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# Encoding Audio with DWT-Base64 for QR Code Embedded Secure Transmission

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**ABSTRACT**

Quick Response (QR) code is one type of barcode that is two-dimensional, and it is in the form of matrix code. QR code has many advantages over the one-dimensional bar code. The QR Code is prepared to be watermarked via a robust audio watermarking scheme. This research paper provides information about data hiding, audio compression, extraction data from QR code and study about the different techniques of that. Several techniques are used for data hiding and audio compression. In this separate encoder and decoder are prepared. Also, quality of the audio signal will be improved using various algorithms in this research paper. The text embedding in the QR code is complex task because embedded result should be decodable by standard decoding applications and can be applied to any audio with full area coverage.

**Keywords**

QR code, Audio; Discrete wavelet transform (DCT); Discrete cosine transform (DWT); Genetic Algorithm (GA); Base-64; zxing.

## INTRODUCTION

Nowadays, Digital watermarking has become one of the recent topics in multimedia signal processing and information security. According to serve less research on audio watermarking has done compared to the image watermarking. Some algorithms of image watermarking can be applied to the audio but there are some issues in that like exploiting HAS been important in audio watermarking while HVS has been used in image watermarking. Also in audio watermarking synchronization of watermark is another challenge. In this research paper QR code is used for audio transmission.

QR code consisting of an array of black and white squares, it's used for storing URLs or other information and reading by the camera on a smart phone. QR code is designed for automotive industry in Japan in the year of 1994. In QR code information is encoded in both the direction horizontal and vertical direction, thus holding up to several hundred times more data than the traditional barcode. QR code holds considerably more information than a 1D barcode.

QR code uses 4 standardized encoding modes like numeric, alphanumeric, byte/binary and kanji to store data efficiently. QR code has fast readability and greater storage capacity. QR code contains black squares arranged in square grid on white background which can be read by camera and processed using red-Solomon error correction until image can be appropriately interpreted. The required data is then extracted from patents that are present in both horizontal and vertical components of the image.

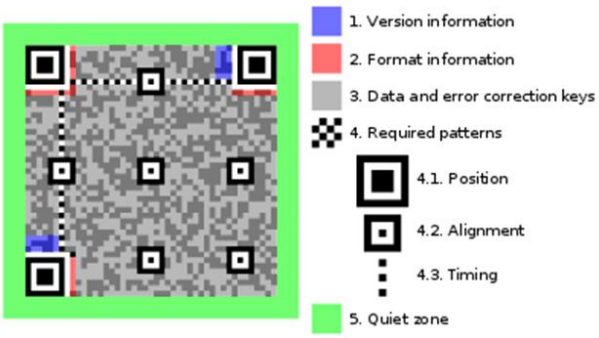


Fig. 1. QR-Code Basic

In QR code symbol the amount of data that can be stored depends on many parameters like data type, Version and error correction level. The correction level L(low) denoted by 40-L and maximum storage capacities occur for version 40.

**RELATED WORK**

ThitapaPoomvichid and PantidaPatirupanusara[1]are applying the QR code technique for introduce a new method for data hiding. By using the method DWT-GA the QR code is prepared and watermark via vigorous audio watermarking scheme. DWT and GA both are the essential mathematical tools for this scheme. To the given audio signal applying the DWT and it map the DWT coefficient and then apply the GA. Also, GA is used for searching optimal position of audio watermarking. Experimental results give inaudibility performance so in future we will try to reduce the noise.

G.Prabakaran , R.Bhavani and M. Ramesh[2] propose a system by using QR code technique that is the video watermarking with text data. By using SVD(singular value decomposition) and DWT(discrete wavelet transform) the QR code is prepared and watermarked via vigorous video watermarking scheme. That watermark gives authorized ownership of video document. For cover I-frame SVD is applied. In logo or watermark the extracted diagonal value is fused. DWT is applied on cover image. Inverse transform is applied on watermark image and added to the frame and then video file sends to authorized person. For the reverse process check the logo and QR code for authorized ownership. In this paper only gray logo with small resolution will be embedded in QR code.

