

# Pattern Image Technique for Data Hiding via Message Bits Stream

B.Thenmozhi<sup>1</sup>, J.Santhosh<sup>2</sup> and A.R.Surendheran<sup>3</sup>

<sup>1</sup>(Department of Computer Science, K.S.R.College of Engineering

Email: thenmozhib93@gmail.com)

<sup>2</sup>(Assistant Professor, Department of Computer Science, K.S.R College of Engineering

Email: j.santhoshme@gmail.com)

<sup>3</sup>(Assistant Professor, Department of Computer Science, K.S.R College of Engineering

Email: surenderan26@gmail.com)

**Abstract:** Many types of multimedia can be used to conduct pervasive communication, like advertisements, posters, videos, images, audios etc. Messages may be embedded into such multimedia by data hiding techniques, resulting in the so-called Message-rich multimedia. In this study a new technique is proposed for creating a new type of Message-rich multimedia, called Message-rich video, via which people can exchange information without transmitting directly digital files such as videos and images. With its task related to that of a QR code, such a type of image is produced by encoding the message into a binary bit stream, representing the bits by binary code patterns of  $2 \times 2$  blocks, and injecting the patterns into the target frame by a novel image-block luminance modulation scheme. Message can be embedded in frame of video and extracted by display-and-imaging fashion techniques. For message embedding, the use of diagonal circular signals in the frequency domain is proposed, by which a 2-bit signal can be embedded in each video frame. For message extraction, a signal detection method based on the technique of moment-preserving thresholding using certain specially-designed masks is proposed. A message synchronization mechanism is also proposed to guarantee correct message extraction is also proposed. The feasibility of the proposed method is demonstrated by theoretical analyses and good experimental results.

**Keywords** – Frame Conversion from video, Pattern Image Creation, Block luminance modulation, Message-rich-video, Image preprocessing, Binarization.

## I.INTRODUCTION

MESSAGE-RICH-ART is art that communicates its uniqueness to context-aware devices, where art includes all forms of inventive communication. Various types of identities presented in the human environment can be used as message-rich-art carriers, such as digital media, pictorial objects, and artwork. In recording human visual perception consequences, the image/video identity has more imaginative effects than other types of identities. In this paper, we define message-rich-art video as the type of message-rich art with its identity being an video which can be not only any digital file, but also any real object, such as posters, illustrations, pictorial objects, and labels. Message-rich-art video can help people to perform ubiquitous computing; they can substitute information via such videos existing in the environment everywhere and anytime. Two frequent techniques for Message-rich-art communication are the use of data hiding and barcodes technique. Barcodes, which are usually close to objects for different identification purposes, face recognition and verification, spoofing, fingerprint verification, represent machine-readable data by patterns of lines, rectangles, dots. For example, Fig. 1 shows some commonly used barcodes, 2-D barcode, QR code and data matrix code. The information encoded into such barcodes can be extracted using barcode-reading techniques. Proposed an image-processing framework for 2-D barcode reading, which includes four main phases: 1) region-of-interest detection; 2) code localization; 3) code segmentation; and 4) decoding; proposed a real-time barcode localization method as a two-stage process, which segments first the barcode shape in a low-resolution image by region-based analysis, and then extracts the barcode meaning from the image of the original resolution proposed another accurate barcode localization method using some prior knowledge of the barcode shape to detect corners initially, followed by more accurate corner localization. Proposed an adaptive thresholding technique for binarizing barcode images by constructing a dynamic search window centered at the edge pixel nearest to each pixel to be binarized.

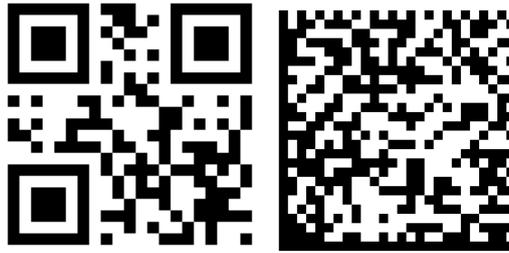


Figure 1.Examples of commonly used barcodes  
(a) QR code. (b) Data matrix code.

