Challenges and improvements in Smart Bed for Bedsore patient and bedridden patients

Raja S [1], K.S.Vinod[1], Jarugumalli Siva Pradeep[2], Nagi Siva Kumar[3], Y.Maheswara reddy[4], K.V.Sasi Kiran Reddy[5], Y.V.Sri Charan Reddy[6], K.jyothi swaroop reddy[7]

[1]*Assistant Professor, Vel Tech Rangarajan Dr.Sangunthala R&D Institute of Science and Technology, Avadi - 600062, Chennai, India*

[2,3,4,5,6,7] *Pre Final Year Students, Vel Tech Rangarajan Dr.Sangunthala R&D Institute of Science and Technology, Avadi - 600062, Chennai, India*

***Abstract*- The bedsore patient is an allergic health issue and difficult to doctors and patients, medical advisor system, in depth if the patient living year the population increases. Bedsore patients are common chronic wounds that occur as localized injury to the patient skin out layer and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. BEDSOREs range in size and severity of tissue layer affected, with the majority occurring below the waist; particularly vulnerable areas are the sacrum, buttocks, and heels. These factors are common in patients with serious acute and chronic illness and high harmful ratio groups include elderly, medical, cardio/vascular surgical, orthopedic intensive care, end-particular portion terminally ill, long-term care and community care Inflammation in diabetic feet can be early and predictive warning sign for ulceration, and temperature of feet proven to be major factor. Studies have indicated that infrared dermal thermal image processing of foot soles can be one of the important parameters for assessing the risk of diabetic foot ulceration. This work covers the feasibility study of using infrared images, to acquire the spatial thermal distribution on the feet soles. With the obtained infrared images automated detection through image analysis was performed to identify the hyperthermia. Hyperthermia defined that the temperature difference between two feet should not exceed 2.20C. In present work image processing for foot soles of patients with diagnosed diabetic foot complications are acquired before the ordinary foot examinations. Assessment from clinicians and thermal image processing were compared and follow-up measurements were performed to investigate the prediction. A preliminary case study is presented indicating that dermal thermal image processing in proposed setup can be screening modality to timely detect pre-signs of ulceration.**

***Index Terms*—pressure ulcer; bedsore; risk factors; Arduino; smart bed.**

I. INTRODUCTION

Static body support surfaces are mainly low tech constant low pressure (CLP) systems [1]. These are classified as foam, air, gel, water mattresses .Cold foam (also known as conventional foam) mattresses are made of polyether foam [2].After compression it recovers very quickly to its original shape. The foam shows "no memory" behavior. In early days, cold foam mattresses were used to prevent the pressure sores [3]. Viscoelastic foam mattresses (memory foam mattresses) are also made from polyurethane, but they are generally less springy and maintain a sense longer, "remembering" the shape of patient's body. This type of mattresses has been used in many bedsore patient prevention researches [4]. ROHO 3 is a very air filled mattress used widely to treat BEDSORE. This type of support surface system [5] is a constant low pressure (CLP) device in which the patient can be comfortable so that the weight is distributed over a greater surface area. The degree of patient immersion is controlled by the volume of air introduced into the air cells with a hand [6]. The unique design of each individual air cell allows for maximum patient skin out layer contact and pressure area relief. It is also used in ward and operating theatre situations and also comes with a waterproof therapeutic cover if patient incontinence becomes an issue [7].

