Evaluation Tv- Image Quality for Different Cable Signal Transmission Resistance Based on Contrast Edge Algorithm

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Abstract

Some degree of noise is always present in any electronic device that transmits or receives a signal . For televisions, this signal i has been to s the broadcast data transmitted over cable or received at the antenna; for digital cameras, the signal is the light which hits the camera sensor. At any case, noise is unavoidable. In this paper, an electronic noise has been generate on TV-satellite images by using variable resistors connected to the transmitting cable . The contrast of edges has been determined. This method has been applied by capturing images from TV-satellite images (Al-arabiya channel) channel with different resistors. The results show that when increasing resistance always produced higher noise for a television image .

Introduction

Image noise is the digital equivalent of film grain for analogue cameras. Alternatively, one can think of it as analogous to the subtle background hiss you may hear from your audio system at full volume. For digital images, this noise appears as random speckles on an otherwise smooth surface and can significantly degrade image quality. Although noise often detracts from an image, it is sometimes desirable since it can add an old-fashioned, grainy look which is reminiscent of early film. Some noise can also increase the apparent sharpness of an image. Noise increases with the sensitivity setting in the camera, length of the exposure, temperature, and even varies amongst different camera models. Noise in analog video and television is perceived as a random dot pattern which is superimposed on the picture as a result of electronic noise and radiated electromagnetic noise picked up by the receiver's antenna it is the "snow" which is seen with poor analog television reception or on blank VHS tapes When there is no transmission, which is to say no signal, the noise or "snow" is due mostly to thermal noise from the device itself, stray electromagnetic fields from other household electric devices, and other electromagnetic signals, all of which is interpreted as luminance signal.

Most of this noise comes from the first transistor the antenna is attached to [1] .Due to the algorithmic functioning of a digital television set's electronic

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circuitry and the inherent quantization of its screen, the "snow" seen on digital TV is less random [2] .

Resolution of a Television Screen

Computer monitors and television screens both rely on the same cathode ray tube (CRT) technology first developed over a century ago. The inside of a television or computer screen is lined with light-emitting phosphors. These phosphors are grouped in threes, with a red, green, and blue phosphors all next to each other. When hit from

behind by a trio of electron beams, these phosphors will all glow at different intensities, producing millions of different colors. By traveling left to right across the screen in a series of thin rows (called "scan lines"), the electron beams can create a convincing image. For a far more detailed explanation Each group of three phosphors is called a pixel, or a dot. If you have a magnifying glass or exceptionally good eyes, you may be able to differentiate each individual phosphor simply by scrutinizing your computer screen. The number of dots horizontally across the screen will determine the maximum resolution that the CRT can display. To properly display 1600 by 1200 resolution, a monitor must have at least 1600 pixels horizontally and at least 1200 scan lines.This brings us to televisions. Television signals, by convention, contain information for 525 scan lines. Even if a television set were capable of displaying more lines, there wouldn't be any information to put in them! Thus, the screen resolution that you see on your television today was determined more by the FCC than by Sony or WebTV Networks. While the display dimensions on - a computer screen are limited only by the hardware circuitry, analog television screens are limited by the signal they receive[3].

Electronic noise

Video images often contain noise that comes from various electronic sources. Video (TV) image noise is often referred to as snow. Some of the electronic components that make up a video system can be sources of electronic noise. The noise is in the form of random electrical currents often produced by thermal activity within the device. Other electrical devices, such as motors and fluorescent lights, and even natural phenomena within the atmosphere generate electrical noise that can be picked up by video systems Electronic noise is a random fluctuation in an electrical signal, a characteristic of all electronic circuits. Noise generated by electronic devices varies greatly, as it can be produced by several different effects. Thermal and shot noise are unavoidable and due to the laws of nature, rather than to the device exhibiting them, while other types depend mostly on manufacturing quality and semiconductor defects.

We can classify noise sources into two types: temporal and spatial. Temporal noise can be reduced by frame averaging, while spatial noise cannot. However, some spatial noise can be removed by frame subtraction or gain/offset correction techniques. Examples of temporal noise that are discussed in this document include shot noise, reset noise, output amplifier noise, and dark current shot noise. Spatial noise sources include photo response non-uniformity and dark current non-uniformity.

