



## Comparison image color-reduction methods based on FCM, K-Means and SOM to fabric printing

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### Abstract:

Fabric printing consists of three main steps: Design preparation, Screen making and Printing on fabric. In the preparation step the quantity of every color indicates one screen to be executed; this means that one image could not be ready for printing with thousands of colors because this industry is facing limitations for selecting the color quantity on the fabric therefore color Reduction is known as one of the major parameters in this industry which is generally done by hand (in manual mode). It has been tried in this article to identify and investigate the most optimum method of fabric printing by comparing suitable methods of image color Reduction based on FCM, K-Means, SOM. Results shows that FCM methods has more acceptable result than two others.

**Keywords:** Color reduction- FCM- K-Means- SOM- Fabric printing.

### 1. Introduction

Color reduction is the process of decreasing the quantity of separated colors used in an image and presenting a new image using limited colors. The produced image should visually have the most similarity to the initial one. The main purpose of color decreasing in the industry of fabric printing is making a design applicable for printing.

### 2. Theoretical methods of color reduction by computer

Color reduction methods can be classified in to group: manual methods and automatic methods. The manual methods can be done in graphic environments including soft wares EAT, NET GRAPHIC, PHOTOSHOP and BOORIA. In these software's or similar ones the steps of color reduction is done manually and with the taste and prefer of designer. It also needs plenty of time and has a high error coefficient because of performing all steps by operator; hence, approaching automatic methods based on available standards of textile industry is of importance. The automatic methods have several advantages in comparison with manual methods whose most important ones are time saving and also decreasing error coefficient; these methods include color reduction by algorithm k-means, FCM, SOM that all these methods act by the means of a precise and described algorithm for the computer and each has an exclusive properties.

#### **K-means algorithm**

Clustering or cluster analysis is a branch of data analysis which assigns the data to a number of predetermined clusters using common data features and no need of the default data. Cluster is a set of objects which are similar, and dissimilar to other

objects. Different factors can be considered for similarity, one of which is a distance factor that can be used for clustering. Then, the closer objects regard as one cluster. This clustering is also called clustering based on distance. K means algorithm is one of the most useful clustering algorithms. K means algorithm is defined as following [1, 2]:

Step 1: select K data as a center of the cluster.

Step 2: determine the distance of other data to the cluster centers.

Step 3: place the data in the cluster which is closer to any cluster.

Step 4: calculate each mean cluster as a new cluster center.

Step 5: repeat steps 2 to 4 to get the stable state in clusters.

#### **SOM (Self Organization Map)**

In self organized network the competitive method is used for teaching and it has developed based on special properties of human brain. The cellules of human brain in different areas are organized in such a way that in different sensational areas are presented with sorted and meaningful calculating maps [3].

The competitive learnings applied in such networks are like this that in each learning step, units compete each other for being activated; at the end of one learning step only

One unit succeeds and its weighs are changed in relation to the weighs of other units in a different manner. This type of learning is called without-supervision learning.

#### **FCM (Fuzzy C-Means)**



In this algorithm the relationship between elements can be investigated from a subjective view point. This idea is sourced from where that in data classification some data tended to multi-cluster and it was not possible to put them in one cluster.

As regards the abilities of any introduced algorithm, image color reduction is done and investigated over one unit image that color reduction in the first image by K-means algorithm, the second image by SOM and in the third image by FCM is done which is shown hereafter.

### 3- Results and discussion

For investigating the efficiency of algorithms of color reduction, 10 images used in bed-sheet printing were selected then the images were color reduction by K-means, SOM and FCM and. Next ask three professionals two color reduction the samples manually. Then the methods results are compared to manual color reduction as resourced. The comparing outcome indicate that the SOM method gives more desirable results than two other. The example of a color reduction of two images by the methods are shown in the (Fig. 1)

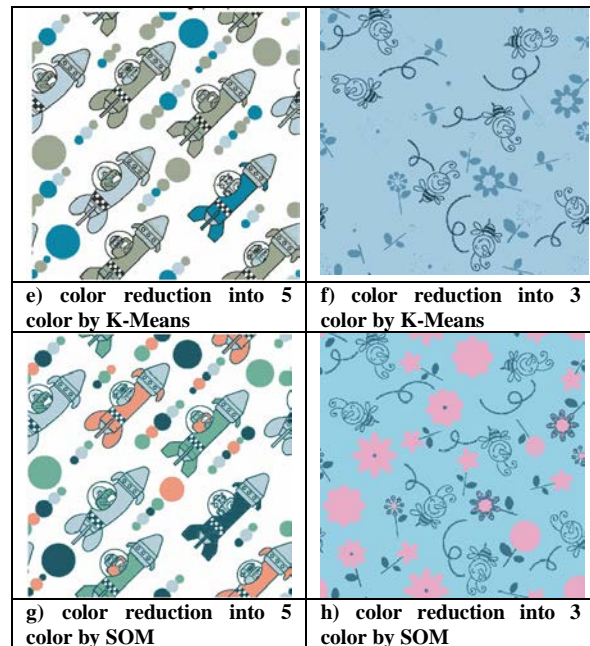
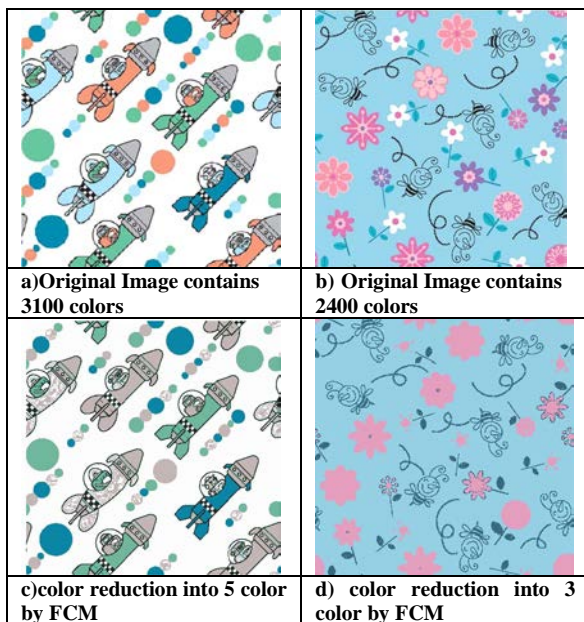


Fig. 1.) a,b )original image c,d) color reduction by FCM e,f) color reduction by k-means g,h)color reduction by SOM



### 4. Conclusion

In this survey three methods of color reduction K-means, SOM and FCM were compared and the results arisen from the pollster indicates the efficiency of SOM in comparison with the other methods.

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