Ain Shams University

Faculty of Engineering

4th Mechatronics Dept.

Digital Image Processing [CSE 468]

Project Submission

X-Ohm Team

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Contents

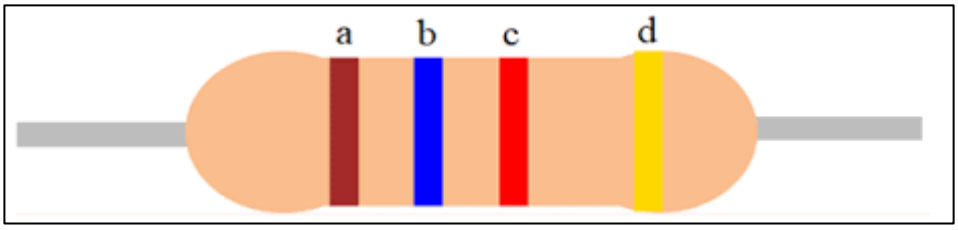
Objective

Detection of values of Resistors based on colors

Introduction

- Colorbands are commonly used (especially on resistors) because they are easily printed on tiny components, decreasing manufacturing costs.

- we propose a real-time color recognition method to automatically evaluate the resistance value of a resistor from video frames captured by camera . Resistor is a passive electronic component used frequently in electronic circuits to limit the electric current. It is a tiny component which makes it difficult to print resistance values on it. To solve this issue, the resistor color coding system is used to indicate the resistive value and the tolerance. More specifically, the resistors generally contain four or five different color bands around them, which are printed on a carbon or metal film, to specify their resistive values and tolerances. Note that twelve different colors are used as codes and each color band indicates a decimal value associated with it. Fig. 1 shows the resistor color coding system. In the 4-band resistor example, the resistance value is 270 ohms ±5%. The resistance value for this example is found by the following rule: the first and the second color bands (red and violet) together generate a two digit number (27), the third band (brown), which is a multiplier, is multiplied with the two digit number (27 × 101 ohms (Ω)) to obtain the resistance value of the resistor, and the fourth color band (gold) shows the tolerance (±5%). In the 5-band resistor, the four color bands on the left side (brown, black, black, orange, in this sequence) are grouped together to represent the resistance value of a resistor (100 × 103 Ω) and the fifth color band (brown) on the right side indicates the tolerance of the resistor (±1%). It is obvious that reading the resistance value of a resistor is not an easy task, especially for color blind people and non-professional person. Therefore, it is important to tackle this problem by taking advantage of image processing and computer vision algorithms.



Color	Numeric Value	Multiplier	Tolerance	Temperature coefficient
BLACK	0	1Ω		250
BROWN	1	10 Ω	±1%	100
RED	2	100 Ω	±2%	50
ORANGE	3	1K Ω		15
YELLOW	4	10 Ω		25
GREEN	5	100 Ω	±0.5%	20
BLUE	6	1M Ω	±0.25%	10
VIOLET	7		±0.1%	5
GREY	8			1
WHITE	9			
GOLD			±5%	
SILVER			±10%	

