Method for Coding Images with Shape and Detail Information

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Abstract— **In this paper, a new method for coding image data together with its shape and other details as a two dimensional barcode is presented. The method stores the shape details together with the color information of a product which is very useful for representing to a user. The proposed method enables the encoding of an image with its shape, size, name and other details of the product in a most compact way. Also, the method enables decoding of the information to get the detailed information without using internet.**

Index Terms— **Image Coding, Barcode, Image Decoding.**

I. INTRODUCTION

Technology is advanced to a higher level and communication becomes so easy with the latest mobile and handheld devices. Such a life style demands all the tasks to be done quickly, easily and efficiently. Internet is in the forefront for getting all kinds of information about anything. People use it to search for details about a product or a place or any service. This process will consume more time and has become tedious with the busy life today. Apart from this the information we get from this will not be real time and may be an outdated one.

Organizations and companies use various methods as a way to market their products or services [1-4]. They will put advertisements about their new product or service with its qualities and attributes emphasized in a very good and attracted way. Printed media are the first one and later tried online media also to do the same in a much better way. But today, mobile devices are changing the scenario and making our lives very simple and useful by reducing the time spent in all the activities. There exist various methods for identifying and recognizing products in the market [5, 6]. There are serial numbers and generally barcodes for identifying and recognizing the item with its other attributes [7, 8]. The information in these kinds of codes is very less and primitive. Nowadays there are some two dimensional barcodes which stores some text information as well as some links which give information about the product [9-11]. Information got from the existing two dimensional codes are also very less and it cannot represent. Information got from the existing two dimensional codes are also very less and it cannot represent the product as such. To get more information from it we need to access the link which is coded. For that we need Internet access without knowing the relevance and exact requirement of the product. Thus, there exists a need for a mechanism where a user gets more details from the code given without accessing the Internet.

The present paper provides a method to recognize the information related to the product by getting the shape, color and other related information from the code. By this, user gets all the related information without accessing the Internet and without any time delay. This method enables the recognition of information, where the images are captured using their mobile devices. The mobile device includes a capturing device, expandable memory and digital signal processor for processing the images. In another aspect, the present paper provides a method for encoding and decoding detailed information of a product.

In a preferred embodiment of the method, the present paper provides a new encoding and decoding standard for embedding shape and color features together with other details of an image which represents a product without the use of Internet.

II. THE PROPOSED TECHNIQUE METHODOLOGY

Figure 1 shows the overall flow of the method. This technique is mainly into coding the shape and color features of images along with its text data into binary codes. The method includes the step of capturing a code using any image capturing device. The image capturing device can be any mobile or handheld device which has some storage space and processing unit in it. Once the system gets the code which is denoised and segmented, the decoding procedure has to be applied on to it. Here denoising means removing the noises happened during the image capturing time. A modified version of masking filter is used to get deblurred and sharpened image. While capturing the code some other parts also come in the image, so segmentation is to be done to get the correct code area. Region selection for the decoding is done based on the focused area and shape of the code area.

In the decoding procedure the standards used for pattern and further the various algorithms used are extracted. The standards and the algorithms used are explained in the further figures. Once the second step is done, get the shape and color features from it as in the next step. Information of algorithms used for constructing and coding the features are understood from the second step itself. A final step is to represent the image with all these features (that is shape and color) and show it on the display device of the mobile or handheld device.

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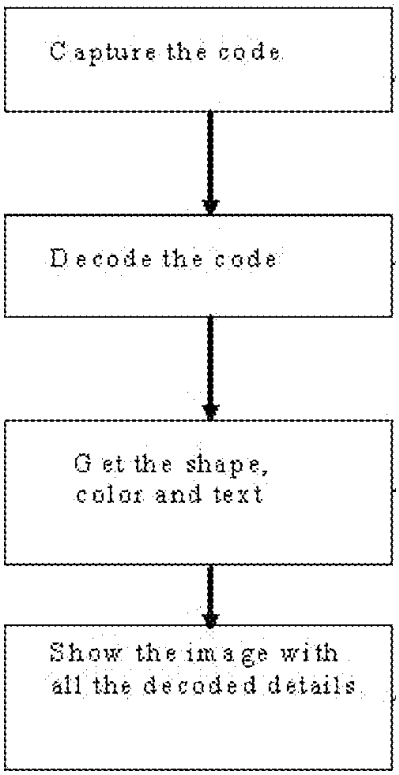

Fig. 1 The overall flow of the system and the various components in the system.