Shot Noise

Shot Noise is the noise associated with the random arrival of photons at any detector. It is nature's fundamental limit on noise performance in light detection systems. Since the time between photon arrivals is governed by Poisson statistics, the uncertainty in the number of photons collected during a given period of time is simply[4]:

$$\sigma_{shot} = \sqrt{S}$$

Where , σ_{shot} is the shot noise and is the signal, both expressed in electrons. So a 10,000 electron exposure will have a shot noise of 100 electrons. This implies that the best signal-to-noise ratio possible for a 10,000-electron signal is 10,000/100 = 100. S

Reset Noise

At the device output, the signal from an image sensor is typically converted from the charge domain to the voltage domain by means of a sense capacitor and source-follower amplifier. Before measuring each pixel's charge packet, the CCD's sense capacitor is reset to some reference level, VRD. There is an uncertainty in this voltage related to thermal noise generated by the channel resistance of the reset FET. In volts, this noise is[4]:

$$\sigma_{reset} = \frac{KTS}{q}$$

Where, k is Boltzman's constant (J/K), T is the temperature (K), B is the noise power bandwidth (Hz) and R is the effective channel resistance (). In terms of electrons this becomes Ω [4] :

$$\sigma_{shot} = \sqrt{S}$$

where, C represents the sense node capacitance (F) and q is the fundamental charge (C). This equation is the origin of the term “kTC noise”, which is a commonly used synonym for reset noise[3]. The presence of noise in a video system becomes especially noticeable when the image signal is weak. Most video receivers have an automatic gain (amplification) circuit that increases the amount of amplification in the presence of a weak signal. This amplifies the noise and causes it to become quite apparent within the image. This effect can be easily observed by tuning a TV (video) receiver to a vacant channel or a channel with a weak signal. The presence of excessive electronic noise in a fluoroscopic image is often the result of a weak video signal because of system failure or misadjustment.

Electrical imaging technique

Electrical imaging technique has been found to be a powerful tool to delineate sub-surface contaminated zone, when there is sufficient resistivity contrast. Electrical tomography (imaging) involves measuring a series of constant separation traverses with the electrode spacing being increased with each successive traverse. Since increasing separation leads to information from greater depths, the measured apparent resistivity have been used to construct a pseudo-section displaying the variation of resistivity , both laterally and vertically over the section. Normally, the pseudo-section contains geometrical effects, geological noise and the distorting effects of near-surface lateral changes in resistivity, which occur close to the electrodes (electrode effects). In order to remove geometrical effects as well as to produce an image of true depths and true formation resistivity, the inversion technique is used. This technique was successfully demonstrated near Dindigul town, where groundwater was contaminated due to untreated tannery effluents. Resistance can come from three areas Technical systems, Political Systems and Cultural Systems. Technical systems resistance includes task-based habit and inertia, fear of change, loss of sunk costs. Political systems resistance can come from internal coalitions against change, limitations on resource availability, and the idea that admitting that change is necessary is an indictment on past leadership. Cultural systems resistance includes the perception that an organization is one thing, and cannot bean other, that the past holds security, and that current organizational culture makes change difficult [3,4].

Result and discussions

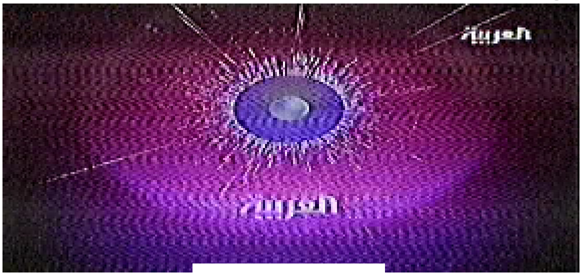
This study depends on a set of satellite images, which their properties illustrated in table (1) that recorded by (satellite Phlipis- receiver) :

Table (1) properties of satellite images recorded from Al-Arabiya TV channel

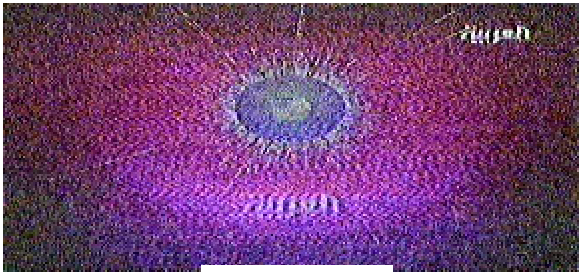
Frequency	11.938 GHz
Symbol rate	5275
polarization	vertical
Strength	80
Quality	98