Thach V. Bui , Nguyen K. Vu , Thong T.P. Nguyen , Isao Echizen and Thuc D. Nguyen[3] main contributions is to propose algorithms that hide a secret message into QR code. The secret message is secure against any kind of modification and invisible to attackers. Development of steganography in

QR code raises many problems and also keep the original content of QR code & hiding secret information into it is challenge. So, this paper proposed a scheme based on read-Solomon code to encode secret messages.

SartidVongpradhip and SuppatRungraungsilp[4] are presents that QR Code (Quick Response Code) is insert with invisible watermark by using DCT for a hiding secret information. The QR code image is broken up into various frequency bands using discrete cosine transform. The block DCT based method compression between mid-band coefficients and embed information into middle frequency bands. By using JPEG quantization table, we get quantized coefficient. In that QR code image is used as cover image and it is used for embedding and extracting the watermark text.

Yang-Wai Chow, Willy Susilo, Joseph Tonien, and Wei Zong present an approach that use hybrid DWT-DCT technique with the error correction mechanism. The beauty of QR code is that it can be correctly decoded even if the watermark image is distorted. Using the error correction mechanism watermark image can potentially be decoded even if the image was distorted.

## DIFFERENT METHODOLOGIES

### A. Discrete wavelets transform (DWT)

In digital image processing the wavelet transform is frequently used. Wavelet transform is based on waves of varying frequency with time duration. To embed inaudible watermark signal in digital audio the DWT technique is used because it works in frequency domain, so it takes the ascendancy of masking characteristic of human auditory system (HAS). For converting audio signal in time domain to frequency domain we need to enable watermark system so for that embed it into perceptually significant components. In this technique first the input signal is converted to frequency domain where the watermark is embedded then the resulting signal goes through inverse frequency domain to get watermark signal. This will provide a high level of robustness to the system.

### B. Discrete cosines transform (DCT)

DCT indicates data in the form of frequency space not in amplitude space. DCT gives robust watermarking techniques. DCT is composed of three frequency band: higher frequency band, Lower frequency band and middle frequency band. DCT technique embedding the data into middle frequency coefficient so that data can be more secure compared to other techniques.

### C. Genetic algorithm

To find the global minimum or maximum solutions for problems the search technique genetic algorithm is used. For optimization GA is the most widely used artificial intelligent technique. To obtain a good solution in optimal localization and intensity of audio watermark the genetic algorithm is successfully applied. Usually, the GA starts with some randomly selected genes as the first generation, called population. Each individual in the population corresponding to a solution in the

problem domain is called chromosome. An objective, called fitness function, is used to evaluate the quality of each chromosome. The chromosomes of high quality will survive and form a new population of the next generation. By using the three operators: selection crossover, and mutation, we recombine a new generation to find the best solution. In order to apply the GA for embedding audio watermarking into the DWT the chromosomes are used to adjust position values of audio watermarking on DWT.

**D. Base-64**

TABLE I. BASE-64 VALUES

| Value | Char | Value | Char | Value | Char | Value | Char |
|---|---|---|---|---|---|---|---|
| 0 | A | 16 | Q | 32 | g | 48 | w |
| 1 | B | 17 | R | 33 | h | 49 | x |
| 2 | C | 18 | S | 34 | i | 50 | y |
| 3 | D | 19 | T | 35 | j | 51 | z |
| 4 | E | 20 | U | 36 | k | 52 | 0 |
| 5 | F | 21 | V | 37 | l | 53 | 1 |
| 6 | G | 22 | W | 38 | m | 54 | 2 |
| 7 | H | 23 | X | 39 | n | 55 | 3 |
| 8 | I | 24 | Y | 40 | o | 56 | 4 |
| 9 | J | 25 | Z | 41 | p | 57 | 5 |
| 10 | K | 26 | a | 42 | q | 58 | 6 |
| 11 | L | 27 | b | 43 | r | 59 | 7 |
| 12 | M | 28 | c | 44 | s | 60 | 8 |
| 13 | N | 29 | d | 45 | t | 61 | 9 |
| 14 | O | 30 | e | 46 | u | 62 | + |
| 15 | P | 31 | f | 47 | v | 63 | / |

