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SKIN DISEASE DETECTION AND TREATMENT USING LASER AND IR THERAPY

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Abstract

This paper aims to detect the skin disease of the patient through the color sensor and hence by analyzing the color sensor input we can determine the exact color of the skin. With the help of above decoded color values of skin we can easily identifies the depth of skin disease that has been affected in the earlier stage itself and gives treatment to skin disease based on the severity of the skin infection. In the proposed system, the skin disease is determined by analyzing the data acquired from the color sensor and further processing it through 8-bit microcontroller core chip. In this system of method, we can determine the skin disease by retrieving the real time data of the patient and hence it has the main advantage of curing the patient at the earlier stage by analyzing the severity of skin disease real time. The skin disease can be cured by providing the laser therapy session when the skin disease is severe and provide Infrared Therapy when the skin disease is in starting stage.

Keywords: Skin Disease, Color sensor, Infrared Therapy, Severity

1. INTRODUCTION

The largest organ of human body is "Skin", an adult carries around 3.6 kg and 2 square meters of it. Skin acts as a waterproof, insulating shield, guarding the body against extremes of temperature, damaging UV lights, and harmful chemicals. There are many factors responsible for a disease to occur such as UV lights, pollution, poor immunity, and an unhealthy lifestyle. There are two major categories in which the lesions (spot) of skin disease are classified; benign and malignant skin lesions. Most of the skin lesions are benign in nature which is gentle and non-dangerous, whereas those which are dangerous for patient's health and evil in nature are malignant skin lesions such as melanoma skin cancer. There are many technologies available in the medical science for diagnosis of skin diseases. But the computer based automatic diagnosis is quite more useful for medical decision support and makes the entire process fast.

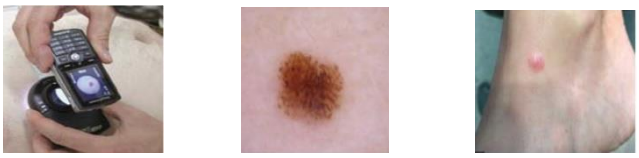
Diagnosis of skin disease from an image is a challenging problem as there exist many skin diseases. Researchers reported following problems during skin disease classification: 1) A disease may have many lesion types. 2) Many diseases may have a similar visual characteristic, which is often confusing for the dermatologist as well to

identify the disease by visual inspection. 3) The varying skin colors and skin type (age) introduce more difficulty in computer-based diagnosis. Therefore, relevant

2. EXISTING SYSTEM

There are many technologies available in the medical science for diagnosis of skin diseases. Mainly by the computer based automatic diagnosis system. It requires more time to process the result. The image is captured with normal or digital camera. This type of image may have different lightening, resolution and different angle depend on the type of camera used for capturing the image.

For computer aided diagnosis, thermoscopic images are more useful. These images are produced using dermo scope [16], which is an instrument used by dermatologist to analyze the skin lesions. The dermo scope usually has uniform illumination and more contrast. As the device has bright illumination, the lesions are clear enough for visualization and recognition. Furthermore, processing of thermoscopic images become easy because the images have less noise. Fig.1 (a) illustrates the way to capture thermoscopic image, (b) presents the thermoscopic image and (c) shows the clinical image.



(a) (b) (c)

Fig. 1. (a) Image acquisition using Dermoscope
(b) Dermocopic Image
(c) Clinical Image

3. PROPOSED SYSEM

AC mains are described in order to fetch the power from the AC main source and which is further step downed by thestep-down transformer in order to get the low voltage AC signal from the high voltage Ac signal. Thus obtained AC signal is processed through bridge rectifier in order to extract the DC voltage which is required to operate the microcontroller. Thus the obtained DC source is an unregulated and rippled DC power source, the capacitive filter and voltage regulator like 7805 are used to obtain regulated DC power source for the microcontroller operation.