II. PROCEDURE FOR PAPER SUBMISSION

A. Review Stage

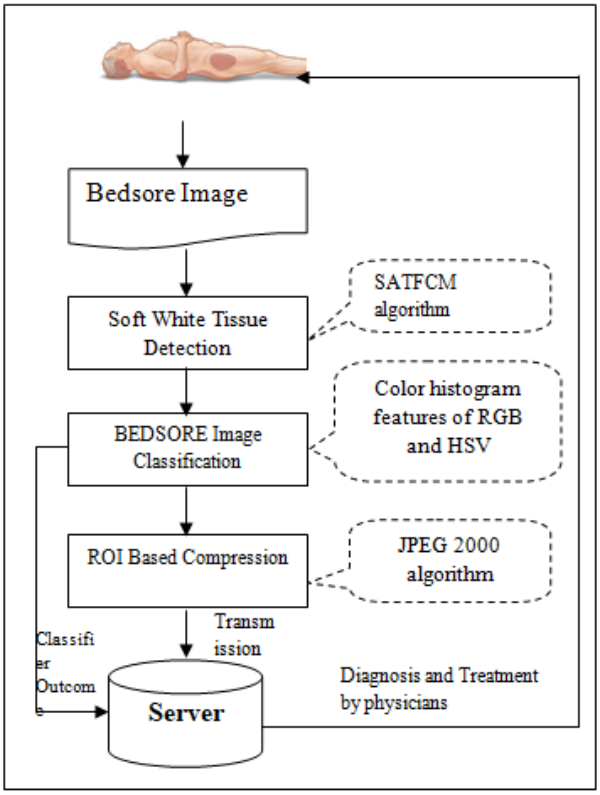

Figure 1 Overall design of smart controlled bedridden patient management system

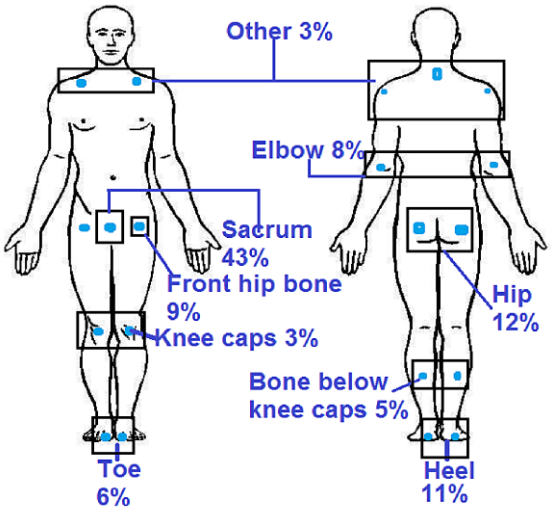

Fig.2; Place of frequent stress at human body and Bedsore patient occurrence rate in human body

III.EXISTING SYSTEM

A. Bedsore patient cultivated in particular portion 1

Non-blanchable erythema refers the intact patient skin out layer with non-bleachable redness of a localized area usually over a bony prominence. The reddened area remains red after the pressure is relieved.

Fig. 3; A patient named Kumar with heel bedsore patient

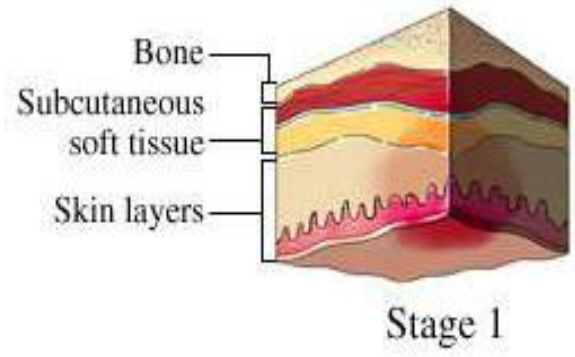

Fig. 4 ; Bedsore patient cultivated in first particular portion1 representation

B. Bedsore patient cultivated in particular portion 2

Thickness damaged in half of the toe, in this particular a shallow open red pink ulcer is visible due to the partial thickness loss of the dermis. It can also be represented as an open serum-filled/serosanguinous filled blister.

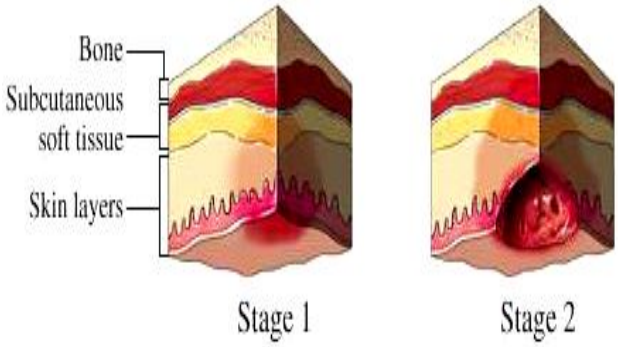

Fig. 5; Bedsore patient cultivated in second particular portion 1representation

C. Bedsore patient cultivated in particular portion 3

Entire affected thickness patient skin out layer Loss: In this particular portion bedsore patient absorbs with almost full thickness patient skin out layer loss and due to this the tissue necrosis delivers in a patient's body but not through bone tendon or joint capsule.

