

Microcontroller Based Portable Data Logger For Medical Application

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Abstract— We all know data logger is an electronic device that automatically records, scans and retrieves the data. The proposed design of a portable data logger that includes Camera, LCD screen, and rechargeable battery and microcontroller .The images are taken by camera which does operations on it and shows the borders of it. At that same time it will also show that taken skin images on the monitor of screen .Theses images which can be easily distinguish normal and abnormal skin edges of skin region by showing different color .Testing with the images of skin is used to demonstrate the performance advantages of the data logger. To show Skin defected edges is one of medical application for dermatologist. Images taken by camera convert into electrical signals for processing, transmission and recording by an electronic devices. The hardware design can be use for various medical or industrial applications by changing only the hardware. Recently, now a day there is no any method used to work on the defected skin areas. Images can be transmitted wired to a data logger unit. Continuously data logging is completed, the image is processed such that it will be examine the captured data for medical diagnostics.

Keywords— *Raspberry PI Microcontroller; Camera ;MATLAB simulink, Image processing.*

I. INTRODUCTION

To collect and analyze experimental data, which having the ability to represent real time analysis ,data logger is used to respond the parameters that are beyond the normal range available from the most traditional equipment. Comparing with the various data loggers ,the main difference is based on the first data is recorded or sensed and then stored. It is an electronic device which automatically records the data, scan it or monitor it and retrieves the same data with high speed and high efficiency during a test or diagnosis.

A Portable battery operated data logger unit with the camera is useful. The design of the battery operated data logger is general and simple which can be used for several medical applications such as diagnosis .according to literature survey there are several works that are related to data logging for medical applications. In a data logger which perform operations like border difference on the different images of skin taken by camera. The data logger receives data using HDMI interface along with in this data logger work is portable and has LCD display for displaying images, videos, and graphs in real time.

The largest organ of the body is skin. it is made up of the two layers upper epidermis and the second is lower dermis. The both layers, the epidermis and the dermis are

divided into again in other layers. Basal layer which is lower layer of the epidermis. It contains organelles called melanosomes .It contain cells which is called melanocytes to produce a pigment called melanin. The color of skin mainly depends on this melanin .this contains some amount of melanin in the layer of epidermis .The thickness of epidermis and vascularity of the epidermis are factors which affecting the color of skin .Pigmentation means coloring in skin . In Skin pigmentation disorders affect the color of the skin. Skin cells gives our skin color by making a substance called melanin. When melanin cells become damaged or unhealthy, it directly affects production of melanin. Some pigmentation disorders affect just patches of skin.

In this paper (1) first introduce the system, how it works briefly introduce. Then which are the basic assumptions of system. (2)After that block diagram of the system and explanation of each block is given. (3)Then the hardware and software specification and then result shows. (4)Finally conclude the total system.

II. BASIC ASSUMPTIONS

To design Solar Activated coin Based Mobile Charger basic assumptions is as follows.

1. Microcontroller; Raspberry Pi B model
2. Web-Cam; which is used for detection using image processing.
3. HDMI to VGA converter; such that it can compatible for any LCD Screen.
4. Battery power bank; for power storage.

III. ARCHITECTURE OF PROPOSED SYSTEM

This proposed system Battery operated portable data logger, images are taken by camera and doing edge detection and morphological operations on it with different color borders. These edge detection operators can have better edge effect under the circumstances of obvious edge. The collected image has lot of noises, these so many noises may be considered as edge to be detected for color and Morphological techniques such an image with a small shape or template called as a structuring element .The structuring element is positioned at all the possible locations in the skin image and it get compared with the corresponding neighborhood of others pixels .the taken image have two different windows in one of the window showing only edges and other is actual image of the skin. Morphological operations differ in how they carry out this comparison with

red and green color border. Such that it will easy to compare the normal skin with abnormal skin. The abnormal skin boundary region will be shown by showing pixel either region with different color based on the applied conditions.

