➔ ***Short Research Paper – NS***

Image Quality Determination of HD Cameras by Using Image Processing

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Abstract

Today, images taken from the digital video camera can be supplied in high quality with very low cost. Film cutting and mounting equipment used in the professional system has been no longer left to the computer. High brand value in direct proportion to the development of new technologies produced by companies with number of HD cameras has increased. The HD camera's shutter speed and aperture diameter are the most important factor determining the quality of HD cameras. Because of two important factors, there has been a need to test the HD cameras. Image processing techniques and mechanical system design has been carried out to determine the camera in HD quality. The three electric motors have been used for movement of the system apparatus. Control of the engine has been provided with micro-controllers and driver hardware equipment.

Keywords: *image processing*, *image quality*, *hd camera*, *shutter speed*.

1. INTRODUCTION

At the present time, image quality has an important position in every field. In this context, the first thing that comes to mind is HD cameras in today's technology. HD (High Definition) is used to express 720 or 720x1280 pixel resolution. If there is HD camera or HD video shoot in photographic apparatus, cell phones and cameras, 720p resolution is mentioned. This resolution is enough for many things but it may not be enough for videos that will be watched with pleasure in the next years. Full HD screen resolution that is defined as another expression is 1920 x 1080. They are tagged as 1080i or 1080p. If these tags seem, this is understood that they are full HD. Letters retrieval system that they are "i" and "p" on tags represent "progressive" and "interlaced". To give an example for these retrieval systems, while frame rate that 1080i gives to screen per second is 30 FPS, this rate in 1080p is 60FPS [1].

Instantaneity that is one of the important parameters of cameras that we use in this study is a system that controls how much time rays that pass from diaphragm will stay. That is, it is a period that light sensitive field takes light. There are various speeds in instantaneity. They start with 30 seconds and continue till 1/8000. Values that are below one second are 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/8000. Values that are under one second are 2, 4, 8, 15, 30. Each vault of these values means pose double light when conditions such as diaphragm and ISO are equal. 1/1000 means thousandth of a second [2]. That is, light mechanism opens and closes during this period.

When it is thought that eyewink occurs in twentieth of a second speed, this is understood that 1/1000 becomes a rapid instantane easily. AForge NET that is used in this study is a C# library

that is designed for developers and researchers who are interested in machine vision and artificial intelligence (photo manipulation, artificial neutral networks, genetic algorithm). This library gathers in five main titles; AForge imaging: Rutins and filters of Photo manipulation, AForge Neuro: artificial neutral networks, AForge Genetic: genetic algorithm and evolutionary programming, AForge Vision: machine vision, AForge Machine Learning: machine learning [3]. Developing technology and adapting to this technology swiftly causes to be unavoidable for development of new applications and devices.

Instrumentation design is realized by being considered this conditions and opportunities. After the system design is realized, contact is aimed between shutter speed of software and cameras and speed of system. After this contact is occurred, this is aimed that photos that are attained from cameras are examined in terms of chromatic dispersion by applying techniques of software and image processing that are developed. This is aimed that examination of photo outputs of HD cameras is provided from results that will be obtained in terms of shutter speed.

2. RELATED WORK

Modulation transfer function (MTF) is used for both objective and measurement of camera quality by developing spatial frequency reaction of image systems in the study by Chunchang Xiang and his friends [4].

An algorithm who Dehnie developed allowed the image that computer produces is achieved with its compounds to build up an approach of filter for forensics [5].

Yutaka, Morita and their friends developed a new device and method to control orally disintegrating tablet. This system consists of a personal computer that is rigged with motion, catching and image analyzing software, an interface distributer and CCD camera [6].

Apart from these studies that are explained, a similar study about the system that we make real is not encountered. At the same time, this study is done by being aimed at showing up an original study neither mechanical design nor applying style of software and test actualization. This is wanted that an original study brings in literature in consideration of this information. Moreover, this is aimed that this study that is occur is used in international certificate test laboratory without test laboratory of HD camera producers costly.

3. MATERIAL METHOD

3.1. Created of HD Camera test device system

Firstly, diagrams of device are done with Solid Works to do mechanical parts of device. Mechanical parts consist of motor alt and top platform, pulleys, pins, bearing spidles, couplings, dc engine bearing, step engine bearing and universal engine bearings. After drawings of these mechanical devices are done, they are actualized. After connection between mechanical parts is completed, electric circuit components are added to the system. Electronic circuit components consist of Arduino UNO, universal motor (550W), step motor, DC motor, 1293d controller, TB6550-V2.0 step motor drive, RGB leds and power sources. Software that is developed is written in C# language to provide connection between system, computer and camera that will be tested. Aforge.net library and bitmap class is used as well as general features of C# language.