Many satellite video clips were recorded , each one for (1 min) from Al-Arabia TV channel on Nilesat. It had been studied the effect of variable resistor that connected to the transmitting cable of signal on the quality of the image and then converted these video clips to frames in 30 frames/s by using ulead video studio 10 program then choosing one frame (picture) from each video clips for each resistor(75, 125, 150, 200)Q and saved as Bitmp images. We can see in figures (1) when increasing resistors always produced higher noise for a television image The histograms of these images illustrated in figures (2) , It had been found decrease occurs in distribution probability for all RGB-L components when we increasing resistors .

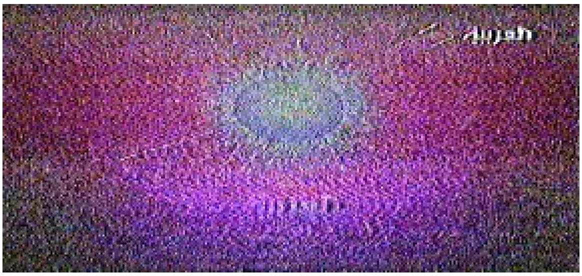
Image original



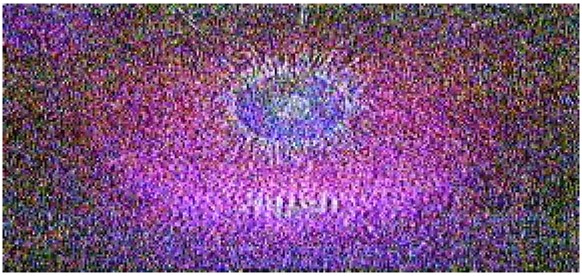
R =75 Ω



R =125 Ω

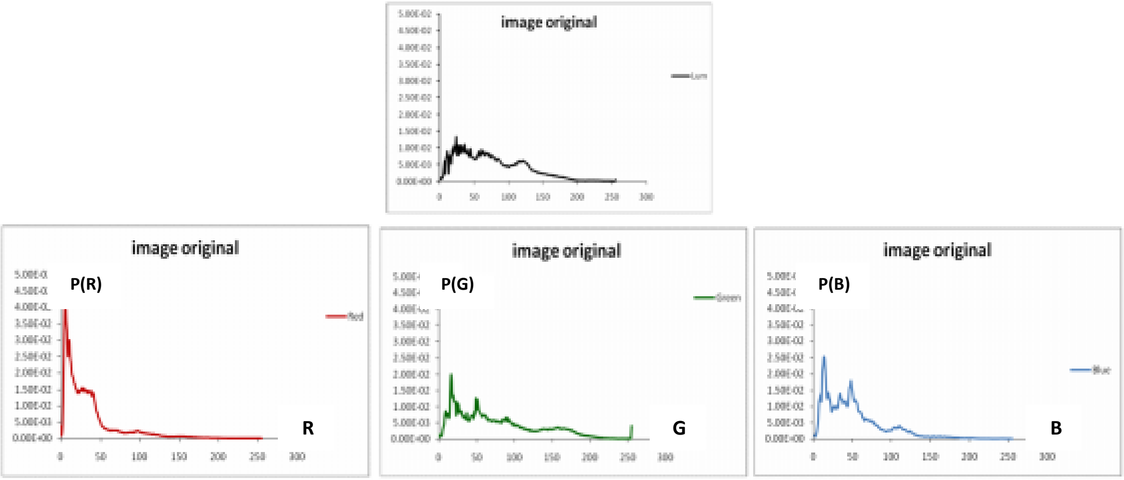


R =150 Ω