In addition to the use of barcodes, data hiding is an alternative signal-rich-art communication technique that embeds data into cover media for applications like covert communication, copyright protection, authentication, and so on. With the advance of computer technology, many data hiding methods have been applied on digital cover media, such as images, videos, audios, text documents. However, these data-hiding methods transfer data via digital files only. Furthermore, they are mostly insufficient to enable the Message-rich-art effect when one wants to interact with the surrounding environment. Such methods may be called digital data hiding. Another type of data hiding, which may be called hardcopy data hiding, can embed information into the so-called image barcodes by using halftone techniques. These barcodes have the visual appearances of other images and the encoded information can be decoded from their hardcopy versions acquired by scanners. That is, the encoded information can survive print-and-scan attacks. Also, the data embedded by Lee and Tsai's method can be extracted from a camera-captured version of the created signal-rich-art character image, whereas those embedded by the use of the aforementioned hardcopy data-hiding methods using image barcodes cannot. The function may be implemented on a mobile device. Each signal-rich-art character image generated by Lee and Tsai contains many small character fragments with undesired visual effects. Also, it requires an optical character recognition scheme to extract the embedded message, which is usually time consuming. Also, the size of each block cannot be too small to keep the resolution in the captured image sufficiently good for correct extraction of the character shapes in the image. To solve these problems, another new type of signal-rich-art image, called signal-rich-art code image, is proposed in this paper. Specifically, instead of transforming the given message to be embedded into a character message image, the message is converted, in the sense of data coding, into a bit stream of codes first, which is then represented by binary pattern blocks, each being composed of  $2 \times 2$  unit blocks. A block luminance modulation method is then applied to each pattern block to yield a signal-rich-art code image with the visual appearance of a preselected target image. The additional merits of the proposed method: 1) the yielded signal-rich-art code image has a much better visual appearance of the target image; 2) the accuracy rate of message extraction from the generated code image is higher; and 3) the message extraction speed is higher; 4) In the propose method to detect noise, blur and luminance from the frames of videos.

## II. IDEA OF PROPOSED METHOD

Proposed a framework for data hiding in videos printed with clustered dot halftones via a pattern orientation modulation technique. However, if one uses a mobile device to capture the frame of a hardcopy of the aforementioned image barcodes, the information might not be decoded successfully, because the captured image will suffer from more types of distortions than those acquired by scanning, such as perspective deformation, noise addition, blurring, uneven lighting, and so on. Proposed a new type of message-rich-art video, which is called signal-rich-art character image here. Specifically, a signal-rich-art character image is created from a target image used as a carrier of a given message by fragmenting the shapes of the composing characters of the message and injecting the resulting character fragments randomly into the target image by a block luminance modulation scheme. Each signal-rich-art character image so created has the visual appearance of the corresponding preselected target image while conventional barcodes do not. The main goal is to propose appropriate data hiding techniques to create various type of message-rich multimedia for pervasive communication. Fulfillment of this goal will be expected to enhance the state-of-art studies on data hiding techniques, yielding new visions of pervasive communication and further steps of extending its applications. We design a linear data structure for storing message signals and segmenting the sequence of message signals correctly. The structure stores detected patterns and their lengths of continuous segments as signal lines. Several problems encountered in the creation of message-rich videos, including message embedding and extraction, have been solved so that such videos can be applied more easily. For message embedding, the use of diagonal circular signals has been proposed, by

which the system can embed a 2-bit signal in each video frame. A synchronization mechanism by the uses of special signals and certain properties of the video frame rate has been proposed, by which the system can synchronize the message extraction work with the embedded message signals without transmitting any information. For message extraction, a signal detection method by moment-preserving thresholding based on the use of certain specially-designed masks has been proposed, by which the system can detect signals adaptively with a high recognition rate.

### 2.1 Message-rich-art code video generation

The operations of the proposed system include mainly a message-embedding process and a message-extraction process. The message-embedding process can take as input most types of videos which have different resolutions, frame rates, formats, etc. It can generate message-rich videos which can survive the display-and-imaging operation. At the beginning, the system gets the message for embedding as input and retrieves the frame rate of the source video. To achieve signal synchronization in message embedding and extraction, specially-designed signals are added to the original message as initial and ending signals, and the resulting message is transformed into a bit stream of ASCII codes according to the video frame rate. Image is produced by encoding the message into a binary bit stream, representing the bits by binary code patterns of  $2 \times 2$  blocks, and injecting the patterns into the target image by a novel image-block luminance modulation scheme.