FIG. 2 illustrates the procedure of encoding data. First identify the data to be encoded, which contains the image together with its text and other related data. In the next step, construct the features which represent the shape of the image, and get the color features for the representative colors of the image. Then, these features are represented using descriptors which are constructed using a hybrid technique which involves Fourier and scale invariant methods. The descriptor selection is done so that its reconstruction rate is high and the dimensionality reduction techniques are applied to it efficiently. This is done by changing them into sparse matrix representation. The descriptors which represent these data are now encoded using high compressive rated codes as in the next step. The advanced coding technique used here uses the concepts of compressive sensing. The next step uses an advanced error correction code which is a modified version of Reed Solomon (RS) codes which has high correcting power. RS code has a limitation for error correction. In the new method, error correction capability is high by modifying the existing technique using compressive sensing methods. So now it is ready with all the codes to represent the data. It's time to create the pattern based on this data as in the last step.

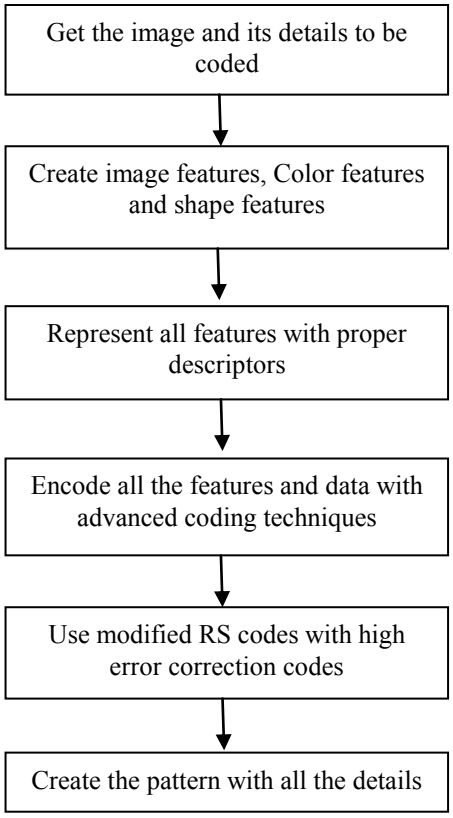

Fig. 2 The flow diagram for the encoding process according to one embodiment of the method of the paper.

Figure 3 illustrates the steps for creating the pattern with all details. In the creation of the pattern first thing is the defining of standards for the correct placing of data to make it generic. The way in arranging these details in the code is a modified version because it contains the fields for the algorithms used for coding. The algorithms which are used for extracting the features, descriptors which are used for representing features, size and type of data are to be defined. This is helpful at the time of decoding. When this becomes generic and predefined, the decoding process can search these areas for which algorithms have to be used on what type of data, etc. Get the data which are to be added to the pattern in the next step. Make it appropriate with the standard defined for the pattern. Construct the pattern based on the standards defined along with the data provided in the third step and finally send the pattern created to the system.

Figure 4 illustrates the decoding procedure for the system. Decoding system including a mobile then he mobile device can be any image capturing device with a good camera, storage capacity and a processing unit. Capture the image where the pattern is printed in the step. Definitely the image captured will contain extra contents other than the pattern. And also there might occur many kinds of noises to the image, such as blur, some distortion, etc. These noises have to be removed and only the pattern has to be taken in the third step for decoding.

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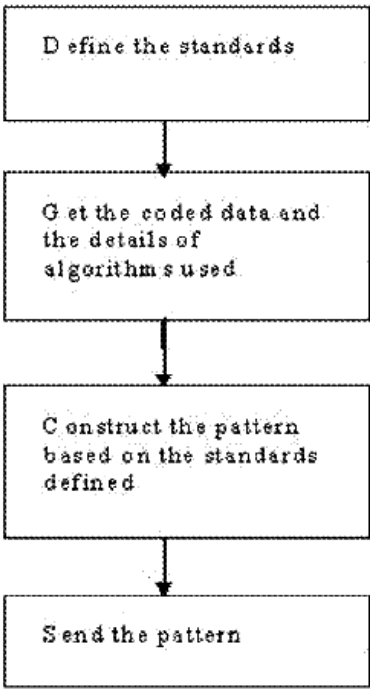

Fig. 3 The flow diagram for creating the pattern with the data encoded.

