50 years ago the audio tried to synchronize with the series or play as 'bottom' music, photographic photographs in slide form were projected on a computer.



**Figure 1.** Disparate Multimedia Elements Funneling Into One Unit

Multimedia uses various media formats (such as text, sound, graphics, animation, film, interactive) in the collection and processing of information to educate or entertain the user of these. The use of electronic devices to store and experience visual content also applies to multimedia. Multimedia is comparable, but larger, to conventional mixed media art. "Rich media" means immersive multimedia.





**Figure 2.** Multimedia uses various media formats

## 2. Literature Review

A New H.264 / AVC watermarking method is proposed [1]. They were embedded robust and fragile watermark into DCT domain to the motion vector, which can work together to achieve copyright protection and authentication of both sides. Our solution is superior to higher capacity and another video watermark plan, especially in low bit-rate compression. In addition, being a good mode selection function in H.264 / AVC Lagrangian optimization aligned. The software would only trigger very minor changes to the material. The solution is very efficient algorithm to extract watermark from emails.

Such act ensures the creators of copyrighted works have actual power over the contents of their archives. We wish to apply DW-SVD algorithm in creating digital watermarks [2]. The proposed method includes two steps: the embedding of watermark and the extraction of watermark. In the process of embedding and embedding, we mix DCT and CSS embedding methods with PSNR and Video Concealment. "Watermarking method based on DWT and SVD proposed hybrid concept of digital video". This technique can be used to hide information from people. DCT is rather time-consuming method because it requires another database. A hybrid result was found superior over a single DWTSVD method. It was found that the watermarking method met the required criteria. It is of fast processing and is probably robust.

Hiding video data is a big research topic [3]. They suggest a new video data hiding method which uses repeated error correction to accumulate area code penalty and supremacy of data hiding (FZDH). FZDH is authorised for no modification and data hiding method. The frame was checked for any form of file, including.MP4,.3gp,.AVI etc., and the performance of the whole method of hiding video output details. Protection of the proposed scheme, video encryption and decryption secret methods. The simulation results indicate that the surveillance video phase is secret.

Video watermarking is a recent technology, primarily used for the illicit spread of multimedia video on the internet[4]. When a watermark is added to the recording, it must not be detected when sound is still visible. The encoded original picture details can be transparent or invisible as a „digital watermark." More nuanced attacks can be carried out to enhance the protection and method of embedding watermarks. Research has shown that the most effective and economic way to evaluate Eigenwerte is

by utilising the SVD algorithm. For purposes of embedding and extraction method, the advanced SVD transformation algorithm suggested in this work would be. The experimental findings suggest that the watermarking method suggested for SVD algorithms is comparatively less risky.

The plans are focused on the copyright security of validity and discrete wavelet transformation (DWT) and single-value decomposition (SVD). These are grey watermark logo image. As the watermark, the algorithm that the original image was converted into the wavelet domain and the use of a reference sub-picture, in which a contrast is set and value coefficients of a wavelet are used and shaping. In this way, LUCC can have a significant influence on political and economic decisions.

Proposed work scans the image for the digital image obtained from the watermarked software. In their algorithm, cover pictures they use as a watermark [6]. It combines object watermarking techniques with blurry block images. It also embeds the watermark in the host image displacement and LSB. A watermark image is copied from the suspect image and inverted.

The use of PKI, public key encryption and watermarking technologies in developing a visual image of the latest testing and evaluation methods that apply to information system security [7]. The main idea of their paper is that the image was watermarked (LSB).

Suggested to apply zero-knowledge cryptography for secure the watermark picture [8]. In its scheme using DWT (discrete wavelet transforms) of the embedded watermark, they made adequate secure watermark in the bit least significant in host image (LSB).

Proposed a fragile watermark image authentication scheme [9]. They used the singular values of the image decomposition (SVD) singular values, integrity check images. In order to make the singular values authentication data is changed to use modular arithmetic bit. Then, they are inserted least significant bits of the original image bit (LSB). The change in the original image pixels are selected randomly.