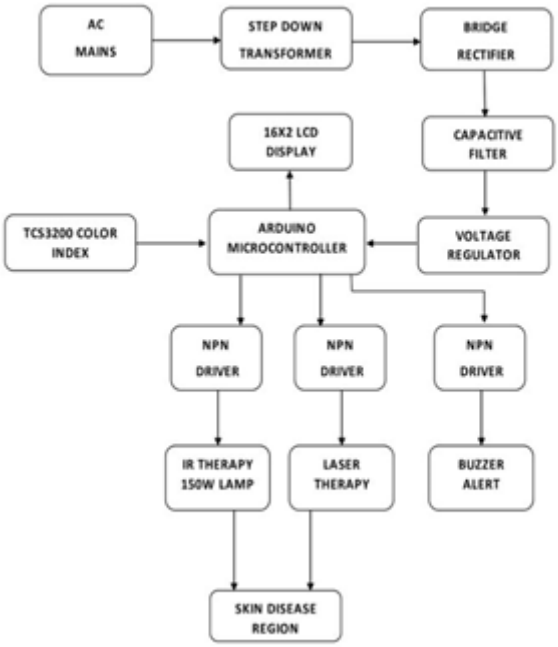


Fig 2 – Block Diagram

Power Supply - A regulated power supply is an embedded circuit; it converts unregulated AC (Alternating Current) into a constant DC. With the help of a rectifier, it converts AC supply into DC. Its function is to supply a stable voltage (or less often current), to a circuit or device that must be operated within certain power supply limits. The output from the regulated power supply may be

alternating or unidirectional, but is nearly always DC (Direct Current). The type of stabilization used may be restricted to ensuring that the output remains within certain limits under various load conditions, or it may also include compensation for variations in its own supply source. The latter is much more common today. Feature selection for such diseases is very important in computer-based diagnosis in order to identify it correct.

Transformer - The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output. It is a general-purpose chassis mounting mains transformer. Transformer has 240V primary windings and center tapped secondary winding. The transformer has flying colored insulated connecting leads (Approx. 100 mm long). The Transformer act as step down transformer reducing AC - 240V to AC - 12V. Power supplies for all kinds of project & circuit boards. Step down 230 V AC to 12V with a maximum of 1Amp current. In AC circuits, AC voltage, current and waveform can be transformed with the help of Transformers. Transformer plays an important role in electronic equipment. AC and DC voltage in Power supply equipment are almost achieved by transformer's transformation and commutation

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Electromagnetic induction produces an electromotive force within a conductor which is exposed to time varying magnetic fields. Transformers are used to increase or decrease the alternating voltages in electric power applications. It is a step-down transformer in which the secondary winding is more than primary winding. Due to this winding, it can able to step down the voltage. A Transformer changes electricity from high to low voltage or low to high voltage using two properties of electricity.

Bridge rectifier - When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. The positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow. The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3. One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier. One advantage of a bridge rectifier over a conventional full wave

rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits. The peak voltage developed between points X and y is 1000 volts in both circuits. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts. The maximum voltage that appears across the load resistor is nearly-but never exceeds-500 v0lts, as result of the small voltage drop across the diode. Current flows through the load during both half cycles of the applied voltage. In the bridge rectifier shown in view B, the maximum voltage that can be rectified is the full secondary voltage. Therefore, the peak output voltage across the load resistor is nearly 1000 volts. With both circuits using the same transformer, the bridge rectifier circuit produces a higher output voltage than the conventional full-wave rectifier circuit. In the conventional full-wave circuit, the peak voltage from the center tap to either X or Y is 500 volts. The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3. One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows.
The current flow through RL is always in the same direction.

Voltage Regulator **-** Regulator IC units contain the circuitry for reference source, comparator amplifier, and overload protection all in a single IC. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts.

The series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts. A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts. For ICs microcontroller, LCD - 5 volts. For alarm circuit, op-amp, relay circuits -12 volts.

Microcontroller Unit **-** Arduino is an opensource project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

Liquid Crystal Display - LCD stands for liquid crystal display. They come in many

sizes 8x1, 8x2, 10x2, 16x1, 16x2, 16x4, 20x2, 20x4, 24x2, 30x2, 32x2, 40x2 etc. Many multinational companies like Philips Hitachi Panasonic make their own special kind of LCD'S to be used in their products. All the LCD'S performs the same functions (display characters numbers special characters ASCII characters etc.) Their programming is also same and they all have same 14 pins (0-13) or 16 pins (0 to 15). Alphanumeric displays are used in a wide range of applications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc.