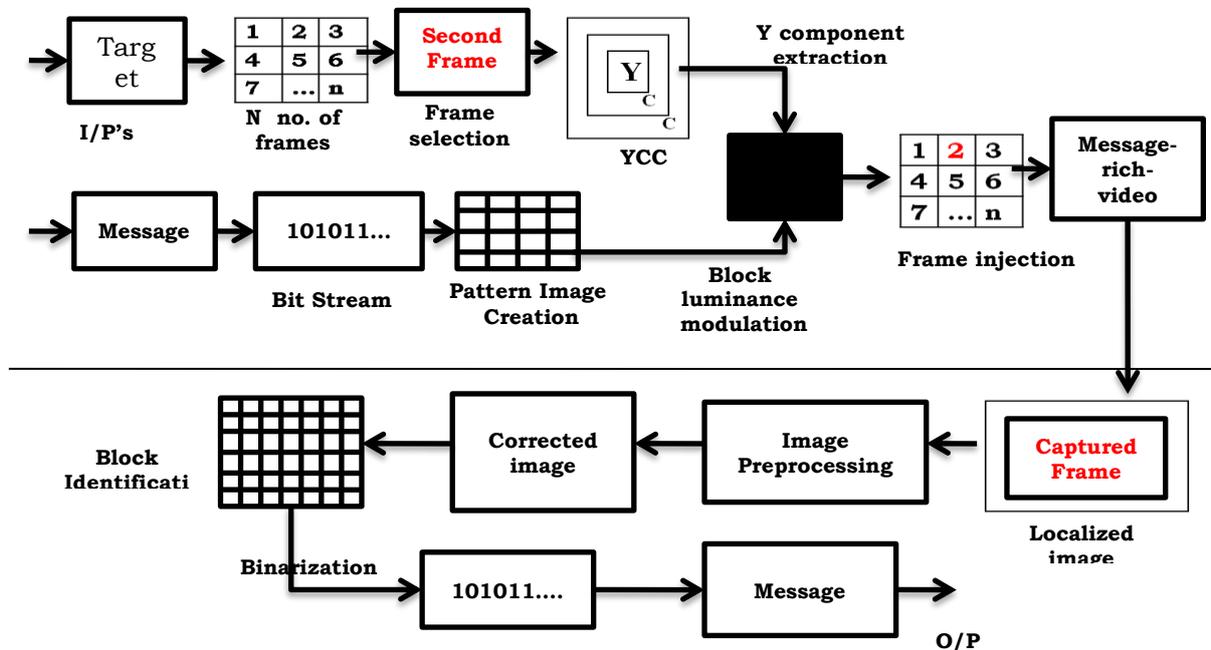


Figure 2. Message Rich Art Code Image Generation

Instead of transforming the given message to be embedded into a character message image, the message is converted, in the sense of data coding, into a bit stream of codes first, which is then represented by binary pattern blocks, each being composed of  $2 \times 2$  unit blocks. A block luminance modulation scheme is then applied to each pattern block to yield a signal-rich-art code image with the visual appearance of a preselected target image. Performing bit expansion scheme on every three message bits to yield eight binary code patterns represented by pattern blocks. A block luminance modulation technique is proposed for use here, which modulates the mean of each pattern block to be the same as that of the corresponding target block. The resulting modulated pattern image so has roughly the visual appearance of the Y-component of the target image. First, the Y-component of the target image is divided into blocks, denoted by, all with the same size as that of the pattern blocks in the pattern image.

### 2.2 Message Extraction

Messages may be embedded into such multimedia by data hiding techniques, resulting in the so-called message-rich multimedia. The hidden message may be extracted. A new technique is proposed for creating a new type of message-rich multimedia, called Message rich video, via which people can exchange information without

transmitting directly digital files such as videos and images. Message can be embedded in such videos and extracted the message can be extracted by a display-and-imaging fashion, i.e., the video with the hidden message is displayed on a screen and a sequence of images of it is acquired with a smart phone, from which the hidden message is extracted finally. In this way, people can exchange messages robustly and possibly secretly without file transmission. Applications of such a new technique include: message transmission, covert communication, information hiding, QR code-like usages, and so on. In Graphics Processing, the spatial transformation consists of a polygon mesh. The transformation is executed by texture mapping from the rectilinear of the input image to the transformed shape of the destination image. Each polygon on the input image is thus applied to an polygon in the output image. Graphics Processing based Image Geometry Correction, may be performed with inexpensive PC-based graphics controllers. Graphics Processing based image geometry correction is very effective. To identify the unit blocks in pattern image. In order to apply linearization and pattern recognition to them, an idea similar to the Hough transform is adopted, which uses the statistics of the pixels' gradient values to guess the number of unit blocks in the horizontal or vertical direction in Pattern image, because those pixels on the splitting lines between the unit blocks usually have larger gradient values. To identify the unit blocks in pattern image. In order to apply linearization and pattern recognition to them, an idea similar to the Hough transform is adopted, which uses the statistics of the pixels gradient values to guess the number of unit blocks in the horizontal or vertical direction in Pattern image, because those pixels on the splitting lines between the unit blocks usually have larger gradient values.

