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Skin Cancer Diagnosis Using Open CV

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ABSTRACT: Prediction of skin cancer is most challenging problem due to structure of cancer cell, where most of the cells are overlapped each other. The skin cancer detection using raspberry pi open CV techniques are mostly used for prediction of skin cancer and also for early detection and treatment to prevent the skin cancer. To predict the skin cancer various features are extracted from the images therefore, raspberry pi based approaches are useful to predict the skin cancer. Recently, these types of cancer detection techniques are widely used in several medical areas especially in various cancer tumors such as, skin cancer, breast cancer etc. Image quality and accuracy is the core factors of this research, image quality assessment as well as improvement are depending on the enhancement stage where low processing is used based on filter. Since user can show the cancer infected images the raspberry pi camera detect the image a skin cancer infected or not. Following the raspberry pi controller principles and enhanced region of the object of the interest is used as a basic foundation of feature extraction is obtained. Relying on general features, a normality comparison is made. The summary for prediction of skin cancer by previous researcher using image techniques is also presented.

I. INTRODUCTION

Skin cancer is a disease of abnormal cells multiplying and growing into a tumor. The mortality rate of skin cancer is the highest among all other types of cancer. Skin cancer is one of the most serious cancers in the world, with the smallest survival rate after the diagnosis, with a gradual increase in the number of deaths every year. Survival from skin cancer is directly related to its growth at its detection time. But people do have a higher chance of survival if the cancer can be detected in the early stages. Cancer cells can be carried away from the skin in blood, or lymph fluid that surrounds skin tissue. Lymph flows through lymphatic vessels, which drain into lymph nodes located in the skin and in the center of the chest. Skin cancer often spreads toward the center of the chest because the natural flow of lymph out of the skin is toward the center of the face. Skin cancer can be divided into two main groups, non-small cell skin cancer and small cell skin cancer. These assigned of the skin cancer types are depends on their cellular characteristics.

II. LITERATURE SURVEY

1. Mirbeik-Sabzevari and N. Tavassolian, "Ultra wideband, Stable Normal and Cancer Skin Tissue Phantoms for Millimeter-Wave Skin Cancer Imaging," in *IEEE Transactions on Biomedical Engineering*, vol. 66, no. 1, pp. 176-186, Jan. 2019.

Skin cancer is a major cause for cancer-related deaths. The detection of pulmonary cancer in the early stages can highly increase survival rate. Manual delineation of skin nodules by radiologists is a tedious task. We developed a novel computer-aided decision support system for skin nodule detection based on 3D Deep Convolutional Neural Network (3DDCNN) for assisting the radiologists. Our decision support system provides a second opinion to the radiologists in skin cancer diagnostic decision making. In order to leverage 3-dimensional information from Computed Tomography (CT) scans, we applied median intensity projection and multi-Region Proposal Network (mRPN) for automatic selection of potential region-of-interests. For the detection of skin cancer, CAD systems are developed to assist the radiologist in the process of nodule detection by providing a reference opinion. From the performance comparisons it is evident that our proposed model 3DDCNN attained the highest results against other state-of-the-art systems for sensitivity and FPs per scan.

2. Mirbeik-Sabzevari, E. Oppelaar, R. Ashinoff and N. Tavassolian, "High-Contrast, Low-Cost, 3-D Visualization of Skin Cancer Using Ultra-High-Resolution Millimeter-Wave Imaging," in IEEE Transactions on Medical Imaging, vol. 38, no. 9, pp. 2188-2197, Sept. 2019.

Low-dose computed tomography (LDCT) plays a critical role in the early detection of skin cancer. Despite the life-saving benefit of early detection by LDCT, there are many limitations of this imaging modality including high rates of detection of indeterminate pulmonary nodules. Radiomics is the process of extracting and analyzing image-based, quantitative features from a region-of-interest which then can be analyzed to develop decision support tools that can improve skin cancer screening. Although prior published research has shown that delta radiomics (i.e., changes in features over time) have utility in predicting treatment response, limited work has been conducted using delta radiomics in skin cancer screening. We found the best improved area under the receiver operating characteristic curve (AUC) was 0.822 when delta features were combined with conventional features versus an AUC 73 for conventional features only. Overall, this method demonstrates the important utility of combining delta radiomics features with conventional radiomics features to improve performance of models in the skin cancer screening setting.