Proposed a new standard of structural digital watermarking by using the random function mapping for LSB [10]. They believed that the randomized position of the image is more reliable than the use of traditional hashing algorithms.

Proposed compromise between concealment and using SSIM quality measure of watermark robustness [11]. They detect watermarked images using complex statistical procedures.

This proposed a bit-plane index modulation based on fragile watermarking scheme used to verify the RGB colour image [12]. By embedding the R, G, in the R, G, B component of the watermark image, the original image of the B component, and as the embedding distortion is minimized by using the least significant bit (LSB) to change the program. Their encryption method includes encoding and decoding procedures. We hope to deal with the limitations of the prior art through the incorporation of a new technology.

It refers to machine data security markings that prohibit its unauthorised copying and file identification. The DW-SVD solution for optical video watermarks is recommended [13]. There are two parts: watermark embedding and watermark extraction. In the embedding step, we combine method Comparison with the comprehensive PSNR code tag with the time elapsed and the robustness of the check.

Watermarking approach based on DWT and SVD proposed a hybrid concept of digital video [14]. This method can be used to ensure identification and data privacy. DCT method is rather complicated but it has superior capacity and concealment. It is observed that DWTSVD combination is effective than DCT

method. The techniques meet the required security policy, reliability, fast processing and the visibility time required.

Find that steganography works poorly because a very little image shift can be deleted efficiently by rolling LSB from a single pixel is a cover picture stored in JPEG format within the spatial domain [15]. Noted that a large spatial stylus is given in the original uncompressed format, but that uncompressed image sharing is considered equal to a similar author's cryptography.

Suggested a realistic JPEG-embedded image algorithm to deliver steganography with high capabilities without compromising protection [16]. The algorithm F5 is introduced into an irregular coefficient of DCT bit selection and integrated into a matrix to minimize shifts in the length of a post.

A new scheme was proposed to hide LSB replacement for encrypted image data. It consists of the encryption of images, data embedding and data recovery [17]. Encryption key used for encrypting the original image of copyright owners. A shift in the encrypted picture data that masks the use of a key to create a sparse space for the smallest bit of the extra data to handle.

The immune digital watermarking algorithm is the latest, insecure, reverse watermarking the charge [18]. In certain cases reversible digital watermarking will not include the watermark information in a totally restored way to its original undifferentiated state according to the watermark security characteristics, but will allow for minor differentiations. In this sense, this paper suggests an embedded digital watermark that integrates new concepts to guarantee the consistency of work that value has been done after failure, so that the intruder does not benefit from the value of public works embedded with a watermark.

New telemedicine circles are also the solution to enforce image protection requirements by shielding information to safeguard proprietary and copyrighted content [19]. The delicate watermarking system offers a reliable, health-care, telemedicine solution. In this document we suggest a reversible colour medical image, a watermarking method for the spatial domain. Watermarks of an image stored in the unaltered as an important component extract in a given watermarking process. Used to extract the watermark after the main information.

We propose in this paper a hybrid watermarking approach focused on digital images of a single decomposition (SVD)[20]. The watermarks protection of copyright and longevity are two main facets of the software. Here, we entered the wavelet host picture, which provides copyright security and reliability, as main components of DCT field marking. The factor of scaling depends on the image. Providing preliminary findings shows that the software can avoid all forms of attacks and covers in image processing.

Tacit writing is the technology to be covered in some newspapers to prevent eavesdroppers with distrust. They were introducing a new transformation approach for DWT steganography [21]. This approach allows sensitive knowledge to be concealed in a visual image. By changing the wavelet coefficients, hidden knowledge is inserted into the picture. The proposed approach is very similar to the initial hidden picture quality.

Service owners are using forensic watermarking's to track users who upload content unlawfully in order to tackle the redistribution of the piracy technologies in Internet Content-the largest threat to many providers of content around the world [22]. In order to be adaptive, it is necessary that the watermark functions smoothly in this setting, as one of the major frameworks for delivering advanced multimedia content on the internet. In this technical report a solution is defined for a single watermark content with a plurality of scalable streaming applications in each receiving system. The suggested watermarking solutions for service providers include a fully functional and easy-to-use authentication scheme to deter the piracy's redistribution of adaptive broadcasting of internet content.