It is an important to work on the affected skin .Now a day's dermatologist do not have any devices to see the edges of the affected skin part because it is very difficult to go in city area, so that this battery operated data logger is useful in rural areas. After logging, the images is get processed and detects boundary if its more then it show high disease by red and if it low disease, it will show by green color border. It is easy part to understand in medical applications .Image segmentation is important part in image processing. The micro-controller based portable data logger is used in application of detection skin cancer or in any skin disease. It will be easy to detect the difference between normal skin with abnormal skin .This Data logger identify the presence of streaks in the skin lesions, by analyzing the appearance of detected streak lines in a pigmented skin lesion .It is analyzed to extract their orientation features in order to detect the underlying pattern of it . The filters are used in the process of identifying the image by locating the sharp edges of skin area are discontinuous. These discontinuities which bring changes in pixels intensities which define the boundaries of the object .The proposed system block diagram is as shown in fig. 1.

Raspberry pi Microcontroller is the heart of this system .this whole system is no need of any computer .All system run through uC(Microcontroller). In this proposed system the pi controller is used which having large storage capacity with HDMI interfacing .It works on battery power bank which gives the power to the microcontroller.

IV. SYSTEM SPECIFUCATIONS

A. Hardware specification

1) Raspberry Pi Microcontroller

The Raspberry Pi microcontroller is based on the Broadcom BCM2835 system on a chip (SoC). It contains ARM1176JZFS 700 MHz processor with 256 megabytes of RAM

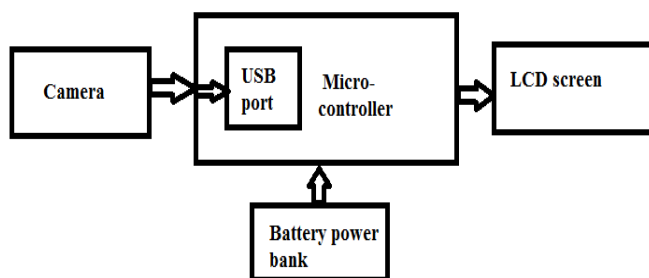


Fig.1. System overview

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python which is main programming language.

2) Camera

A webcam is a video camera that takes continuously image in real time connected to screen .webcams includes a lens, an image sensor .Image sensors can be CMOS or CCD to record the picture. It having features like low power consumption, smaller size and high image quality.

3) Battery Power Bank

Battery charger or recharger is a device which is used to put energy into a secondary cell and it can used again. Rechargeable battery by forcing an electric current through it. The size and type of the battery main factors of it. It provides small current and less charging capacity required.

4) HDMI TO VGA Converter

HDMI (High-Definition Multimedia Interface) is a audio/video interface for transferring uncompressed video data, such as a display controller to a compatible computer monitor .The VGA (video graphics array) converter is 15-pin VGA connector is found on many video cards, computer monitors, and high definition television sets.

5) LCD Screen

A liquid-crystal display (LCD) is video display. It is used to display either arbitrary image or fixed images which can be displayed over it. LCDs are used in range of applications such as computer monitors, televisions. The liquid crystal display is more energy efficient and low electrical power consumption.

B. Software specification

For programming of this system MATLAB SIMULINK is used. Following software is used for the programming.

1) MATLAB SIMULINK

MATLAB is a numerical computing environment and fourth-generation programming language. It is developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces.

It is the software which is used for detection affected skin area with border edges in this system.Result from MATLAB is as shown in figure 2, 3 and 4.