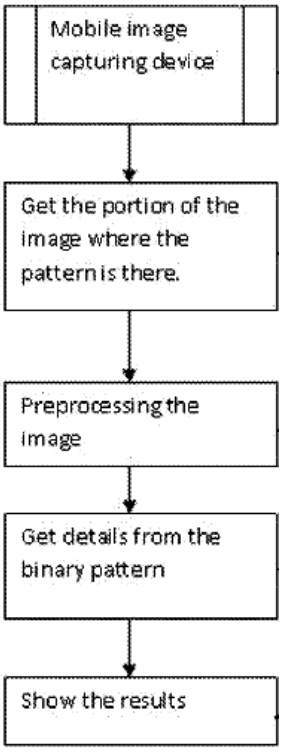

Fig. 4 The flow of the overall decoding process.

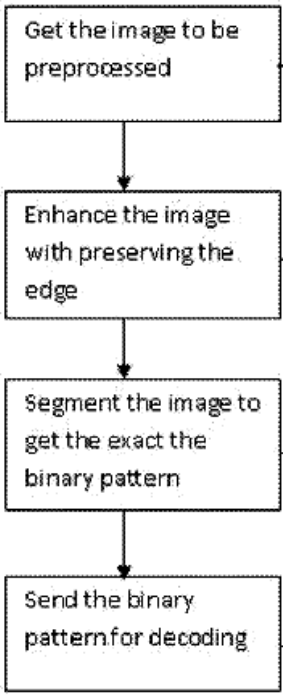

Fig. 5 The preprocessing steps to be applied in the decoding process.

Figure 5 illustrates the preprocessing procedure. Get the portion of the image which contains the pattern in the first step. Apply denoising and enhancement techniques while preserving its strong edge details. In the denoising, deblurring and enhancement techniques are applied. Segment the image for getting the exact pattern from the image in the third step. And finally, send this pattern extracted for the decoding process.

Figure 6 illustrates about the various methods used for extracting data from the pattern. It starts with getting the preprocessed and segmented pattern, then detect the locations for the standards defined for the start of the pattern, end of pattern. From the standards, in the third step, get the information of the algorithms used for the feature extraction, descriptor creation and error correction coding.

From pattern standard get the type and size of the data and get the descriptors for the shape and color features. The text data which are encoded are also extracted in this step. Represent the image with the shape features and color features in the descriptor as in the last step. Finally, show the image with its shape and color information together with its text and other data to the display system.

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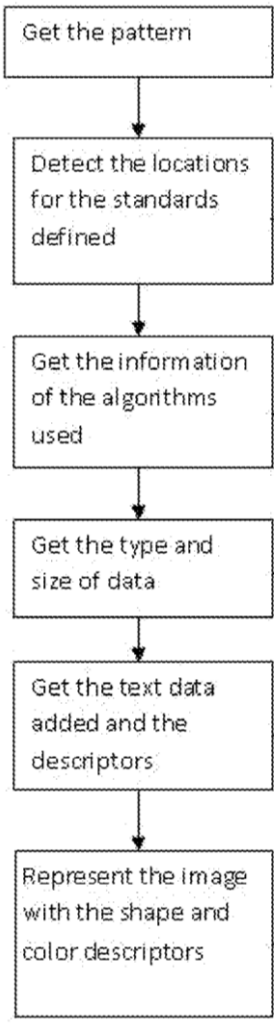

Fig. 6 The logical diagram about how the data is extracted from the pattern.

III. CONCLUSION

In this paper, a new method for coding image data together with its shape and other details as a two dimensional barcode is has been presented where it stores the shape details together with the color information of a product. This is very useful for representing to a user. The proposed method has enabled the encoding of an image with its shape, size, name and other details of the product in a most compact way. Also, the method has enabled decoding of the information to get the detailed information without using internet.

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