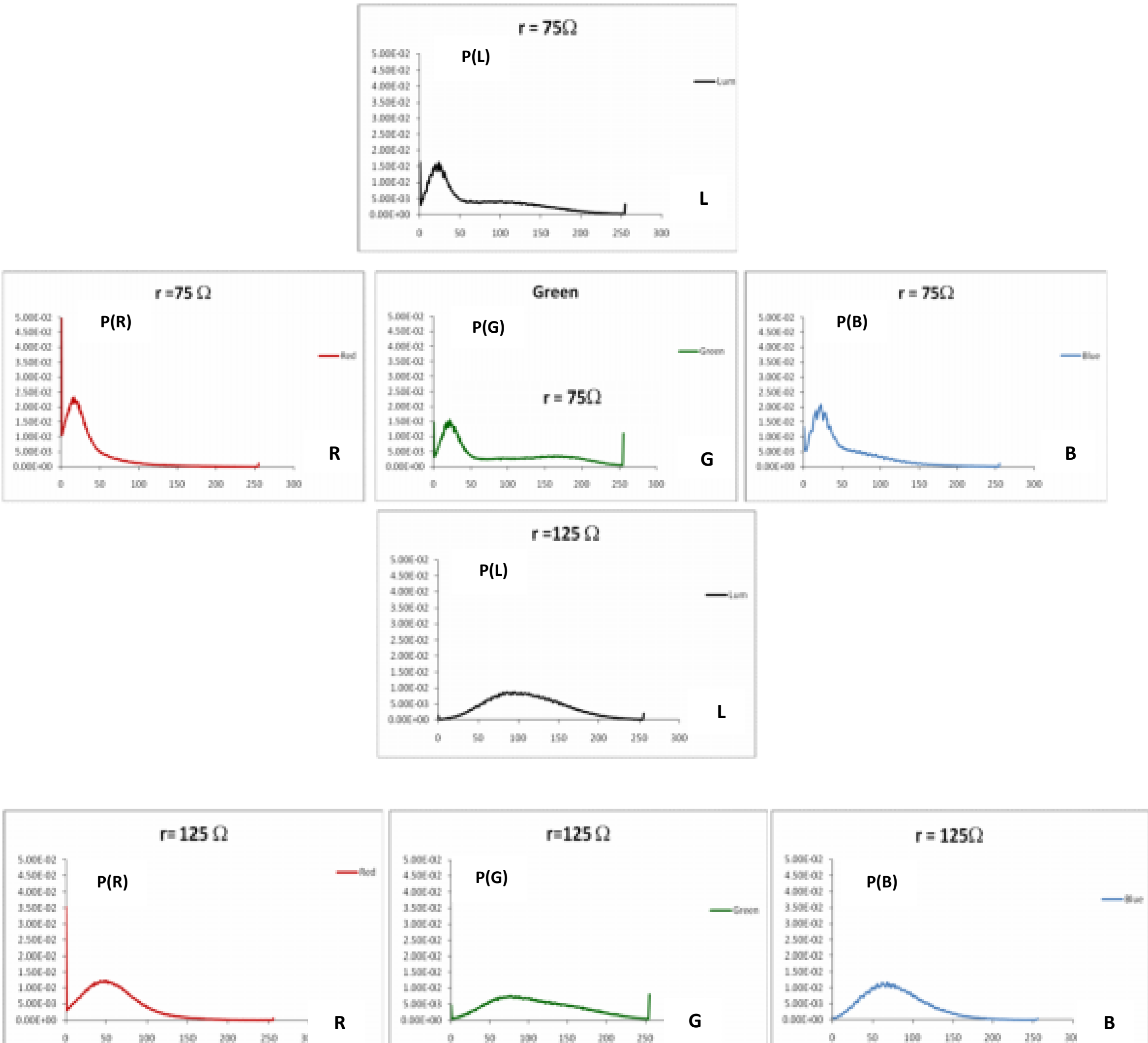


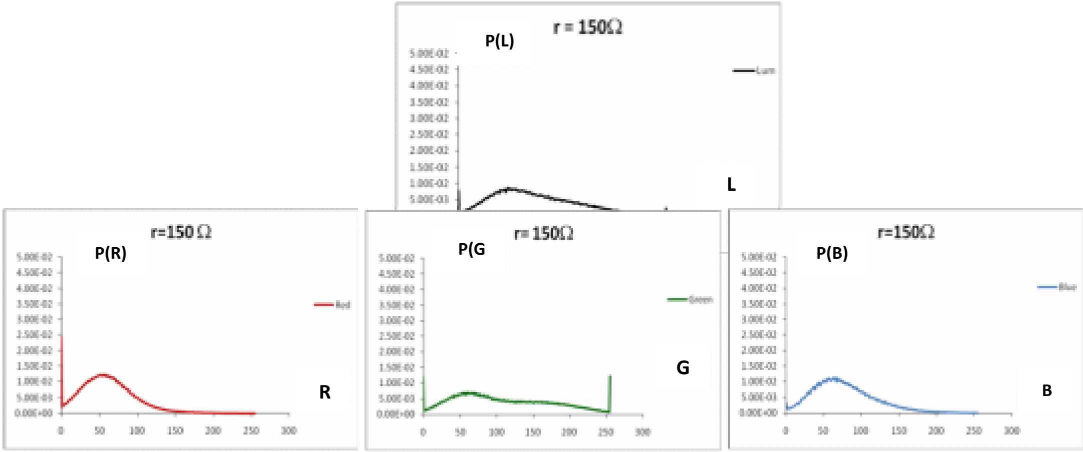
R =200 Ω

Figure (1) shows the images used in this study, extracted from Aarabiya – Tv satellite channel for different resistance

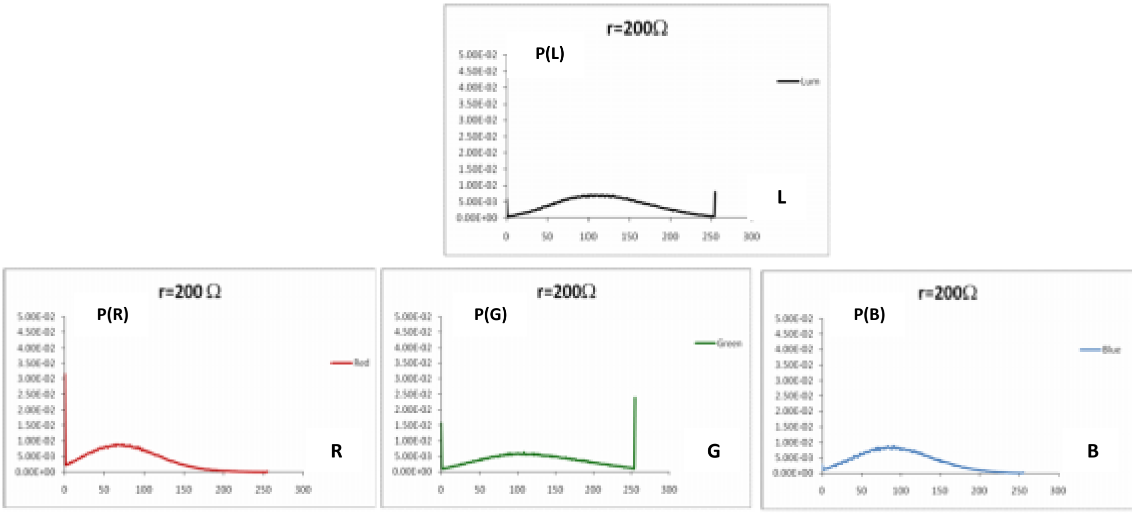


Figure(2) Distribution probability for RGB-L Components for each images recorded from al-arabiya Tv Channel by using variable resistance





Figure(2) Distribution probability for RGB-L Components for each images recorded from al-arabiya Tv Channel by using variable resistance



Figure(2) Distribution probability for RGB-L Components for each images recorded from al-arabyia Tv Channel by using variable resistance

Measurements of image contrast

Contrast is the rate between object lighting and background lighting that the objects fall on. The constant sensing depends upon the domain distribution of light and dark regions in image. Contrast is relative measure of a stimulus; as compared to its surrounding . In psychophysical studies, the typical measure of contrast between tow intensities Imax,, and Imin (Imax being brighter) is the Michelson contrast[5]:

$$C = \frac{I_{max} - I_{min}}{I_{max} + I_{min}}$$

In this paper we used tow contrast techniques, each one using contrast to equation (1) and applying to image edges points regions only. This would be made by taking triple windows around edges points and searching for lower and higher value in intensity of image components relating to edges anther used average of element and searching for lower average and higher average value.Contrast techniques are applied to edges regions only where contrast in edge regions is calculated after specifying the edges using Soble operator. In figures (3,4) show the contrast which calculating by two method with different thresholds of soble operator (20,40,60,80,100).