The authentication, weak or malicious attacks embedded watermark are of significant importance in the strong digital colour image of the RGB colour frame [23]. In this analysis, the most important bit replacement (LS B) for authentication of the RGB colour picture watermarking method is introduced, since the use of a minimized alternate bit (LSB) is based on a distortion of the embedding mechanism. The software is modified in three stages by modifying the initial pixel and the pixel watermark. Initial watermark approaches with red, green or blue histograms for histograms are suggested. However, the 3D image elements are red, green, blue, and watermark too. The initial and watermark image and PSNR algorithm of insertion and removal will be in this article.

The use of digital data is rising with the rapid growth of IT and Multimedia. Thus, it is very critical to secure, but also very difficult, the multimedia material pirating [24]. Many people are afraid that the unauthorized repetition of their knowledge cannot secure their copyright. So, the advancement of technologies is really important in the face of all these issues. Considered the digital option for watermarking to avoid multimedia records. This paper introduces, brings out and incorporates an electronic watermark concept. Under its suggested watermarking, the DWT series was in the original rearrangement format, using a picture which had to be rearranged. Then all bands of high LH, HL and HH were used with DCT and SVD. Then by changing the specific values of these bands, the watermark is integrated.

The watermark is reversed by the optimized watermark extraction process [25]. In order to pick these three strips for a band and a pure high frequency band, strong invisibility is assured and resilient against multiple forms of attacks. Utilising DWT, DCT, and SVD conversion leads to a more efficient algorithm of watermarking than any watermarking algorithm that has been proposed. In terms of hiddenness, watermark picture quality is fine. All bands LH, HL, HH options in this high watermark algorithm are made more resistant for various kinds of filtering noise and geometric noise by the mid-LH, HL and pure high-frequency HH bands. In future, the algorithm can be expanded to colour image and video processing by the entire band DWT-DCT-SVD.

### 3. Proposed Work

We note that there are a variety of techniques for watermarking a picture using text, images or other means where watermarking is incorporated in the coverage, based on the initiation and inspiration offered by the analysis literature [26]. In addition to many watermark techniques, the least important bit contains (and discrete Wavelet changes). These involve a small bit, a discrete wavelet conversion, a discrete cosine, and several more. Many modern technologies utilise either a single watermark or a different watermark utilising two distinct watermarking techniques. In our analysis we suggest a way of combining two watermarks into a specific video format and evaluating its performance and the quality of its watermarking [27]. Firstly, it allows us in two ways to improve the payload of the cover frame of the film.

#### 3.1 Process of Watermarking

The sender reads a video and extracts its frames, then integrates two optical watermarks, and executes the vectoring procedure for watermarking encryption [28]. In addition, the sender sends the first watermarked initial picture with the LSB technique first plane. Then the consumer combines the cover with the invisible watermark using a 3rd bit plane LSB technique. This fundamental mechanism is replicated across all frames, each with two watermarks [29, 30].