3.2. Working Mechanism of the System

Three DC electric motors are used for the movement mechanisms of the prepared system. Motor control is supplied with micro-controllers and driver hardware equipment. The Dc motor is used in the rotation of the LEDs connected to system and l293d controller is used to achieve this rotation. With TB6550-V2.0 step motor driver used to control motors and the hardware part of the system developed by 1293d controller, not only enables dc motor and step motors to rotate but it helps us control the rotational speed as well. In the software set as the default and embedded into the Arduino, speed of the motors increases gradually according to the rotational speed of the step motor. Besides, with intent to denominate the speed of the motors in the RPM, Hall Effect (UGN-3113) sensors are used for speed measurement of the system hardware. These sensors report which motor is at which speed rate to the software by calculating the rotational speed and ensure proper measurement in this case.

3.3 Development of System Software

A software in C# programming language is developed to communicate system whose software part is solved with computer accordingly camera that will be tested. The software firstly is connected to software part of system with Arduino. Speed ratings of motors in the system are taken in terms of RPM (Rounds Per Second) by being clicked buttons of "connect" in software interface. After these speed ratings are taken, the list of whole cameras that connect to the computer comes after button of "connect camera" is clicked to connect with camera that will be tested. After camera that is wanted is selected and is approved, software connects with camera and it starts to take picture. Aforge. Net library is used for these processes. When camera that will be tested does video shoot, image is taken during click button of "snapshot" from software interface with the purpose of image processing application to take snapshot transiently. When image is taken, test process is done during clicking button of "test" for the method of image processing. In detail, image processing is an important field to deal with such issues. It is applied in many different applications including image improve to filtering medical images better [7-9].

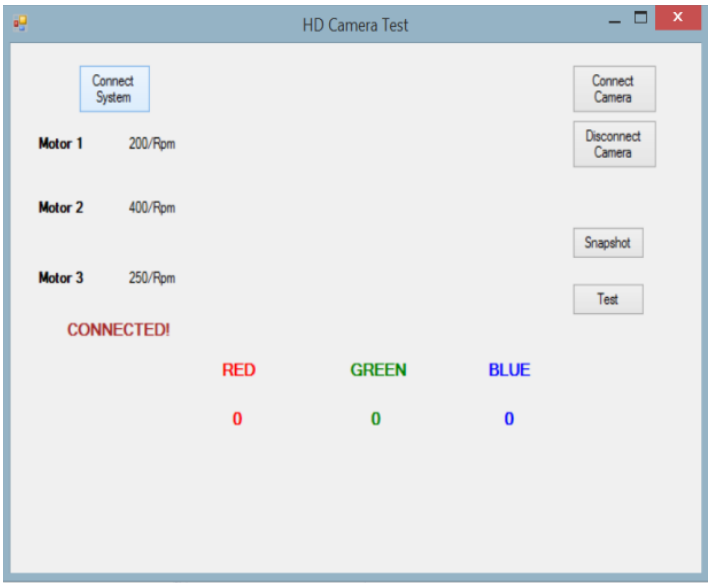


Figure 1: Taking System Speed.