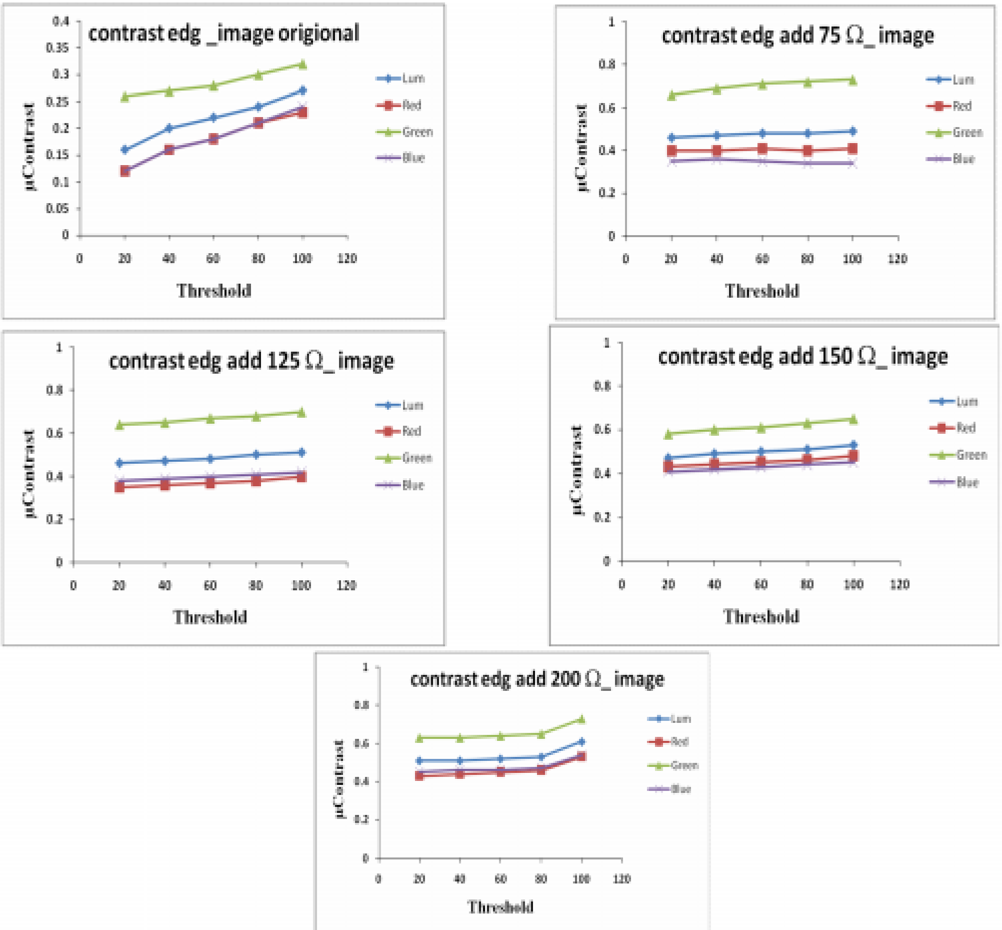


Figure (3) Contrast Calculating with Different threshold of Soble Operator for each Images Depending Maximum and Minimum Element for Edge Element for all RGB – L Component .