### III. CONCLUSION

We have proposed the use of message-rich video for pervasive communication. Through the designs of hardware and appropriate algorithms, several problems encountered in the creation of message-rich videos, including message embedding and extraction have been solved, so that such videos can be applied more easily. For message embedding, the use of diagonal circular signals has been proposed, by which the system can embed a 2-bit signal in each video frame. A synchronization mechanism by the uses of special signals and certain properties of the video frame rate has been proposed, by which the system can synchronize the message extraction work with the embedded message signals without transmitting any information. For message extraction, a signal detection method by moment-preserving thresholding based on the use of certain specially-designed masks has been proposed, by which the system can detect signals adaptively with a high recognition rate. Furthermore, schemes for speeding up the message extraction process by frame resizing and down-sampling have also been used. In the future, more studies may be directed to improving the proposed method to increase the amount of data which can be embedded in a message-rich video and finding more robust signals for message embedding in videos with less distortion.

### IV. FUTURE WORK

To overcome the interference during message extraction is still an open research area because many types of noise exist in our environment. One possible way may be directed to applying error-correction techniques to the result of code-pattern classification to increase the resulting message extraction rate, such as using Reed–Solomon codes.

### REFERENCES

- [1] Ya-Lin Lee and Wen-Hsiang Tsai, "A New Data Transfer Method via Signal- Rich- Art Code Images Captured by Mobile Devices", *IEEE Trans.on. cirs and sys.for video.tech*, vol.25, no.4, April. 2015.
- [2] Abhijith Punnappurath, Ambasamudram Narayanan Rajagopalan, Sima Taheri, Rama Chellappa and Guna Seetharaman, "Face Recognition across Non-Uniform Motion Blur, Illumination, and Pose", *IEEE Trans. Image Process*, vol.24, no.7, July. 2015.
- [3] O. Bulan, G. Sharma, and V. Monga, "Orientation modulation for data hiding in clustered-dot halftone prints," *IEEE Trans. Image Process.*, vol. 19, no. 8, pp. 2070–2084, Aug. 2010.
- [4] N. Damera-Venkata, J. Yen, V. Monga, and B. L. Evans, "Hardcopy image barcodes via block-error diffusion," *IEEE Trans. Image Process.*, vol. 14, no. 12, pp. 1977–1989, Dec. 2005.
- [5] G.Doërr and J.-L. Dugelay, "A guide tour of video watermarking," *Signal Process., Image Commun.*, vol. 18, no. 4, pp. 263–282, 2003.
- [6] R. L. Legendijk, G. C. Langelaar, and I. Setyawan, "Watermarking digital image and video data. A state-of-the-art overview," *IEEE Signal Process. Mag.*, vol. 17, no. 5, pp. 20-46, Sep. 2000.

- [7] W.Lie and L.-C. Chang, "Robust and high-quality time-domain audio watermarking based on low-frequency amplitude modification," *IEEE Trans. Multimedia*, vol. 8, no. 1, pp. 46–59, Feb. 2006.
- [8] Y.L. Lee and W.-H. Tsai, "Signal rich art image- A new tool for automatic identification and data capture applications using mobile phones," in *Proc. IEEE Int. Conf. Acoust. Speech Signal Process.*, pp. 1942–1946., May 2013. 39
- [9] Orhan Bulan and Gaurav Sharma ,” High Capacity Color Barcodes:Per Channel Data Encoding via Orientation Modulation in Elliptical Dot Arrays”, *IEEE Trans. Image Processing*, vol.20, no.5, May . 2011.
- [10] Z.Wang, C. Bovik, H. R. Sheikh, and E. P. Simoncelli, "Image Quality assessment: From error visibility to structural similarity," *IEEE Trans. Image Process*, vol.13, no.4, April. 2004.
- [11] H. Yang, A. C. Kot, and X. Jiang, "Binarization of low-quality barcode images captured by mobile phones using local window of adaptive location and size," *IEEE Trans. Image Process*, vol.21, no.1, Jan. 2012.
- [12] H. Yang, A. C. Kot, and X. Jiang, "Accurate localization of four Extreme corners for barcode images captured by mobile phones," in *Proc. IEEE Int. Conf. Image Process*, Sep. 2010.