TCS34725 (Color Sensor) **-** The TCS34725 device provides a digital return of red, green, blue (RGB), and clear light sensing values. An IR blocking filter, integrated on-chip and localized to the color sensing photodiodes, minimizes the IR spectral component of the incoming light and allows color measurements to be made accurately. The high sensitivity, wide dynamic range, and IR blocking filter make the TCS3472 an ideal color sensor solution for use under varying lighting conditions and through attenuating materials. The TCS34725 color sensor has a wide range of applications including RGB LED backlight control, solid-state lighting, health/fitness products, industrial process controls and medical diagnostic equipment. In addition, the IR blocking filter enables the TCS34725 to perform ambient light sensing (ALS). Ambient light sensing is widely used in display-based products such as cell phones, notebooks, and TVs to sense the lighting environment and enable automatic display brightness for optimal viewing and power savings. The TCS34725, itself, can enter a lower-power wait state between light sensing measurements to further reduce the average power consumption.

Infrared LED **-** Red light therapy (RTL) is a treatment that may help skin, muscle, tissue and other parts of body heal. It exposes to low levels of red on near infrared light, infrared light is a type of energy eye can't see, but body can feel as heat.

Laser **-** Laser stands for **Light Amplification by the Stimulated Emission of Radiation**. One basic type of laser consists of a sealed tube, containing a pair of mirrors, and a laser medium that is excited by some form of energy to produce visible light, or invisible ultraviolet or infrared radiation. Laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation.

4. HARDWARE SETUP

The figure represents the overall hardware implementation of skin disease detection and treatment using laser and IR therapy.AC mains are described in order to fetch the power. Which is further step-down transformer. Thus obtained AC signal is processed through bridge rectifier. Thus the obtained DC source is an unregulated and rippled DC power source, the capacitive filter and voltage regulator like 7805 are used to obtain regulated DC power source for the microcontroller operation. The color sensor detect the skin disease of the patient through the color sensor and hence by analyzing the color sensor input we can determine the exact color of the skin. With the help of above decoded color values of skin we can easily identifies the depth of skin disease that has been affected in the earlier stage itself and gives treatment to skin disease based on the severity of the skin infection. The skin disease can be cured by providing the laser therapy session when the skin disease is severe and provide Infrared Therapy when the skin disease is in starting stage

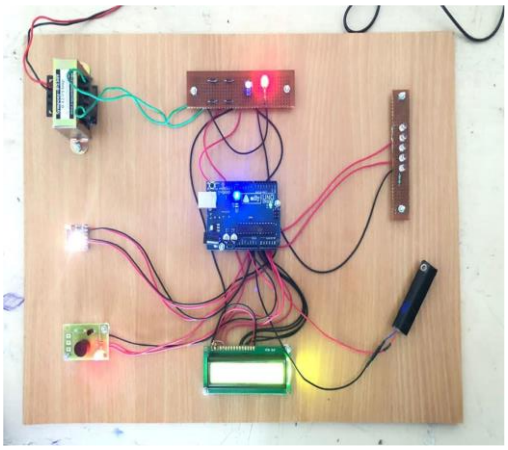
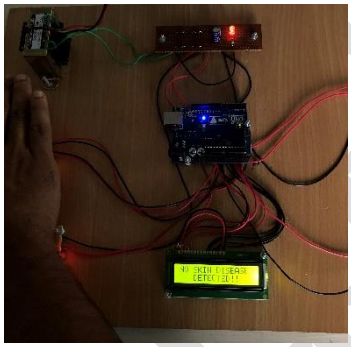
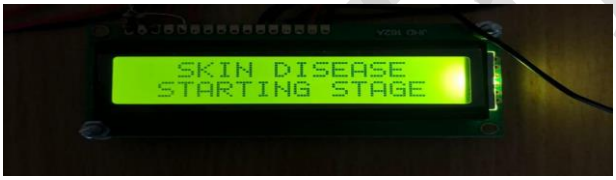


Fig 3 – Hardware Setup

5. RESULT



(a)



(b)

(C)

Fig – 4 (a), b), (c) - Output Display

6. CONCLUSION

By using this project we have tried to identify the skin disease using color sensor (TCS34725) .Our system helps to detect the skin disease initial stage and treat it as soon as possible. In future work, we can classify the disease based on color and their frequency. We can use more color sensors in future progress in the treatment. Self-detection and self-diagnosis of skin disease will help the patient to get treatment initial stage. They don't need to go to the doctor.

7. REFERENCE

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