III. EXISTING METHOD

The existing system skin diseases and skin cancer are detected using image processing techniques. Laser Scanner skin images of cancer patients are acquired from various hospitals. Using image processing techniques like pre-processing and feature extraction, area of interest is separated. Developing the algorithm, features like area, perimeter and eccentricity are extracted from all the images. The parameter values obtained from these features are compared with the normal values suggested by a physician. From the comparison result, cancer stage is detected. A graphical user interface is developed to scan all the images and display the features and cancer stage. This system can help in early detection of skin cancer more accurately. We will directly program using peripheral interface controller (PIC). Once it is programmed we have to create an event in Ubidots to particular e-mail and mobile number.

Once the program is compiled and ruined, a screen appears on the Mat lab know as skin cancer detection which is having two sections. One is training and another one is testing. Once the training section is completed the testing section begins which includes processes such as open image, pre-process, add noise, filter image, diagnose, show report. After completing all these processes we have to click on send report then patients report will be sent to their relatives, parents, spouse. To classify skin diseases such as Asthma, Chronic obstructive pulmonary disease (COPD), infections such as tuberculosis, skin cancer, pneumonia and other breathing problems. There are many techniques to diagnose skin cancer like X-Ray, Laser Scanner, MRI which detects the skin cancer in advanced stages but our method detects in its early stages. It is a genetic approach method which is more significant.

DISADVANTAGES OF EXISTING METHOD

- The length of the program will be big because of using RISC (35 instructions).
- Program memory is not accessible and only one single accumulator is present.
- Include the need for radiation exposure and the use of a contrast material (dye)
- In most cases, this may make it inappropriate for patients with significant kidney problems.
- Using Laser Scanner some patients may have nausea and vomiting, Headache.

