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Skin disease prediction using Arduino UNO and UV sensor

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Abstract

The human bodies are covered with skin at the outermost side and tissues in the innermost side. The skin in the human bodies is acting as the barriers that prevent the entering of virus, bacteria and other harmful organism inside the body.

The skin disease is the most common and challenging diagnosis in the daily life. Most of the occurrence in the skin disease was not reported. Since there is the lack of infrastructure and medical services.

In this study, the neural network based on the image analysis is used to predict the skin disease. Skin disease prediction is the time saving process that involves in identifying the type of disease and the report the patient about the type of the disease.

The existing of this system was the device like wristbands and patches measure UV exposure. They often connect to smartphones to track data and provide alerts when UV levels are high. Some apps analyze exposure data to assess potential skin risks.

The proposed system combine the sensors to gather comprehensive environmental data. This would allow for a more accurate assessment of skin health risks.

This technique is the web based application that makes easy for the patient to check themselves about the type of the disease. The results are accurate and are available to the patient by the web page.

Keywords: Skin disease; Arduino; UV exposure; Neural networks; Web application; Smart phones

1. Introduction

Skin diseases are often referred as the environmental condition that affect the skin and make the cause and change in their texture, appearance etc…, It has been recorded that from 1990 to 2021 the skin disease was increased in the world wide by 67.93%.67.73% and 66.77% respectively.

At specific from 2022 to 2024 it was eliminated that 1.8 billion people were affected at the any given time. The major cause of skin disease was due to environment factors like irritants, allergens and excessive sun exposure can trigger the skin condition like skin cancer.

The minor cause is lack of hygiene, stress, diet, and the environmental changes. The specific cause of the particular skin may vary based on many cases multiple factors and may contribute to its development.

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The proposing system could combine the sensors to gather the comprehensive environmental data. This allows for a more accurate assessments of skin health risks.

Even though the users and patients can use the available hospital system or medical facilities to predict the skin disease. In the already existing system the android applications are used.

The main aim of this system is the user can just use the Arduino uno board and sensors attached with gym stapes to predict the skin. This can predict all the types of skin by using the web application. The people can just test their skin by using the simple steps. The user need not to know about the functionalities of the application.

This writing provides the clear and detailed discussion of the image processing techniques that are used in the skin disease by using the simple web based application.

2. Literature review

[1] Prathamesh Karande et.al (2023) highlighted to make the hardware to showcase and collect the live UV index, temperature, moisture of the skin in the particular area. As the final result it was designed with the android application to detect everyone skin in the world and severity of the disease.

[2] Amani Yousef Owda et.al (2022) highlighted to conduct the reflectance measurements in a more diverse population with healthy and diseased skin in both gender. As the result to use these measurements to perform gender based comparison and building the ML algorithm for the automatic prediction.

[3] Taye Girma debelee at.el (2023) had highlighted that to ensure trustworthy and moral applications in clinical settings, concerns including the quality and diversity of training datasets, class imbalance, and the interpret-ability of Al models must be addressed

[4] Jayanth Mohan13 at.el had highlighted that an improved recall in both datasets suggests that the improved precision suggests DinoV2-B is a robust model and can yield a lesser number of false negative diagnoses in the future. The models publically made available through this work can result in quicker and more effective therapy offered by skin specialists, enhancing patient well-being while reducing the financial burden on the healthcare system.

[5] Li Wan et.al (2022) highlighted that Image pre-processing and image augmentation are carried out before inputting the given dataset into the network, which can solve the problem of low classification accuracy caused by the unbalanced distribution of the original data to a large extent.

[6] Changhao Xu et.al (2020) had highlighted that several factors still hamper the practical implementation of skin-interfaced sensors, such as stable and reliable operation in non-ideal conditions, sensitive detection and physiological correlations of more vital biomarkers, and sustainable and flexible power supply for prolonged system operation and wireless communication.

3. Methodology

We can categorize the skin disease by using the neural networks which may help the patient in the diagnosis.