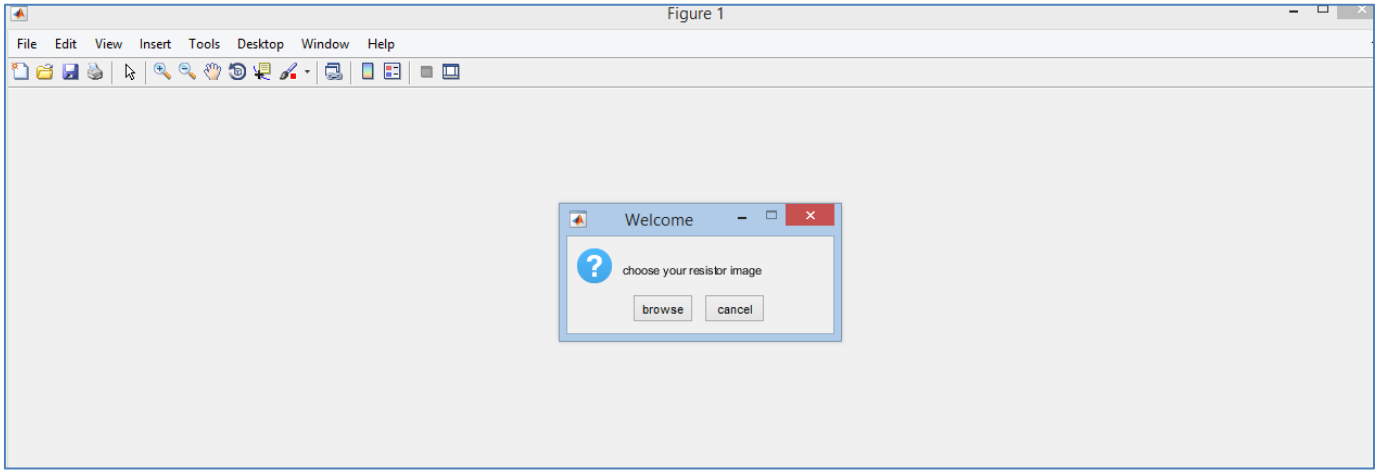
Figure 1 Color Coding System

Algorithm

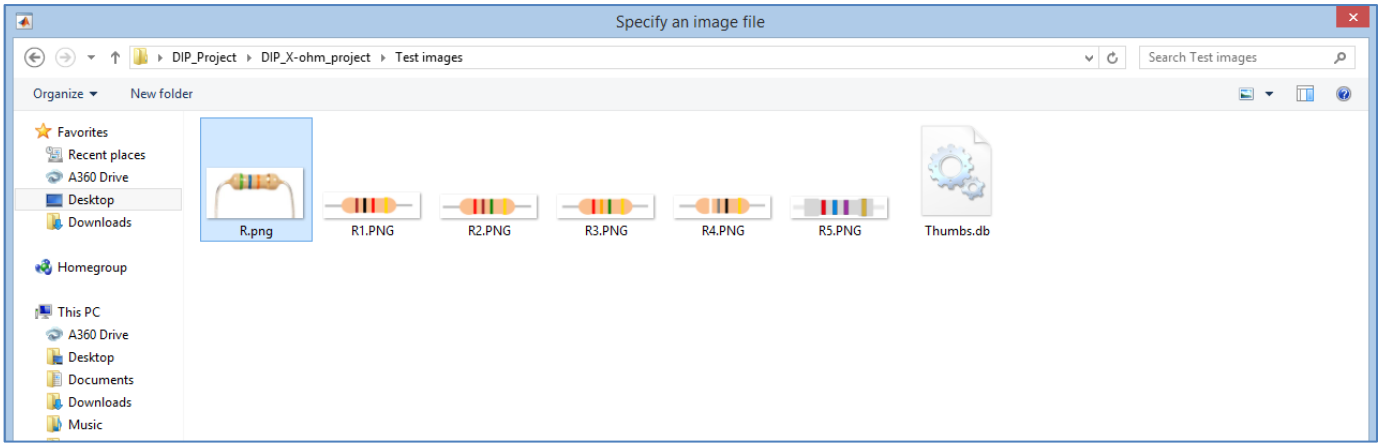
1- General Initializations
2- Image Segmentation and Applying mask on each Color Band of resistor.
3- Color Detection of each band.
4- Detect the order of bands.
5- Calculation of Resistance Value based on colors and its order.

Implementation of Code

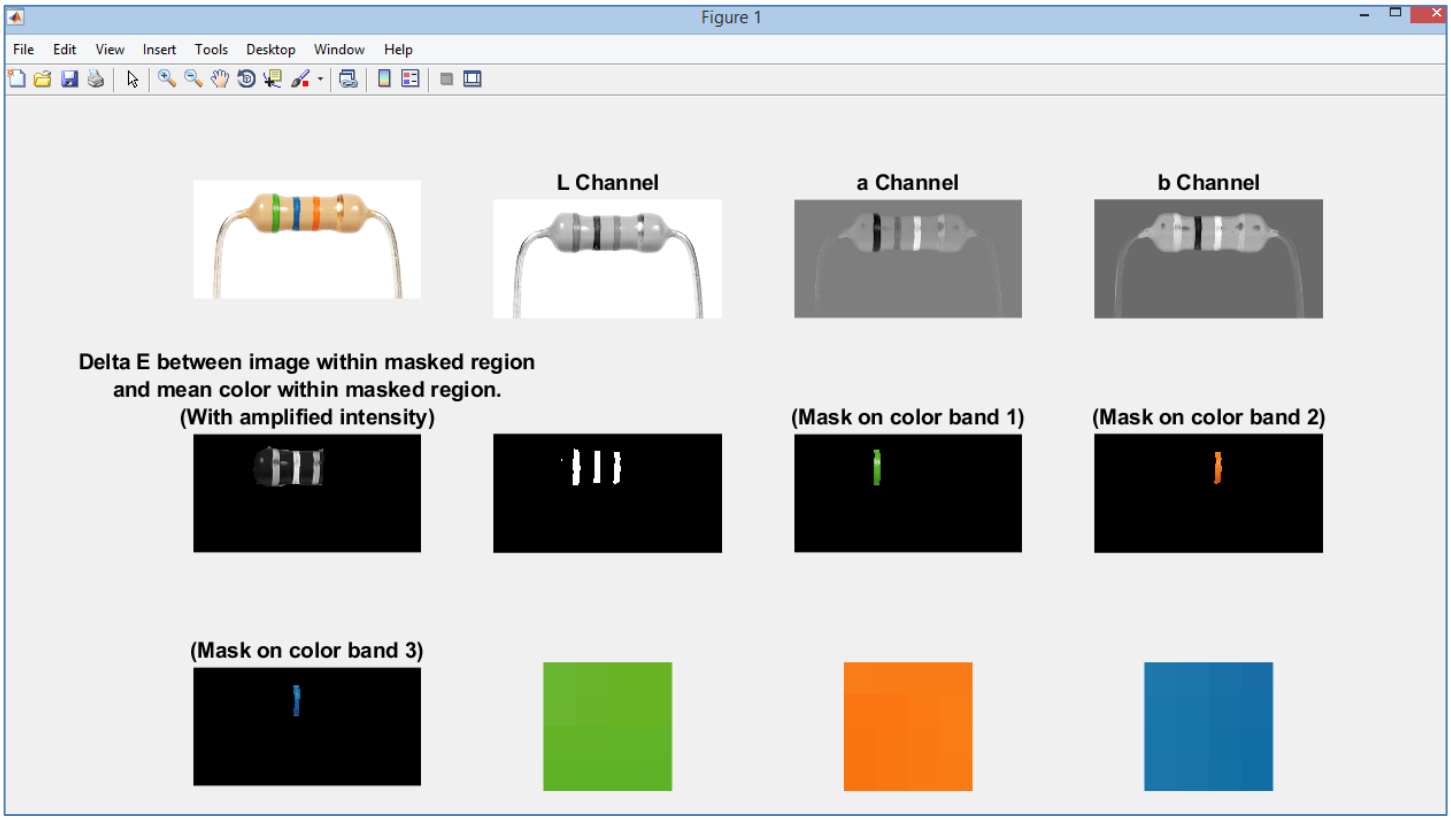
- At first we run the code and the window "Figure 1" appears to choose a photo or image