**PROPOSED SYSTEM**

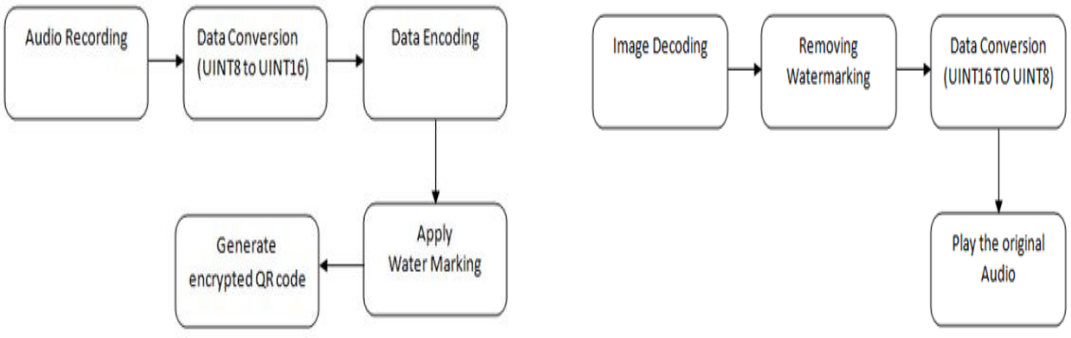


Fig. 2. Encoder-Decode block diagram.

**Encode Algorithm:**

Step 1: Recording Audio or Use .Wav File of 5Sec.

Step 2: Data Converted into Unit8 to Ubit16 Format.

Step 3: Encoding Data Using Genetic or Base-64.

Step 4: Apply Watermarking Using DWT or DCT.

Step 5: Generate Audio Embedded QR-code.

**Decode Algorithm:**

Step 1: Decode QR-Code image Using Genetic or Base-64.

Step 2: Removing Watermark Using DWT or DCT.

Step 3: Convert Extracted data into Unit8 type.

Step 4: Play the recover audio on the player.