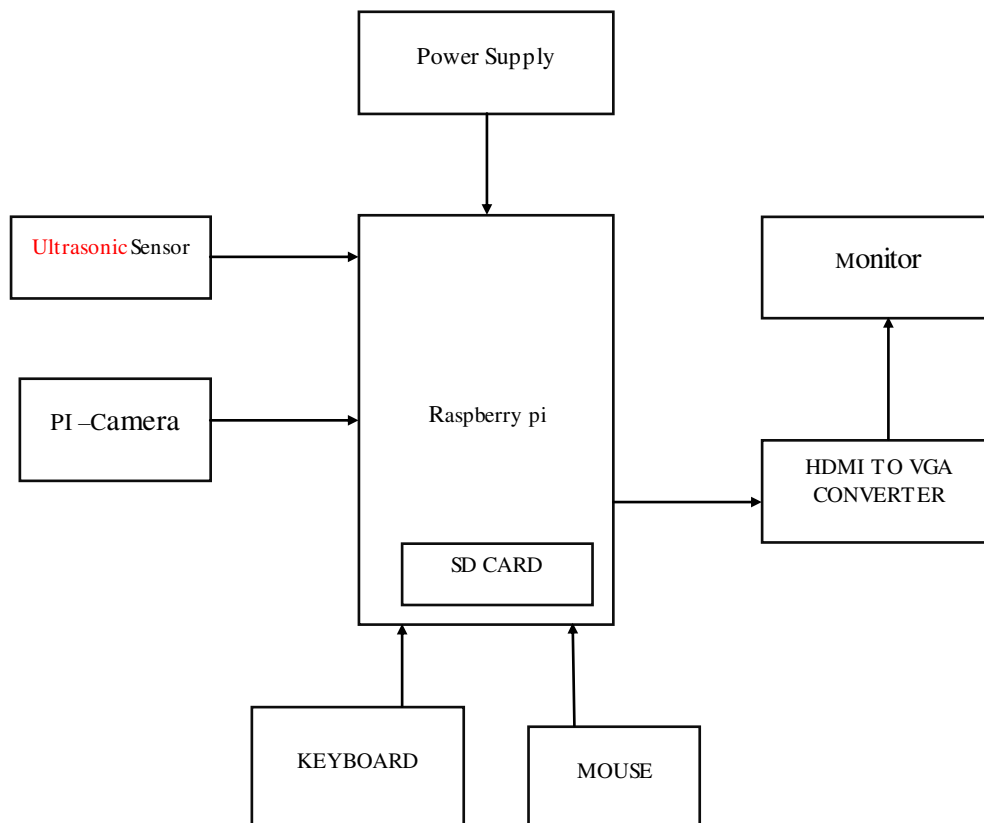
IV. PROPOSED SYSTEM

The proposed goal in this research is the use of Raspberry Pi as the main controller for a portable medical image processing system. After installing the Raspbian operating system and the Python programming language all required hardware components are connected and the power supply is turned on. The system will boot and operate based on the Raspbian Operating System. The system then works on the Python software and checks the network settings to update the Python software with commands in the terminal window. The following packages must be installed to implement the proposed model. Camera settings are activated to take pictures and save them in a folder. Python code is run to check the image is skin cancer affected. The Raspberry Pi is a single computer board with credit card size that can be used for many tasks that your computer does likes games, word processing, spreadsheets etc. Raspberry Pi can be used as a desktop computer the heart of a media center and other applications.

In this proposed system when the input images are given, the processing and the comparison are done with raspberry pi controller. When they display the required output (detecting skin cancer) in our proposed system is to detect skin cancer using images. Our Proposed system is to detect skin cancer using raspberry pi controller in embedded systems. In the 1st stage, skin regions are extracted from user image and are given as input to Raspberry Pi.

In that part each slices are segmented to get tumors. The segmented tumors regions are used to test the patient images. The main objective of this method is to detect whether the tumors present in a patient skin is malignant or benign. The below figure shows the block diagram of the proposed system. As shown in the figure, the trained system will able to detect the cancerous presence in skin.

V. BLOCK DIAGRAM



A. Raspberry pi sensor

The Raspberry Pi 3's four built-in USB ports provide enough connectivity for a mouse, keyboard, or anything else that you feel the RPi needs, but you can still use it if you want to add even more a USB hub. Keep in mind and it is recommended that you use a powered hub not to overtax the on-board voltage regulator. Powering the Raspberry Pi 3 is easy. Just plug any USB power supply into the micro-USB port. There's no power button, so the Pi will begin to boot as soon as power is applied. To turn it off, remove power. The four built-in USB ports can even output up to 1.2A, enabling you to connect more power-hungry USB devices.