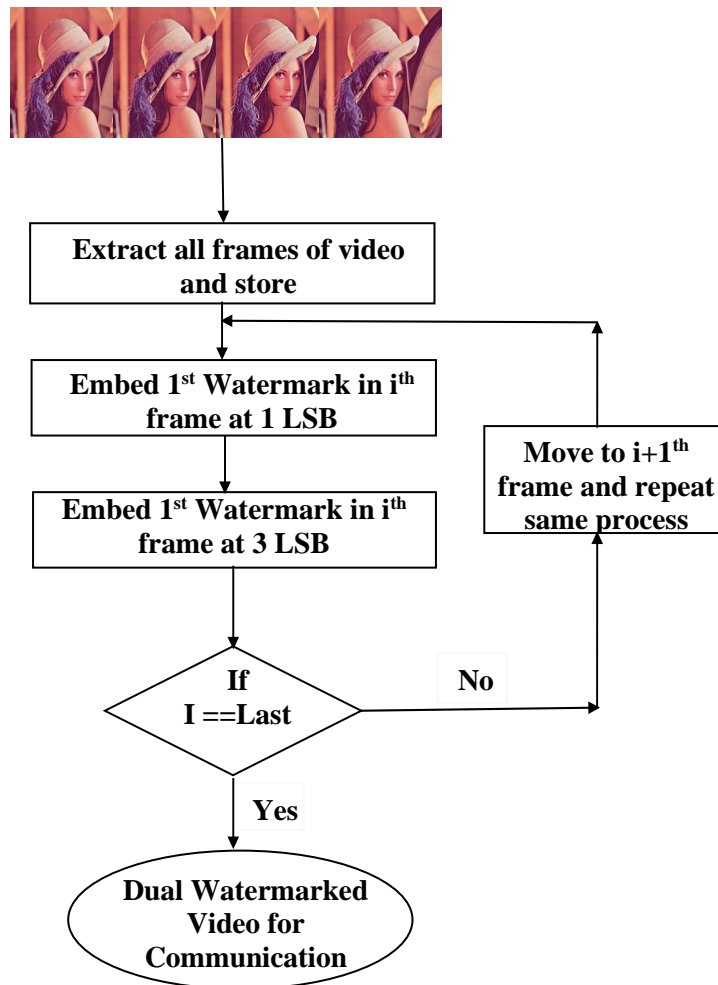


Figure 3. Flowchart at the sender's end

We also used two separate watermarks for embedding:



Watermark 1



Watermark 2

Figure 4. Two different types of Watermark

#### 4. Result & Analysis

The original and watermarked video snapshots are:

**1. MP4 (H.264) Video**



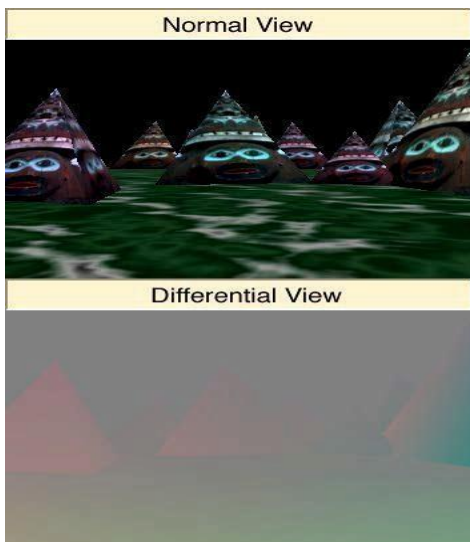
**Original Video Frame (Original)**



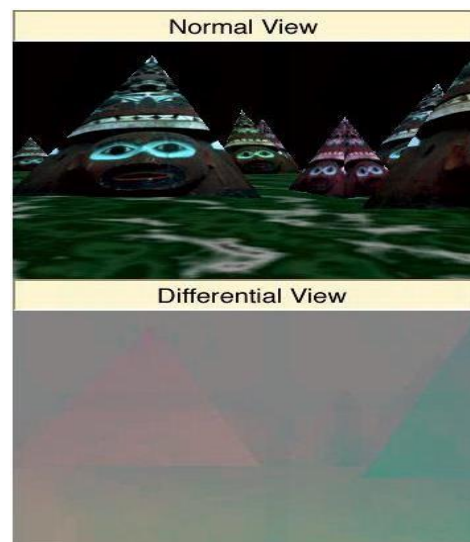
**Watermarked Video with Frame**

**Figure 5. Snapshots of Original and Watermarked Video Frame**

**2. MPEG Video**



**Original Video Frame (original)**

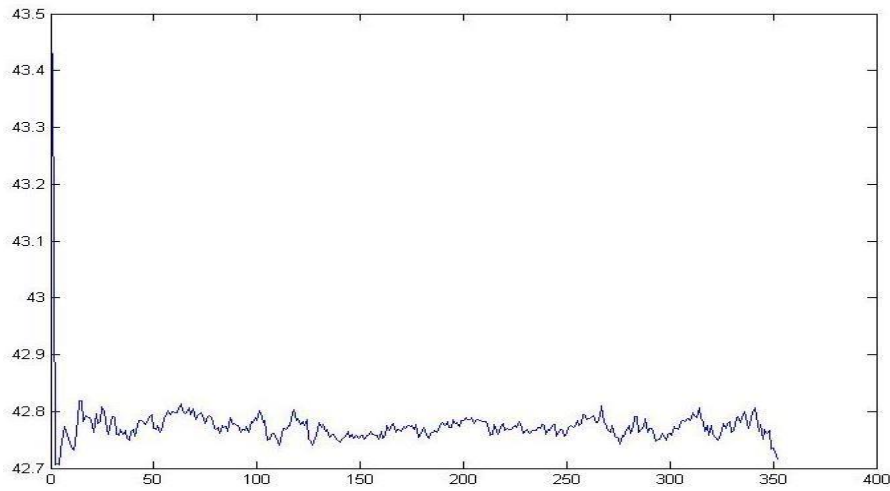


**Watermarked Video with Frame**

**Figure 6. Original and Watermarked Video Frames**

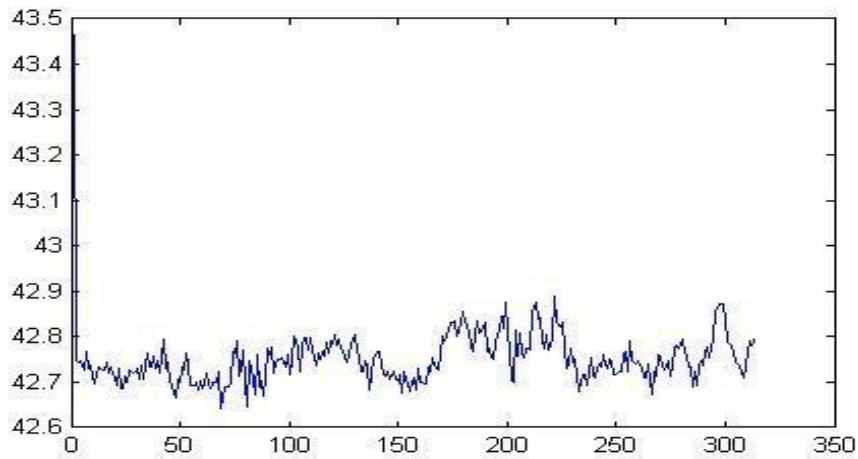
It is time to carry out all the tests and interpret the outcomes with the same results. We evaluate the effects of the sender efforts and the results of the marked video.

Please see below the screenshots and effects of the watermarked video of all three forms and their PSNR values:

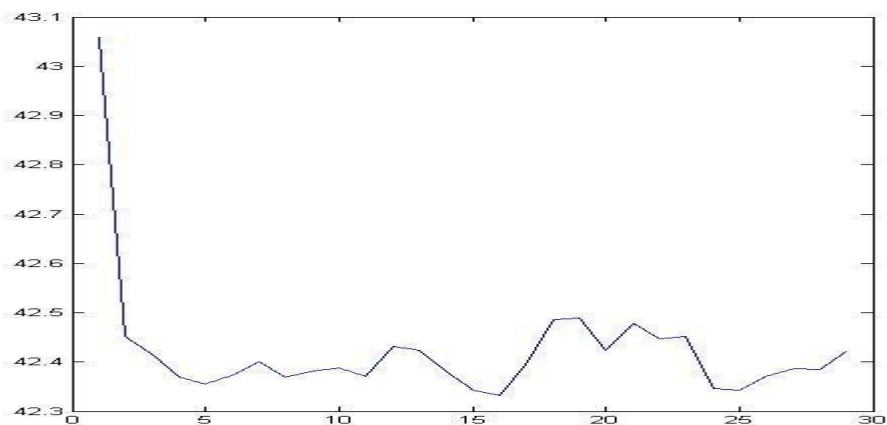


**Figure 7.** PSNR Graph of all AVI video frames

In addition, the security of a specific frame is strengthened in order to make sure that the video is reliable or right, even though anyone breaks the hidden watermark. This work involves three types of content: MP4, AVI and MPEG footage, and two watermarks are used with each video, enabling us to assess the quality of the watermark in all three formats.