**RESULTS AND ANALYSIS**

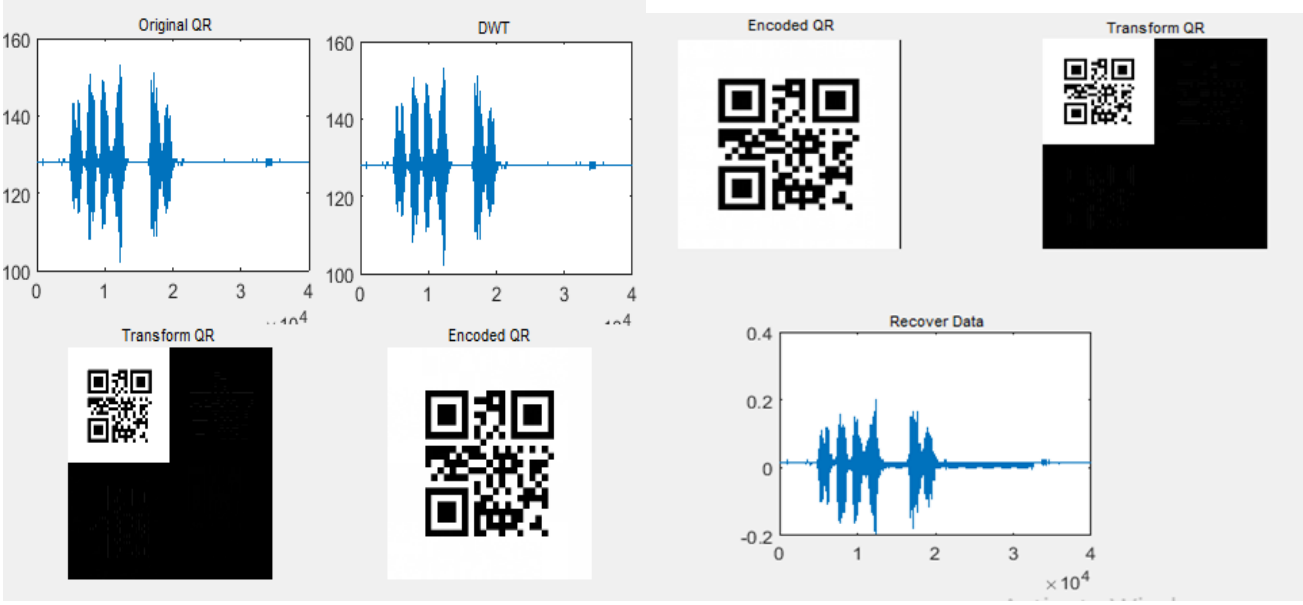


Fig. 3. Using DWT-Genetic in Encoder-Decode

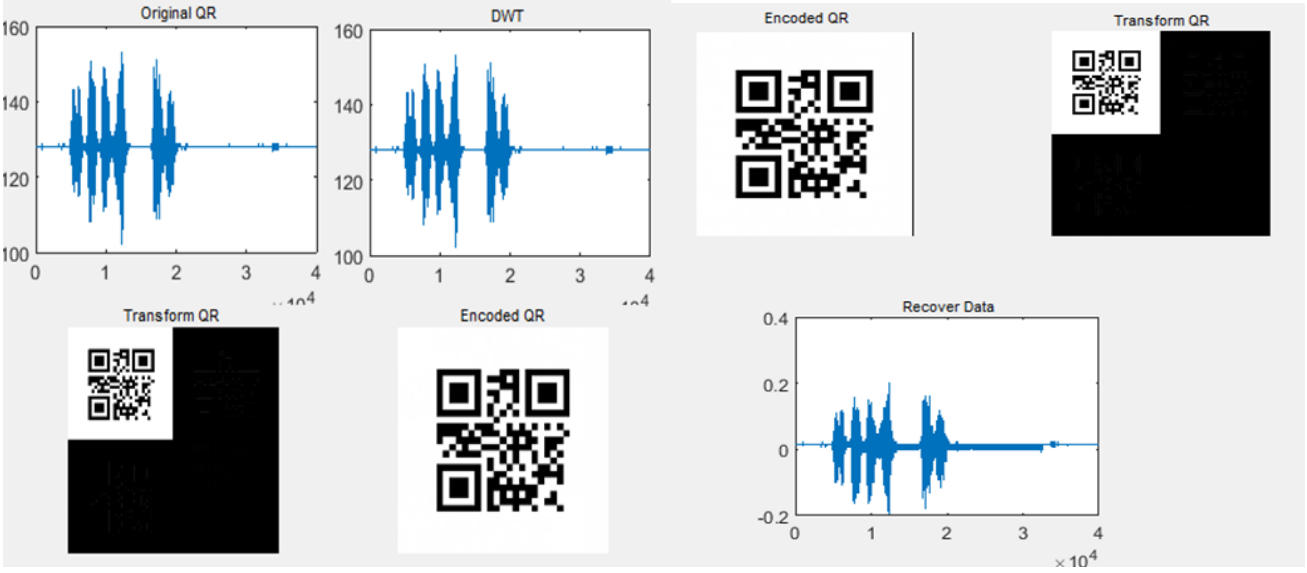


Fig. 4. Using DWT-Base 64 in Encoder-Decode

TABLE II. BASE-64 VALUES

| Technique | Encode Time | Decode Time | SNR |
|---|---|---|---|

| | | | |
|---|---|---|---|
| DWT-GA | 5.789 | 2.650 | 48.34 |
| DWT-Base64 | 5.410 | 2.612 | 48.50 |
| DCT-GA | 5.532 | 2.705 | 48.00 |
| DCT-Base64 | 5.323 | 2.704 | 48.17 |

## CONCLUSION

This paper provides the different methods for data hiding, audio compression, and extraction data from QR code. In this paper separate encoder and decoder are prepared and different techniques are applied on audio signal to compress the audio and then QR code is prepared. So, using the above results we conclude that among all results the DWT-Base 64 technique is better because it gives high SNR and also time parameter is decreases. Also, Robustness and quality of audio signal is maintained. In the future hybrid algorithms can be use and achieve batter results.