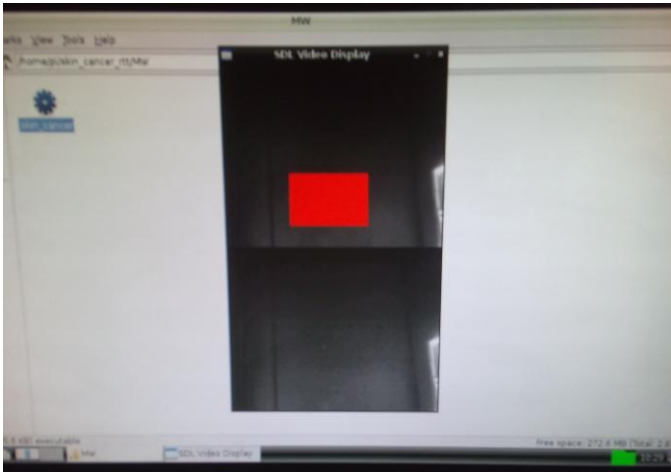


Fig. 2. Input Image

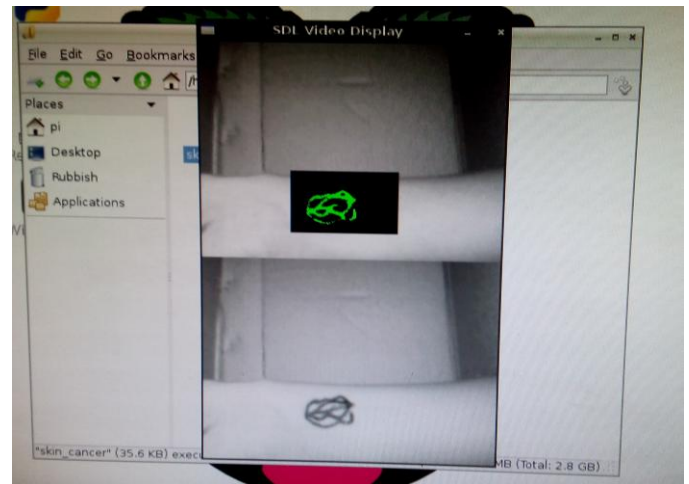


Fig.4. Image taken by camera with showing green borders

In Figure 2 shows a input window when the system is powered ON. The screen displays two window one is display color image and Other is grayscale where the edges will display.

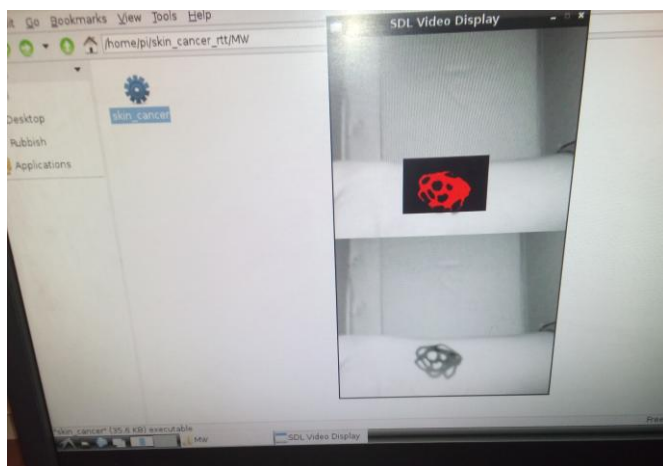


Fig.3. Image taken by camera with showing green borders

Figure 3 shows the skin images in one it shows the red borders which is actual affected. And in second window it just shows normal image to understand the difference.

Figure 4. shows the same as in above only difference is that it will show with green border only when the portion of skin is not more affected or contain dark streaks .It fixes the pixel count and then shows the result .

V. IMAGE PROCESSING UNIT

There are many operations are used perform to identify the abnormal edges of skin images. Morphological techniques takes an image with a small shape or template .This element is positioned at all possible locations in the image and get compared with the corresponding neighborhood of pixels which is shown two windows. The grayscale morphological operations may have other pixel values. The effect of the operator on a binary image is to gradually enlarge the boundaries of regions of images, foreground pixels typically *white* pixels. Thus areas of foreground pixels grow in size when holes within those regions become small.

Continuous images of skin are identified by Boundary detection. It is part of image processing which included with any of the pattern .so that it can use in medical imaging applications. It is present a simple and more effective method to find the borders of skin as an initial step towards the diagnosis of the skin from the color images with the help of data logger that contain information to discriminate the abnormal skin from the background image. The abnormal portion of the skin image is then extracted from the segmented image and borders according to conditions. The use of digital image may help in an objective for study of skin pigment disorder progression and test the efficiency of therapeutic procedures. There are the numbers of algorithms that are used to detect the skin abnormality from the images.

After implementation of algorithm, where point detection, line detection, edge detection and cutting edge detection algorithms are most important. It will shown by the different color by showing region using different color for high and low patches on skin according the pixels value. Detection of abnormal skin region from images of skin is important and helps in detecting the dermoscopic images or detection of Melanoma in Skin Cancer .