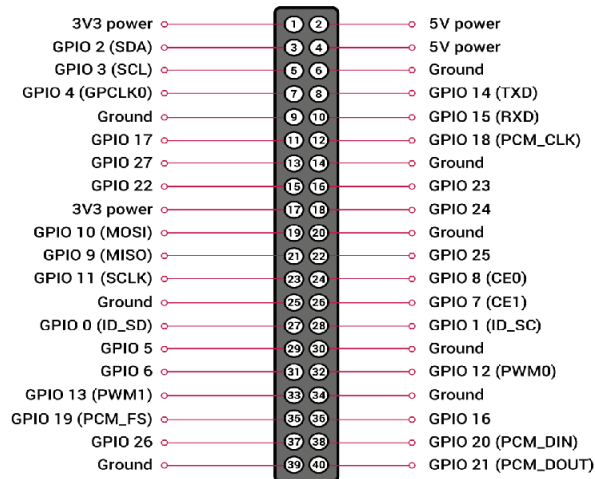


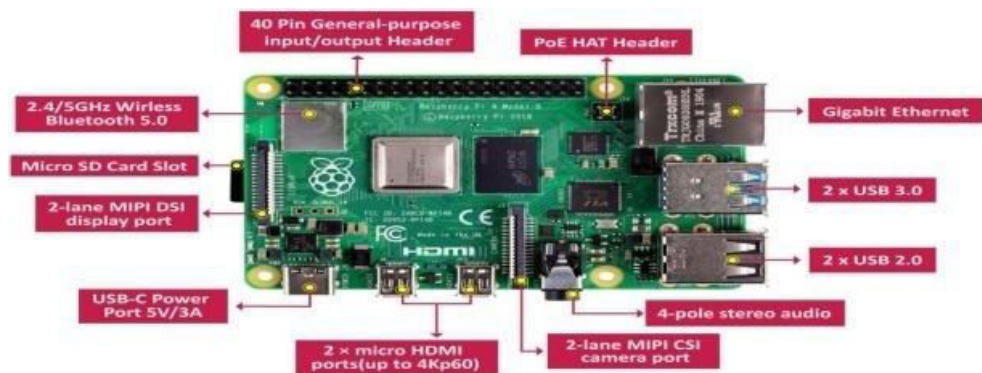
Figure 5.2: Raspberry Pi 3 Sensor Pin Diagram

A powerful feature of the Raspberry Pi is the row of GPIO (general-purpose input/output) pins along the board's top edge. A 40-pin GPIO header is found on all current Raspberry Pi boards (unpopulated on Pi Zero and Pi Zero W). Before the Pi 1 Model B+, boards comprised a shorter 26-pin header.

B. Raspberry Pi OS Set Up

Several power supplies are made specifically for Raspberry Pis, including this model for older Raspberry Pis and this Vilros model for the Pi 4. Some third-party chargers come with on/off switches, but you shouldn't use them to power down. The Pi doesn't have a built-in power switch, so the default way to turn it on is to plug it in. However, to avoid data loss, you'll want to use the shutdown feature in your operating system (OS) before unplugging or switching it off.

C. An OS SD Card



on a micro

There are more than a dozen different OSes for Raspberry Pi, and there's even a way to run full Windows 10 on the Pi 3B. However, Raspbian, a special version of Debian Linux optimized for the Pi, is the best platform for most use cases.

The Raspberry Pi has no internal storage but instead boots off of a micro SD memory card that you provide. Be sure to get a card that's at least 8GB, preferably 16GB or higher, and has class 10 speed. You'll need some sort of card reader to write the OS to it from your PC.

D. RASPBERRY PI CAMERA

The Raspberry Pi has seen several fantastic improvements since its original release, including a new PCB layout, new mounting holes, and a RAM upgrade to 512MB. Following these improvements was introducing the low-price model A Raspberry Pi, which was intended as a cheaper model for education and applications that require lower power. (Just over a year after the initial release of the Model B Raspberry Pi) After some slight delays, the Raspberry Pi

Foundation officially released its first add-on board: the Raspberry Pi camera module. Before the camera module, it was possible to access a camera feed on the Raspberry Pi using a suitable webcam.

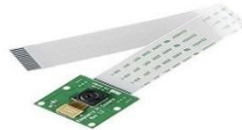


Figure 5.3: Raspberry Pi Camera

Camera functionality had already worked its way into various projects, from live weather monitoring to robotics. However, the Raspberry Pi Foundation's clever folks were aware that if the highly enthusiastic Raspberry Pi community would repurpose their existing webcams, an add-on camera module stood a strong chance of success. The camera module, designed specifically for the Raspberry Pi boards, brought a fair number of features that make it superior to many sophisticated webcams on the market (see the box titled "Camera Specs"). It is easy to see why this camera is now the preferred choice for almost every application that requires a dedicated camera for still photography or video capture with the Raspberry Pi.