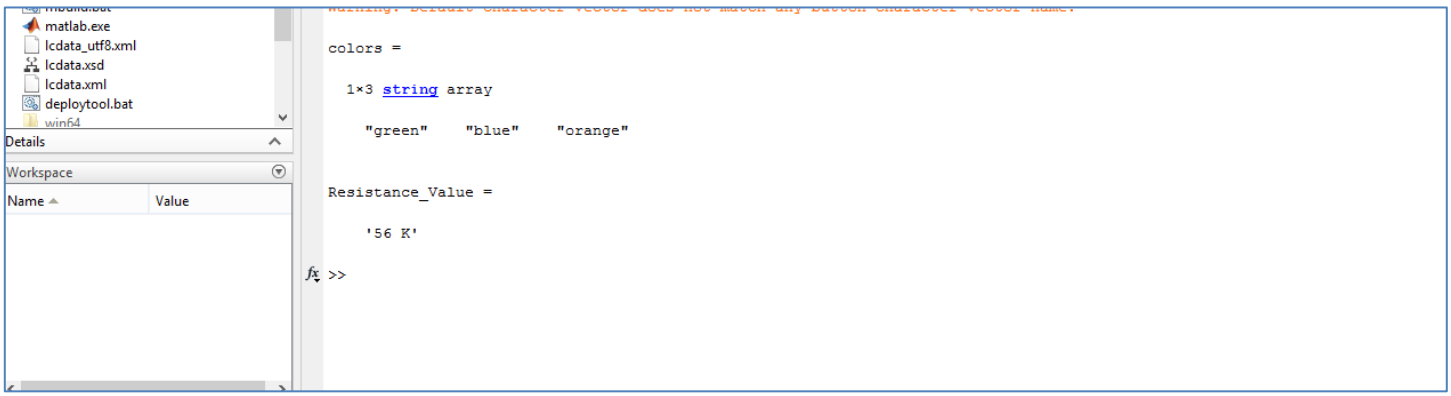
- We select browse to select photo of resistor to be **CALCULATED**



- We then define or crop the region of first three bands without tolerance band, then we will get L,a,b channels and the required masks to define the colors of bands



- We will find automatically the colors of defined region and the valve of the resistance will be calculated as shown in command window of **matlab**



Future Development

- We can make a mobile app to detect the value of resistor by capturing the resistor by the camera of mobile then we will get the value of resistor according to the defined algorithm
- A resistor color code recognition method is proposed to automatically estimate the resistance value of the resistor via an Android application. Our algorithm consists of two main steps. Firstly, a preprocessing method is applied to the input video frame to make the proposed method invariants noise and illumination artifacts. Moreover, to easily extract color bands and make the proposed method invariants to scale and object orientation, a line scanner strategy is used. Secondly, the Euclidean distance based clustering strategy is combined with the lookup table to read the resistance value of the resistor. The proposed method is compared with two resistor scanner mobile applications and the results show that the proposed method is robust and effective.