An Arduino – UNO with UV sensor is created to detect the type of skin indexed in the certain area. Labelimg is used to train the dataset. It is the open-source tool to process the image for processing the computer tasks. The dataset is trained and analysis the data based on the indexed skin that can predict the type of skin risk that had occurred. The user can get the detailed information.

Here we had created the skin disease classification by using the embedded – C for the identification of the skin illness from simple photographic images. There are hundreds of images loaded and trained with the datasets.

The user can just start the application and select test now. When the user starts to test the skin the testing skin was evaluated with the images trained with the dataset. If the images wasn't match with the data trained in the dataset it will repeat the process until the image match with pre-processed image.

The block diagram given below (fig 1.1 and fig 1.2) shows the function of skin disease prediction using Arduino uno and uv sensor,

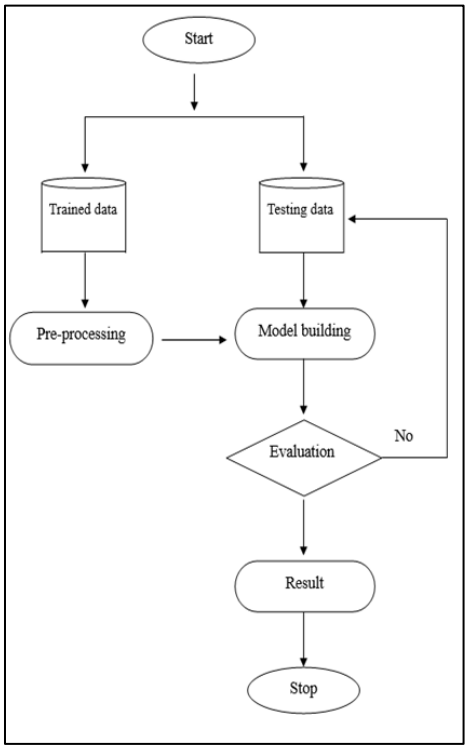

Figure 1 Working of dataset

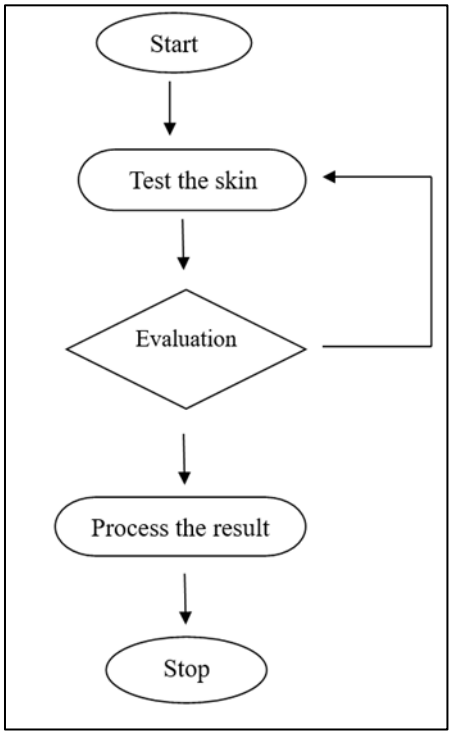

Figure 2 Working of the application

3.1. Hardware requirements

- Arduino-UNO
- USB connector
- Gym strap

3.2. Software requirement

- Arduino IDE
- Interface for running the application
- Visual Studio Code (VS code)

3.3. Language used

- Embedded c
- HTML for designing the interface
- CSS for styling

3.4. Working

The patient should roll the gym strap in the affected area. The uv sensor is attached with the Arduino board. The uv sensor sense the type of cells. If the cells are matched with the pre-processed image it gives the information associated with the particular image. If the cells are not matched with the pre-processed image it will repeat the process until the image is matched with the accurate image. And the information and the steps to be taken are displayed to the user and the application ends.

The image given below shows some of the predefined images,

Figure 3 Model skin disease

The figure and steps are given below shows the sample working of the web based application with the result to the patient,

3.4.1. Step-1:

- Open the web application to sense.
- Click “TEST NOW” to sense the type of the skin risk.