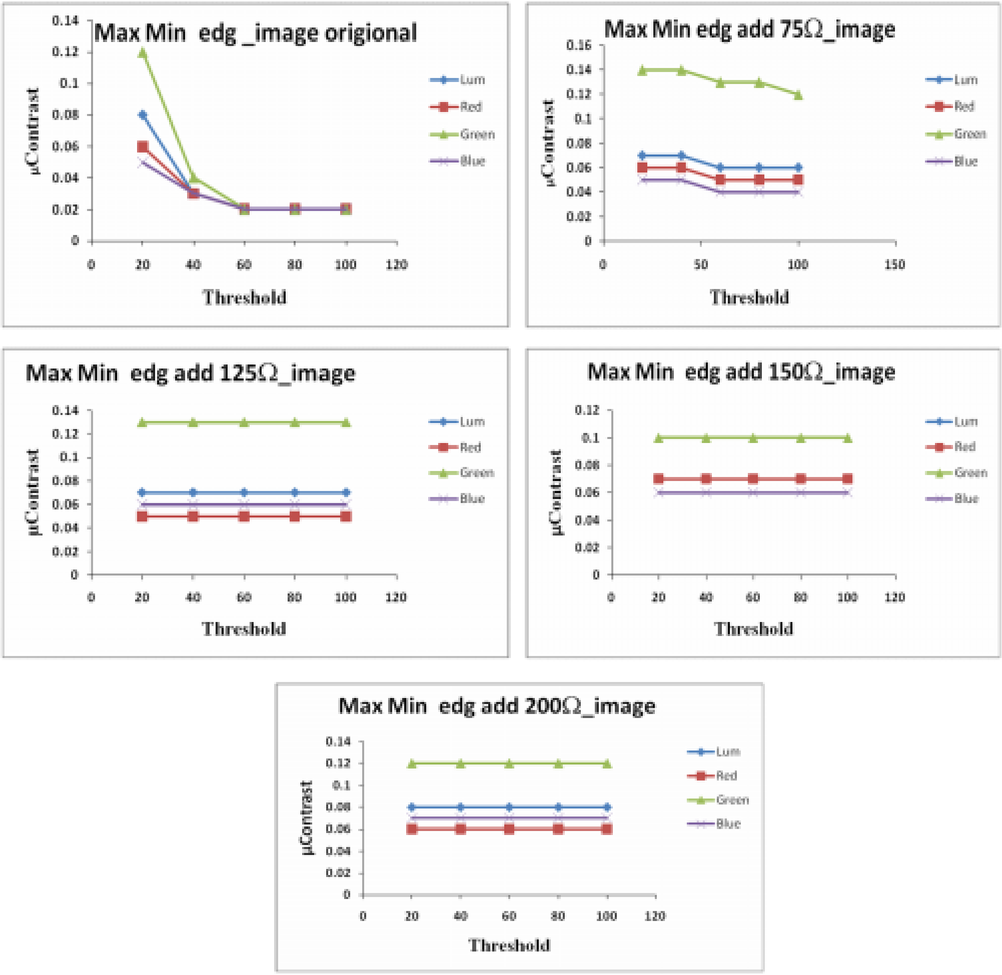


Figure (4) Contrast Calculating with different threshold of Soble Operator for each Images Depending Average Maximum and Average Minimum Elements for Edge Element for all RGB – L Component

Conclusion

From the results of the present study the following point were concluded :

1- From the RGB-L histogram curve of the images, there is gradual decrease in the height of peaks of the curve with the increase of the resistance of video signal cable for RGB-L components. This means that the noise has equal effect on RGB-L components.

2- The Contrast decrease when the resistance increase .

References

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تقييم نوعية الصورة التلفزيونية لمختلف أنواع مقاومات أسلاك نقل الإشارة الفيديوية بالاعتماد على خوارزمية تباين الحافات

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الخلاصة:
تظهر درجة ما من الضوضاء في الأجهزة الالكترونية التي تستلم الإشارة أو تنقلها في التلفزيونات، هذه الإشارة تبث البيانات عبر سلك أو تستلم بوساطة الهوائي ، في الكاميرات الرقمية تكون الإشارة عبارة عن ضوء يسقط على متحسس الكاميرا. وفي كل الحالات يكون ظهور الضوضاء أمراً لابد منه. في هذا البحث تم توليد ضوضاء الالكترونية في صور التلفزيون المستلمة من القنوات الفضائية باستخدام عدد من المقاومات متغيرة القيمة وُضِعَتْ في سلك نقل الإشارة الفديوية وتم حساب التباين الحافات لهذه الصور . هذه الطريقة طبقت على صور القناة الفضائية (العربية) باستخدام مقاومات مختلفة .وقد أظهرت النتائج أن زيادة المقاومة يؤدي عادة إلى زيادة الضوضاء في الصور التلفزيونية .