**Figure 8.** PSNR Graph of all MP4 video frames



**Figure 9.** PSNR Graph of all MPEG video frames

## 5. Conclusion

There are also a range of watermarking techniques that ensure and protect the cover piece, which provides the receiver with limited repetition, with the result of watermarking, like the smallest bit, a discreet wave transformation, discrete cosine transformation, and several more. Many modern technologies utilise either a single watermark or a different watermark utilising two distinct watermarking techniques. In this paper, we suggest that two watermarks of a single video be merged in separate formats and its performance and watermarking quality be evaluated. Firstly, it allows us in two ways to improve the payload of the cover frame of the film. In addition, the security of a specific frame is strengthened in order to make sure that the video is reliable or right, even though anyone breaks the hidden watermark. This work involves three types of content: MP4, AVI and MPEG footage, and two watermarks are used with each video, enabling us to assess the quality of the watermark in all three formats. As our results indicate, with the watermarked video in the input video, the final PSNR performance is very high and the work has also been done to ensure the touch image. The file format H.264 (MP4) and AVI are almost the same. We have also been able to guarantee the authentication and copyright of the watermarked video.

## References

- [1.] J. Sun, X. Jiang, J. Liu, F. Zhang and C. Li, "An anti-recompression video watermarking algorithm in bitstream domain", in *Tsinghua Science and Technology*, vol. 26, no. 2, pp. 154-162, April 2021. doi: 10.26599/TST.2019.9010050.
- [2.] M. Asikuzzaman and M. R. Pickering, "An Overview of Digital Video Watermarking", in *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 28, no. 9, pp. 2131-2153, Sept. 2018. doi: 10.1109/TCSVT.2017.2712162.
- [3.] H. Mareen, M. Courteaux, J. De Praeter, M. Asikuzzaman, G. Van Wallendael and P. Lambert, "Rate-Distortion-Preserving Forensic Watermarking Using Quantization Parameter Variation", in *IEEE Access*, vol. 8, pp. 63700-63709, 2020. doi: 10.1109/ACCESS.2020.2984354.
- [4.] X. Yu, C. Wang and X. Zhou, "A Hybrid Transforms-Based Robust Video Zero-Watermarking Algorithm for Resisting High Efficiency Video Coding Compression", in *IEEE Access*, vol. 7, pp. 115708-115724, 2019. doi: 10.1109/ACCESS.2019.293613.
- [5.] Y. Zhou, C. Wang and X. Zhou, "An Intra-Drift-Free Robust Watermarking Algorithm in High Efficiency Video Coding Compressed Domain", in *IEEE Access*, vol. 7, pp. 132991-133007, 2019. doi: 10.1109/ACCESS.2019.294036.
- [6.] H. Mareen, J. De Praeter, G. Van Wallendael and P. Lambert, "A Novel Video Watermarking Approach Based on Implicit Distortions", in *IEEE Transactions on Consumer Electronics*, vol. 64, no. 3, pp. 250-258, Aug. 2018. doi: 10.1109/TCE.2018.2852258.
- [7.] X. Li, Y. Wang, Q. Wang, S. Kim and X. Zhou, "Copyright Protection for Holographic Video Using Spatiotemporal Consistent Embedding Strategy", in *IEEE Transactions on Industrial Informatics*, vol. 15, no. 11, pp. 6187-6197, Nov. 2019. doi: 10.1109/TII.2019.2897733.
- [8.] Mahrishi M., Morwal S. (2020) "Index Point Detection and Semantic Indexing of Videos—A Comparative Review". In: Pant M., Kumar Sharma T., Arya R., Sahana B., Zolfagharinia H. (eds) *Soft Computing: Theories and Applications. Advances in Intelligent Systems and Computing*, vol 1154. Springer, Singapore
- [9.] M. Amini, M. O. Ahmad and M. N. S. Swamy, "A Robust Multibit Multiplicative Watermark Decoder Using a Vector-Based Hidden Markov Model in Wavelet Domain," in *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 28, no. 2, pp. 402-413, Feb. 2018. doi: 10.1109/TCSVT.2016.260729.
- [10.] H. Fang *et al.*, "A Camera Shooting Resilient Watermarking Scheme for Underpainting Documents," in *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 30, no. 11, pp. 4075-4089, Nov. 2020. doi: 10.1109/TCSVT.2019.2953720.
- [11.] X. Wang, X. Li and Q. Pei, "Independent Embedding Domain Based Two-Stage Robust Reversible Watermarking," in *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 30, no. 8, pp. 2406-2417, Aug. 2020. doi: 10.1109/TCSVT.2019.2915116.