## REFERENCES

[1] ThitapaPoomvichid, PantidaPatirupanusara and Mahasak Ketcham ,"The QR Code for Audio Watermarking using genetic algorithm", International Conference on Machine Learning and Computer Science (IMLCS'2012) August 11-12, 2012 Phuket (Thailand).

[2] Min-Jen Tsai & Chin-Yu Hsieh, "The visual color QR code algorithm (DWT-QR) based on wavelet transform and human vision system", National Chiao Tung University, Institute of Information Management, Springer Science+Business Media, LLC, part of Springer january 2019.

[3] Aniruddha Kanhe andAghila Gnanasekaran, "Robustimage-in-audiowatermarkingtechniquebasedonDCT-SVDtransform" , Kanhe and Gnanasekaran EURASIP Journal on Audio, Speech, and Music Processing, springer 2018

[4] Gelar Budiman, Andriyan B. Suksmono, Donny Danudirdjo, SyarahbilPawellang , "QIM-based Audio Watermarking with Combined Techniques of SWT-DST-QR-CPT Using SS-based Synchronization" , 6th International Conference on Information and Communication Technology (ICoICT), IEEE-2018.

[5] G.Prabakaran , R.Bhavani and M. Ramesh," A Robust QR- Code Video Watermarking Scheme Based On SVD and DWT Composite Domain", Proceedings of the 2013 International Conference on Pattern Recognition, Informatics and Mobile Engineering (PRIME) February 21-22.

[6] Thach V. Bui , Nguyen K. Vu , Thong T.P. Nguyen , Isao Echizen and Thuc D. Nguyen , "Robust Message Hiding for QR Code" , 2014 Tenth International Conference on Intelligent Information Hiding and Multimedia Signal Processing.

[7] SartidVongpradhip and SuppatRungraungsilp , "QR Code Using Invisible Watermarking in Frequency Domain" , 2011 Ninth International Conference on ICT and Knowledge Engineering.

[8] Nancy Victor , "Enhancing the Data Capacity of QR Codes by Compressing the Data before

Generation" , International Journal of Computer Applications (0975 – 8887) Volume 60– No.2, December 2012.

[9] Pooja Guwalani , Rohit Chandrashekar , Maya Kala , Jayashree Shinde and Dashrath Mane , "Image File Security using Base-64 Algorithm" , IJCTA Pooja Guwalani et al, Int.J.Computer Technology &Applications,Vol 5 (6),1892-1895.

[10] Dipesh Rawat , Ravindra Sahu and Yashila Puthran , "Optimizing the Capacity of QR Code To Store Encrypted Image" , International Journal of Emerging Trends in Engineering Research (IJETER), Vol. 3 No.1, Pages : 01 – 04 (2015).

[11] Pei-Yu Lin , Yi-Hui Chen , Eric Jui-Lin Lu and Ping-Jung Chen , "Secret Hiding Mechanism Using QR Barcode" , 2013 International Conference on Signal-Image Technology & Internet-Based Systems.

[12] Congfu Xu , yafangchen and Kevin chiew ," An Approach to Image Spam Filtering Based on Base64 Encoding and N-Gram Feature Extraction" , 2010 22nd International Conference on Tools with Artificial Intelligence.

[13] Jiwu Huang , Yong Wang and Yun Q. Shi , "A Blind Audio Watermarking Algorithm With Self-Synchronization" , IEEE conference circuits and system,2002. ISCAS 2002. IEEE international symposium on , volume 3.

[14] Delphin Raj K. M and Nancy Victor , "Secure QR Coding of Images Using the Techniques of Encoding and Encryption ", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 9, Number 12 (2014) pp. 2009-2017.