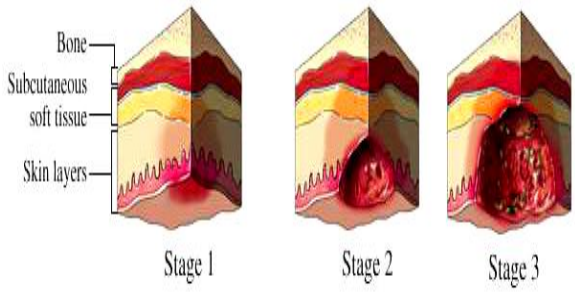

Fig. 6; Bedsore patient cultivated in third particular portion 1representation

D. Bedsore patient cultivated in particular portion 4

This is the final stage: Entire tissue loss with exposed bone, tendon or muscle. Slough may be present. and these ulcers can be shallow. Particular portion 4ulcers can extend into influence and/or subsidiary buildings (e.g. fascia, tendon or joint capsule) manufacture osteomyelitis or osteitis likely to occur.

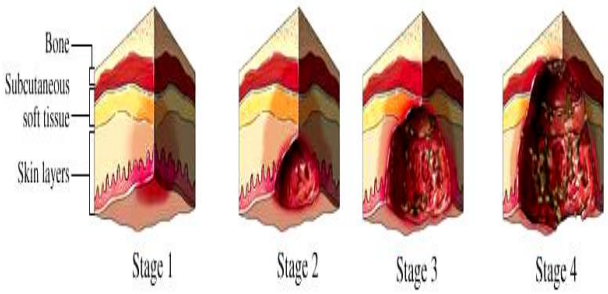

Fig. 7; Bedsore patient cultivated in fourth particular portion 1representation

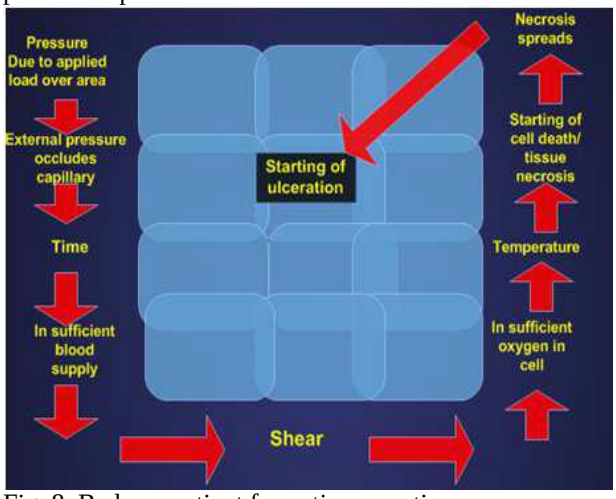

Fig. 8; Bedsore patient formation over time

IV.PROPOSED IDEA

Here the focus is on the analysis for absolute difference between the right and the left foot named as $|\Delta T°|$. The values of $|\Delta T°| > 2.2°C$ are of our interest. So it should be remember that this upper limit could be an early sign of ulcer and the percentage of such points are given as %. Whenever this % is greater than 1%, it corresponds to a surface of 1 cm of diameter in resulted image. It is also the smallest area at risk for the foot. Therefore that limit was chosen here. Hence, this analysis points out a region with significant hyperthermia. Here for better analysis nine images have been taken out of which that a percentage > 1%. Here, the right column shows the contours and pixels such that the value of $|\Delta T°|$ is greater than 2.2°C.Some images show hyperthermia in the heeling region, and some Images reveal toes hyperthermia. The remaining images showed other kind of hyperthermia on the plantar foot surface. When the images are captured by thermal cameras and start the working of protocol of Chan vase algorithm it gradually works on the infected area of the foot, obtained using the image acquisition protocol. Here the background is a homogeneous, and only the plantar surface of the foot appears as a homogeneous white region and the image edges are not very sharp. This image captured by IR thermal camera, is again converted in to Grey Scale image, and it is the pre-processing technique.