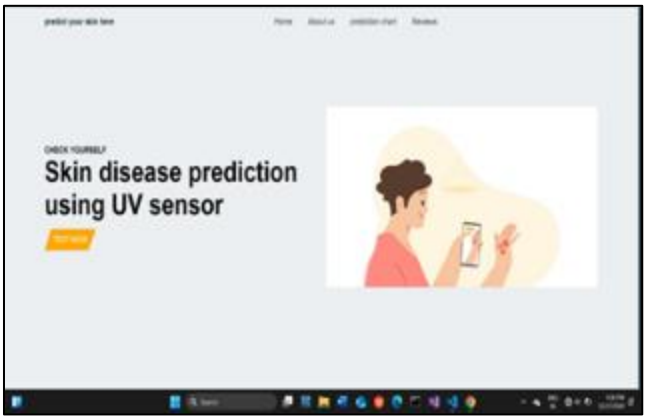

Figure 4 View of the application

3.4.2. Step-2

- Roll the gym strap in the affected area

Figure 5 Way of using the gym strap

3.4.3. Step-3

The results are available to the use and the steps to be taken to prevent the risk in future.

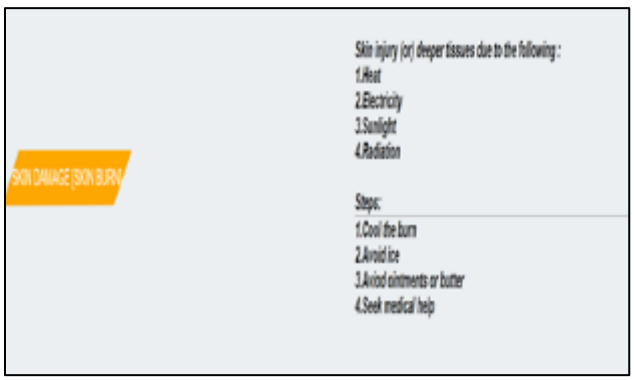

Figure 6 Result to the patient

3.5. Model analysis

To classify and identify the type of skin disease, several researchers had suggested that the image processing-based approach is the simplest way and can easily identify the type.

The Arduino-UNO board is defined for the simplicity, versatility and open source in nature as it is the popular micro-controller board.

The Arduino-UNO is controlled by Arduino IDE. The Arduino UNO board, Arduino IDE, UV sensor, USB connector and a gym strap are used in the skin disease prediction. The IDE must be installed in the laptop or computer to control the performance of the board and sensor. The USB connector acts as a bridge to connect the board and pc to transform the code to the board from the pc. The gym strap is rolled in the patient's affected area to sense the accurate data.

The figure given below shows the simple and basic connection diagram of Arduino board with sensor,

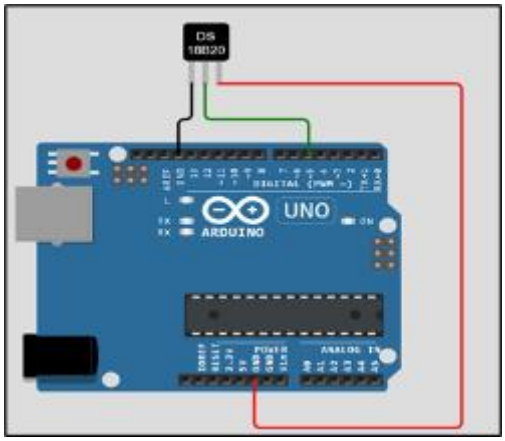

Figure 7 Connecting Arduino with UV sensor

4. Result and discussion

When the user rolled the gym strap on the affected area, the user input ie., the diseases are taken and are processed with the predefined images. The inputs were processed and output available to the patient with the type of disease.

5. Conclusion

The development of skin disease prediction using Arduino UNO and UV sensor offers the unique identification style for the user.

These models are made flexible and can be easily predicted by the patient by his own without seeking the help from others.

The patient can take the necessary step to prevent the skin disease and can easily identify the type of the risk associated with the particular disease.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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