- [12.] Janu, N., Kumar, S., & Mathur, P. (2017). Performance analysis of feature extraction techniques for facial expression recognition. *International Journal of Computer Applications*, 166(1), 1–3.
- [13.] Janu, N., Mathur, P., Gupta, S. K., & Agrwal, S. L. (2017). Performance analysis of frequency domainbased feature extraction techniques for facial expression recognition. 2017 7th International Conference on Cloud Computing, Data Science & Engineering - Confluence. IEEE.
- [14.] Neha, & Mathur, P. (2018). Three level optimization models of scaled Gabor features for Facial Expression Recognition. *International Journal of Engineering & Technology*, 7(2.24), 348.
- [15.] Janu, N., & Kumar, A. (2021). Automated fruit grading system using image fusion. In *Advances in Environmental Engineering and Green Technologies* (pp. 32–45). IGI Global.
- [16.] Mr. Pankaj Dadheech, Dr. Dinesh Goyal, Dr. Sumit Srivastava, Mr. Ankit Kumar, (2018), “A Scalable Data Processing Using Hadoop & MapReduce for Big Data”, *Journal of Advanced Research in Dynamical & Control Systems*, Vol. 10, 02-Special Issue, 2018, pp-2099-2109, ISSN: 1943-023X.
- [17.] Pankaj Dadheech, Dinesh Goyal, Sumit Srivastava & C. M. Choudhary, (2018), “An Efficient Approach for Big Data Processing Using Spatial Boolean Queries”, *Journal of Statistics and Management Systems (JSMS)*, 21:4, 583-591.
- [18.] A. Kumar and M. Sinha (2014), "Overview on vehicular ad hoc network and its security issues," *International Conference on Computing for Sustainable Global Development (INDIACom)*, pp. 792-797. doi: 10.1109/IndiaCom.2014.6828071.
- [19.] Pankaj Dadheech, Ankit Kumar, Chothmal Choudhary, Mahender Kumar Beniwal, Sanwta Ram Dogiwal & Basant Agarwal (2019), “An Enhanced 4-Way Technique Using Cookies for Robust Authentication Process in Wireless Network”, *Journal of Statistics and Management Systems*, 22:4, 773-782, DOI: 10.1080/09720510.2019.1609557.
- [20.] Ankit Kumar, Pankaj Dadheech, Vijander Singh, Linesh Raja & Ramesh C. Poonia (2019), “An Enhanced Quantum Key Distribution Protocol for Security Authentication”, *Journal of Discrete Mathematical Sciences and Cryptography*, 22:4, 499-507, DOI: 10.1080/09720529.2019.1637154.
- [21.] Mahrishi, M., Hiran, K. K., Meena, G., & Sharma, P. (2020). *Machine Learning and Deep Learning in Real-Time Applications*. IGI Global. <http://doi:10.4018/978-1-7998-3095-5>
- [22.] Ankit Kumar, Pankaj Dadheech, Vijander Singh, Ramesh C. Poonia & Linesh Raja (2019), “An Improved Quantum Key Distribution Protocol for Verification”, *Journal of Discrete Mathematical Sciences and Cryptography*, 22:4, 491-498, DOI: 10.1080/09720529.2019.1637153.
- [23.] Ankit Kumar and Madhavi Sinha (2019), “Design and analysis of an improved AODV protocol for black hole and flooding attack in vehicular ad-hoc network (VANET)”, *Journal of Discrete Mathematical Sciences and Cryptography*, 22:4, 453-463, DOI: 10.1080/09720529.2019.1637151.
- [24.] Ankit Kumar, Vijayakumar Varadarajan, Abhishek Kumar, Pankaj Dadheech, Surendra Singh Choudhary, V.D. Ambeth Kumar, B.K. Panigrahi, Kalyana C. Veluvolu, “Black hole attack detection in vehicular ad-hoc network using secure AODV routing algorithm”, *Microprocessors and Microsystems*, 2020, 103352, ISSN 0141-9331, <https://doi.org/10.1016/j.micpro.2020.103352>.
- [25.] Ankit Kumar, Linesh Raja, Pankaj Dadheech, Manish Bhardwaj (2020), “A Hybrid Cluster Technique for Improving the Efficiency of Colour Image Segmentation”, *World Review of Entrepreneurship, Management and Sustainable Development*, Nov. 2020, Vol. 16, Issue 6, pp. 665-679, Print ISSN: 1746-0573 Online ISSN: 1746-0581, <https://doi.org/10.1504/WREMSD.2020.111405>.
- [26.] Dadheech P., Goyal D., Srivastava S., Kumar A., Bhardwaj M. (2021) Performance Improvement of Heterogeneous Cluster of Big Data Using Query Optimization and MapReduce. In: Goyal D., Bălaş V.E., Mukherjee A., Hugo C. de Albuquerque V., Gupta A.K. (eds) *Information Management and Machine Intelligence. ICIMMI 2019. Algorithms for Intelligent Systems*. Springer, Singapore, pp 85-100, First Online: 17 September 2020, Print ISBN: 978-981-15-4935-9, Online ISBN: 978-981-15-4936-6. [https://doi.org/10.1007/978-981-15-4936-6\\_9](https://doi.org/10.1007/978-981-15-4936-6_9).

