Ideation Phase
Define the Problem Statements

Date	01 October 2022
Team ID	PNT2022TMID33733
Project Name	Project – AI Based Localization and classification of skin Disease with Erythema
Maximum Marks	2 Marks

Customer Problem Statement Template:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

V.S.B. ENGINEERING COLLEGE, KARUR

Department of Information Technology

IBM NALAIYA THIRAN LITERATURE SURVEY

TECHNOLOGY: AI-Based Localization And Classification Of Skin Disease With Erythema.

DOMAIN NAME: ARTIFICIAL INTELLIGENCE.

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ABSTRACT:

This article presents a new method for analyzing the spreading of skin erythemas. These occur as a result of the cutaneous vascular axon reflex which can be evoked by a noxious stimulation of the skin. Series of true-color images of the observed skin patch were recorded using a video camera. The images were digitized and stored on computer disk. The delineation of the reddening was segmented for every image of the sequence by a newly developed image processing method. Each image taken after the noxious stimulation was compared with the baseline before the stimulation and each image point was classified as: "unchanged" or "changed skin color." To improve the classification the CIE L a b color space was used. The boundaries of the erythema were extracted from the resulting binary images. Every image of a sequence was analyzed in the same way in order to follow the time course of the flare response. The erythema reaction could be determined in an objective way using this methods. The automatically detected flare sizes were independent of human observers and had a high spatial and temporal resolution. It was used for a crossover study to assess the power of new drugs which modify the blood flow of the skin induced by an intradermal histamine application.

INTRODUCTION:

An injury of the human skin induces a reddening around the stimulus site (flare). It was suggested by Bruce and Lewis [1], [2] that the flare response could be explained by the axon reflex. After noxious stimulation of the skin afferent nerve fibers are activated. They generate action potentials which travel toward the spinal cord, but they also spread antidromically via axon collaterals. This leads to the release of neuropeptides such as substance P or CGRP which induce a dilatation of the blood vessels and the reddening of the skin. The extension of the flare is determined by the anatomical arrangement of the nerve fibers and the innervation of the blood vessels. Some minutes after a noxious stimulus, the size of the flare reaches its maximum size. The extension and the progress of the reaction are dependent on the quality and the intensity of the stimulus. The reddening can be seen after mechanical, chemical, or electrical stimulation of the skin. Thus, the investigation of the flare response can be used to determine the size of the receptive fields of afferent nerve fibers and gives new insights into the mechanisms and the substances which are involved in this neurogenic driven phenomenon.

The reddening was usually traced on translucent paper lying on the skin to determine the size of the flare response [3]–[5]. This procedure depends on the assessment of the human observer and is inappropriate to determine the progress of the response. Another method of monitoring blood-flow changes is the laser Doppler flowmetry, but the registration is limited to a point like area. Using a laser Doppler perfusion imager (LDI) the spatial distribution of the cutaneous blood flow can be measured [6], but the recording of one LDI image takes some minutes. Thus, this method cannot be used if fast changes of the spread of an erythema have to be analyzed.In this work an objective method for determining the time course of the flare response was developed. For this, video images of the observed skin were recorded, digitized, and analyzed by a computer-based image processing system. The advantage of this method is the high spatial and temporal resolution.

LITERATURE SURVEY:

To determine the size of a skin erythema, the reddening was usually traced on a translucent paper lying on the skin [4]. It is difficult, for practical reasons, to use this procedure for the determination of the development of an erythema, because it takes time to mark the reddening precisely. This disadvantage does not apply for image recording using a video camera. Only the time to store the digitized image limits the temporal resolution of the recording. The computer-based analysis of the reddening allows a much more accurate determination of the borderline in comparison with manual tracing. It detects even small details of the erythema which results in a fractal-like structure of the borderline [see Fig. 4(a)]. In addition, every image in the sequence is analyzed in the same way using the same reference image and feature vector for classification.

This allows an objective and reproducible determination of the development of an erythema which is independent of a human observer.

The color of the skin can also be measured with the colorimeter, which uses a standard light source to illuminate the skin under study [8], [9], [14]. By analyzing the spectrum of the reflected light, the CIE L^*, a^*, and b^* values were calculated. With this method, only the color of one distinct point could be determined at a given time. Thus, no measure- ments of the spatial distribution of skin color were possible. In contrast, a video system can record the skin color in series of images with a high spatial resolution. This makes it possible to follow the time course of the color changes and, in parallel, to analyze the spatial spread of an erythema.

The color of an object depends on its reflecting char- acteristics and on the nature of the illuminating light. To obtain identical CIELAB values of the same object during different measurement conditions the CIE specifies a standard illumination. For this study no such standard was used. Thus, the values of reflectance could not be compared between different series of images. However, the CIELAB values that were used to calculate the color differences for the classification were recorded under the same conditions of illumination.

Due to the lack of a reference method which could deter- mine the exact size of the reddening, the results were compared with the standard method which is to mark the reddening by hand. The result was that the area achieved with the computer-ized method was smaller than that marked by the investigators. This can be explained by the following phenomenon: The borders of the erythema traced manually could not follow the small fractal-like details of the erythema extension. Therefore, the investigators usually made borderlines which connected the outer points of the reddening, but did not consider the small coves between them.

REFERENCES:

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