VI. ALGORITHM MICROCONTROLLER BASED PORTABLE DATA LOGGER FOR MEDICAL APPLICATION

Steps:

1. Start.
2. Trigger the camera which is connected to micro controller.
3. Capture image from camera.
4. Convert that Captured image into gray scale image.
5. Detect abnormal region boundary and show that region by different color.
6. If it will detect large abnormal region, It will show borders by red color
7. If it will detect small abnormal region, It will show borders by Green color
8. Go to step 1.
9. End.

VII. EXPERIMENTAL RESULT

The hardware of Microcontroller based portable data logger for medical application is as shown in figure 5. This is one of the systems which shows and helps in medical applications as the first step for detection of melanoma in skin cancer. As melanoma contained skin region is dark and it's easy to show the border of it compared to pixels quantity region is large and dark it shows red borders. Otherwise it will show borders by green color.

VIII. FUTURE SCOPE

As we know this system is based on microcontroller so it is cost effective. But further it could be implemented on FPGA also for highest speed. Such that it will be used in industrial applications in the future.

IX. CONCLUSION

This system is useful to save time for diagnosis for any dermatologist. The purpose of a battery-operated portable data logger is to examine the difference between the normal and abnormal skin images. The data logger is a device which takes continuous images from a camera and processes them to give the proper edges for output within a test or measurement of skin disease or other in less time. The portable data logger gives a fast response as it is real time with consuming less power.

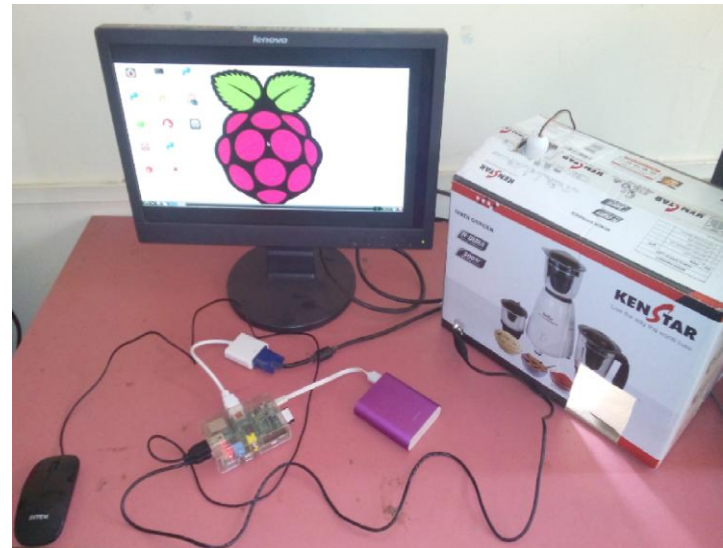


Fig. 5. Experimental setup.

REFERENCES

- [1] Tareq Hasan Khan, Khan A. Wahid "A Portable Wireless Body Sensor Data Logger And Its Application In Video Capsule Endoscopy" *Microprocessors and Microsystems Elsevier*, November 2013
- [2] Maryam Sadeghi, Harvey Lui, and M. Stella Atkins "Detection and Analysis of Irregular Streaks in Dermoscopic Images of Skin Lesions" *IEEE Transactions On Medical Imaging, Vol. 32, No. 5, May 2013.*
- [3] G.T. Shrivakshan "A Comparison of various Edge Detection Techniques used in Image Processing" *IJCSI International Journal Of Computer Science Issues, Vol. 9, Issue 5, No 1, September 2012*
- [4] M. Kalpana "Extraction of Edge Detection Using Digital Image Processing Techniques" *International Journal Of Computational Engineering Research Vol.2 Issue.5, September 2012.*
- [5] Robert Rieger, Yan-RuHuang "A Custom-Design Data Logger Core for Physiological Signal Recording" *IEEE Transactions On Instrumentation And Measurement, Vol. 60, No. 2, February 2011*
- [6] Rajesh Luharuka, Robert X. Gao, "Design and Realization of a Portable Data Logger for Physiological Sensing" *IEEE Transactions On Instrumentation And Measurement, Vol. 52, No. 4, August 2003.*
- [7] Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing" Second Edition, PEARSON Publication.