- [27.] A. Kumar, P. Dadheech and U. Chaudhary, (2020), "Energy Conservation in WSN: A Review of Current Techniques," 2020 3rd International Conference on Emerging Technologies in Computer Engineering: Machine Learning and Internet of Things (ICETCE), Jaipur, India, 2020, pp. 1-8, ISSN: 978-1-7281-1683-9, doi: 10.1109/ICETCE48199.2020.9091736.
- [28.] Kumar A., Dadheech P., Beniwal M.K., Agarwal B., Patidar P.K. (2020), A Fuzzy Logic-Based Control System for Detection and Mitigation of Blackhole Attack in Vehicular Ad Hoc Network. In: Chaudhary A., Choudhary C., Gupta M., Lal C., Badal T. (eds) *Microservices in Big Data Analytics*. Springer, Singapore, First Online: 27 November, 2019, pp 163-178, Print ISBN: 978-981-15-0127-2, Online ISBN: 978-981-15-0128-9, DOI [https://doi.org/10.1007/978-981-15-0128-9\\_15](https://doi.org/10.1007/978-981-15-0128-9_15).
- [29.] Pankaj Dadheech, Ankit Kumar, Vijander Singh, Linesh Raja, Ramesh Poonia (2020), A Neural Network-Based Approach for Pest Detection and Control in Modern Agriculture Using Internet of Things. In: Amit Kumar Gupta, Dinesh Goyal, Vijander Singh, Harish Sharma (eds), *Smart Agricultural Services Using Deep Learning, Big Data, and IoT*, October, 2020, pp 1-19, ISBN13: 9781799850038, ISBN10: 179985003X, EISBN13: 9781799850045, DOI: 10.4018/978-1-7998-5003-8.ch001, Publisher IGI Global.
- [30.] Ankit Kumar, Pankaj Dadheech, Vijander Singh, Linesh Raja (2020), "Performance Modeling for Secure Migration Processes of Legacy Systems to the Cloud Computing", In: Tin Thein Thwel, G. R. Sinha (eds), *Data Deduplication Approaches: Concepts, Strategies and Challenges*, Chapter-13, pp. 255~280, ISBN: 978-0-12-823395-5, DOI: <https://doi.org/10.1016/B978-0-12-823395-5.00003-3>, Publisher Elsevier.