E. ULTRASONIC SENSOR

Ultrasonic Sensor: An ultrasonic sensor is a sensor that measures the distance of a respective object by sending the sound wave of a specific frequency. This sound wave is reflected after the collision with the respective object, and the ultra-sonic receiver receives this wave. Distance is measured by calculating sending and receiving time of this sound wave. You may also like to read distance measurement using an ultrasonic sensor and Arduino. A basic operational diagram of an ultrasonic sensor is shown in figure

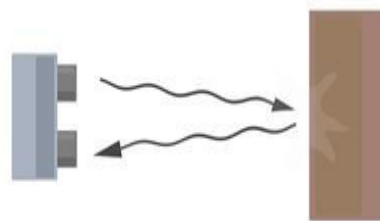


Figure 5.4: The Basic Operation Diagram of Ultrasonic Sensor

The formula measures the distance

$$\text{Distance} = \text{Sound speed} \times \text{time taken} / 2$$

Sound travels through the air with almost speed 344m/s (1129ft/s), and this speed is multiplied by the total time (sending and receiving) of the sound wave. In this formula, because total time is counted, it is divided by 2 to calculate the respective object's total distance. Ultrasonic sensors do not detect some objects due to their improper shape, position and too small size.



Figure 5.6: ULTRASONIC SENSOR



How to Measure Speed with Ultrasonic Sensor

A microcontroller or any Arduino controller must connect with this sensor for measuring speed with an ultrasonic sensor. The ultrasonic sensor consists of two transducers. One is acting as speakers that converts the electrical pulses into sound pulses and then emit them with a high frequency of almost 40KHz. Similarly, the other one acts as a microphone for receiving the sound pulses reflected after the specific object.

Because a microcontroller or any controller is attached with an ultrasonic sensor, the Controller starts to count the pulses when transmitted and stops when the microphone receives sound waves. Based on sending and receiving the sound pulses, the microcontroller or any controller determined to speed of that specific object.

VI. SYSTEM REQUIREMENTS

Hardware Requirements

- Ram size : 8 GB
- Hard disk capacity : 500 GB
- Monitor type : 15 Inch color monitor

Software Requirement

- Operating System: Windows 10
- Language : Python
- Tool : Anaconda

VII. ADVANTAGES OF PROPOSED METHOD

- Lower lobe tumors near diaphragm.
- Dampens tumor motion throughout the respiratory cycle.
- Abdominal compression reduces diaphragmatic excursion with inspiration.
- Huge processing power in a compact board.
- Many interfaces (HDMI, multiple USB, Ethernet, onboard Wi-Fi and Bluetooth, many GPIOs, USB powered, etc.)
- Supports Linux, Python (making it easy to build applications).

VIII. CONCLUSION

An image improvement technique is developing for earlier illness detection and treatment stages; the time issue was taken in account to get the abnormality problems in target pictures. Image superior and accurateness is that the amount factors of this analysis, angel superior appraisal still date wherever were adopted on image detection techniques accurate physicist clarify a part of rules. Image detection using raspberry pi is a form of signal processing where the input from the user images and the output from its skin cancer detected images or a set of characteristics or parameters associated with images. Digital image acquisition usually experiences undesired camera shake and due to unstable camera movements. This image detection concept is implemented in Raspberry pi in the application of medical images. Low contrast images captured using the Raspberry Pi camera module can be scaled up first to identify specific image regions. The most important processing is the removal of noise as a result of noise disturbance during image acquisition on the camera. Due to its small size, which is about the size of a credit card and its lightweight, raspberry pi is very suitable for use as a portable medical image processing system. Besides that Raspberry Pi also consumes low power. We can build a portable medical image detection system using Raspberry Pi hardware and a special camera for Raspberry Pi and Python and Open CV software. Our system can classify the image of the skin whether they are normal or suffer from cancer. The system can do classification automatically and quickly. Besides that, the system that we made is concise, lightweight and easy to carry everywhere.

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