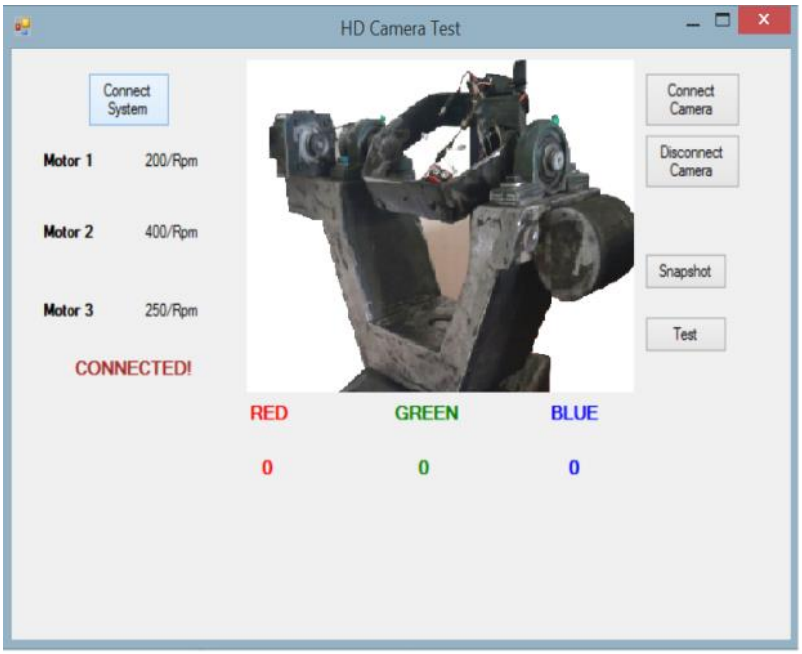


Figure 2: Communicating with Camera

Bitmap class of C# programming language is used to be processed photo that will be tested. Photo that is taken firstly turns into the format of RGB (Red-Green-Blue) by means of this class. Then, whole pixels in the photo are examined one by one and which value it is in is determined. A value is added to a variable that belong to this value in which it belongs to R, G and B. Hence, colour values of photo that are taken from photographic apparatus are obtained.

4. RESULTS AND CONCLUSION

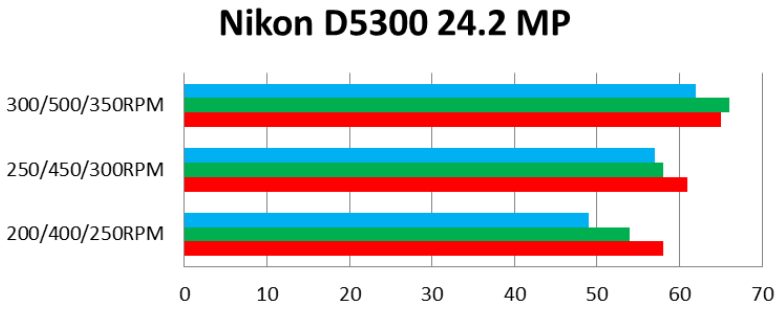
How much quality the results that are measured from three different cameras have are determined images that are taken in different camera quality based on instantaneity speed during video shoot.

When this determination is provided, how many photograph apparatuses show colours as disorderly during taking screen shoot because when image is taken, instantaneity speed is slow and quality of image is low if there are many colours.

Different cameras and colour distribution of images that are taken from these cameras are given in table 1, table 2 and table 3 according to different engine speeds. Three cameras are tested here. More cameras will be tested in the present days and this is planned that RGB values of cameras that will be tested will be holt in data base. Then, when a camera that is not measured is wanted to be tested, this is planned that camera that is closest quality for own is determined and feedback is explained comparatively.

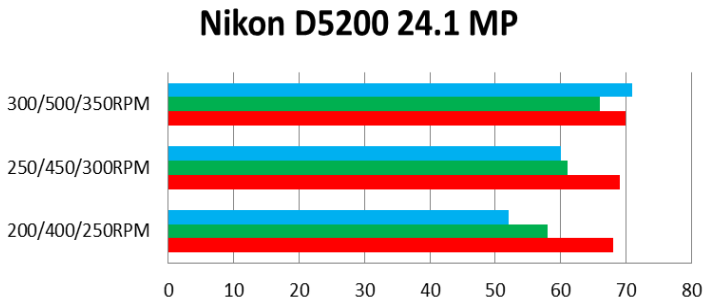
When data in table is examined, instantaneity speeds of cameras during video shoot show differences.

Table 1. Nikon D5200 RGB values



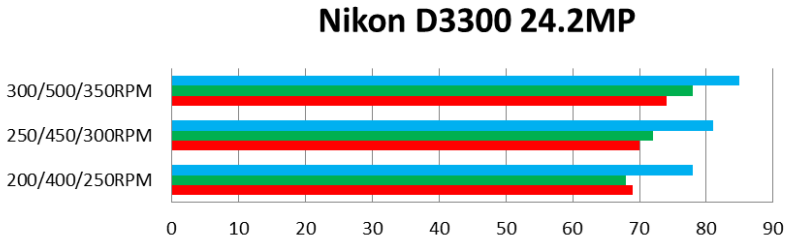
	200/400/250RPM	250/450/300RPM	300/500/350RPM
B	49	57	62
G	54	58	66
R	58	61	65

Table 2. Nikon D5200 RGB values



	200/400/250RPM	250/450/300RPM	300/500/350RPM
B	52	60	71
G	58	61	66
R	68	69	70

Table 3. Nikon D3300 RGB values



	200/400/250RPM	250/450/300RPM	300/500/350RPM
B	78	81	85
G	68	72	78
R	69	70	74

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