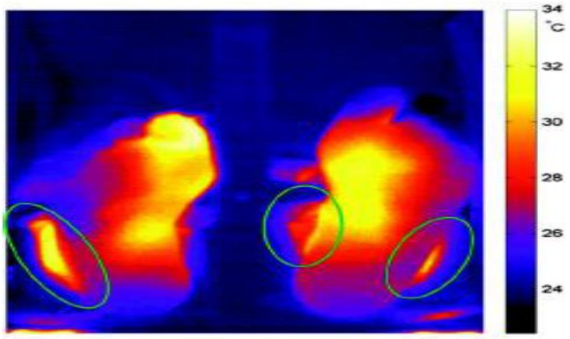

Fig. 10; Acquisition of Thermal Image of foot

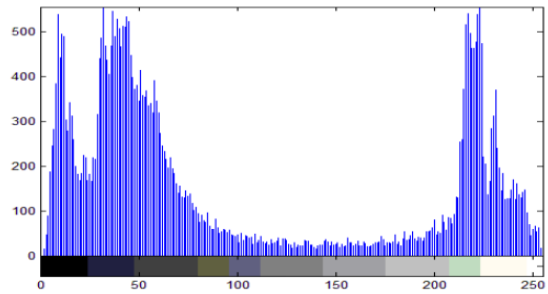

Fig. 11; Histogram of the image of Figure 10

The input image for the image processing method is a plantar infrared foot image as shown in Figure 5.1. It is an image having a resolution of 600x 600 pixels. Instead, from the 100 by100 pixels image of the FLIR i5 sensor, an interpolation concept is performed into the camera to provide this 600 by 600 pixels image. In this image, there is a temperature bar on the right side there is the maximal and minimal temperature indication the thermal image. From this the mean and standard deviation of the plantar foot surfaces of the right and left feet will be calculated. They are named as MR, ML, SR, and SL, respectively. In addition to this, the point to point difference is also of interest. It is to be remembered that temperature of corresponding area of the right and left foot should not generally differs more than 1°C in diabetes patient foot. Therefore, a temperature difference greater than 2.2°C will be considered as a sign of the upcoming possible foot ulcer. Hence, the detection of this increased temperature between the right and left foot is most important parameter for identifying foot ulcer. The absolute differences among the two feet surfaces will be determined it will be named as |ΔT°|. The percentage of points with a |ΔT°| [27] is more than 2.2°C temperature will also be of interest and will be represented as %.

Parameters for ROI of Safe part of feet	Output Images for Various Iterations				
	1500	3000	4500	6000	7500
Area	2110	261	291	300	351
Circularity	0.459	0.451	0.441	0.438	0.422
Solidity	0.8975	0.893	0.8827	0.862	0.843
Eccentricity	0.9045	0.941	0.9523	0.957	0.966
Perimeter	240.108	269.7	288.17	285.33	323.1

Table 1: Comparison table of parameters for various iterations

The table 1 represents the parameters for ROI (Region of Interest) of safe part of the feet. This experimentation has been carried out in order to obtain the best optimal solution. These results are obtained by using MIPAV tool. This comparison table gives the various iterations for various parameters such as Area, Perimeter, Circularity, Solidity and Ecentricity.

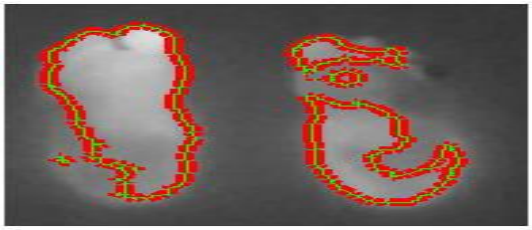

Fig. 12; Output at 4500 iterations Segmented Image

V.CONCLUSION

Decubitus ulcer persistent is the result of question's physiological constraints and body maintenance outward interaction. Although there are several technologies available to detect bedsore patient, none has been adopted as a standard detecting procedure for healthcare. It is in the same way true for avoidance performances. The model embraces Aquatic stumpy groove to describe the biological limitations of topic's harmful ratio factor combined with interfacial pressure at the support surface. Implementation of such a model would allow harmful ratio identification and prevention at the same time-based on the suggestions given the above expert member the future system will harvest the exceptional outcome.

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