IFERP
connecting engineers... developing research

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 5, May 2017

Real-time Facial Disorder Detection Using Internet of Things

[1] K.Asha,[2] Reshma M Gutagi, [3] M.Lorate Shiny
[1][2][3] Assistant Professor, Dept of CSE
[1][2] BNMIT, Bangalore
[3] SSCE, Bangalore

***Abstract*— Today's research emphasis are utilizing on the real-time facial disorders detection (RFDD) by using cameras at public places. These cameras analyse the infected faces and sending it over the WIFI which are becoming more common in the Internet of Things era of today. Recognizing facial disorders is subjective and presently performed by dermatologists. However, with progressive development in the IoT enabling technologies and image processing methodologies, it is now feasible to compute facial skin disorders utilizing digital photographs in real-time applications. In this paper, we put forward a new real-time method for abnormal facial regions recognition and segmentation over the IoT epitome.**

Keywords—Facial fever; Facial disorders; Image segmentation; Internet of Things (IoT)

I. INTRODUCTION

The Internet of Things (IoT) is progressively evolving as a framework to incorporate all recognizable things, in a non-static and communicating network [1][2]. The assurance of intelligent agreements and dynamic systems that could gain benefit from the accumulation and examination of data over the IoT framework is universal. Scholars in communications, R& D departments are fighting to obtain an achievable and robust architecture to attain the benefits of IoT. Internet of Things presume that things, being physical or virtual objects , have digital capabilities and can be recognized and tracked by their adjacent objects, so as to gather data. Data collection in the IoT era can vary from a simple back end controlling application till sophisticated systems and not defined to health and/or traffic monitoring systems in a smart city setup [5].

In this paper, we emphasis on a crucial medical-related application which has deliver a real-time face disorders detection (RFDD). Real-time facial disorder detection is progressively evolving area, in which cameras are being utilized to recognize defects in faces that may need early attention, "Face recognition in orderly image has been a dynamic research area owing to its wide spread applications such as monitoring and surveillance". [6] However, implementation of IoT on this area is an evolving interest among the researchers. IoT looks to make the methods more effective by utilizing all the cameras installed in the city and available WIFI. Attributes like Speed and Accuracy are vital when finding a way to process this image, as FPGA is one of many ways to do it.

McCready [6] with help of the Transmogrifier-2a (TM-2a), which is a customizable hardware having one to sixteen board in two power increment. Every board contained two Altera 10K100 FPGAs individually having 4992 logic cells. Lip tracking unit is a system applied using Microtronix Stratix Development Kit that has an Altera Stratix 40 000 logic element FPGA. The system helps to obtain lip attributes where a motion video is applied to an active buffer and both corners of the mouth are embarked with contrast information from the bottom half of the face [7]. As given [8] on a research regarding facial recognition systems, modern FPGA boards offers number of processing methodologies, sufficient on chip RAM and faster clocks (1, 5, 10). Thereby, enabling FPGA boards perfect tool for image processing. Chuo et al. [9] has suggested a facial recognition system whose image and DVI interface are applied with help of ASIC modified chips with FPGA boards. Chuo et al. [9] further demonstrates that the captured frames of the images are saved in the BRAM of the FPGA.

In this research, RFDD system-scan utilizing FPGA forms a key factor for scientists in progressing the bioinformatics filed. Particularly that the RFDD can be a important tool to

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 5, May 2017

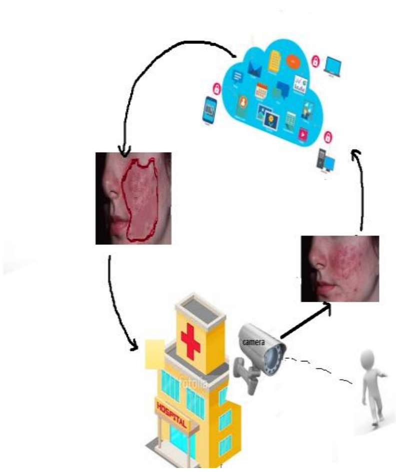

Fig. 1. A real-time face disorders detection (RFDD) system

recognise people with an elevated temperature in dense areas, like airports and railway stations to stop the spread of the disease among people. [10][11]. Moreover, there won't be any queue in hospitals to verify temperature and for external symptoms. A simple RFDD system (see Fig. 1) containing a webcam that has the ability to process the images of incoming patients can recognise all of these signs and send notifications to doctors in emergency cases.

This paper is constructed as follows. Section II demonstrates the work on the suggested method for segmentation of a region with facial disorder using digital images. Section III illustrates the utilized system models in the suggested RFDD architecture. In Section IV, our RFDD framework is explained. A case study of the proposed approach and discussions are provided in Section V, while conclusions are given in Section VI.

II. RELATED WORK

As of late, there has been more concentration in curing facial skin sicknesses/issue at its underlying stages inferable from unfriendly consequences for the patient's wellbeing. For example, infrared warm imaging has turned into a contrasting option to traditional strategies in diagnosing temperature and fever screening to maintain a strategic distance from fever reactions [12].Also, There are 44 regular facial issue that fundamentally requires a RFDD framework [13][14]. Facial redness, including Allergy, Posacea, Psoriasis, Eczema (dermatitis) and Acne, is a typical facial issue worry that can be drawn closer by a RFDD framework. Skin break out for instance, is a standout amongst the most natural facial skin issues that has been focused for delayed time through customary (manual) diagnosing/identification techniques, despite the fact that it had been generally spread worldwide for a long time. Like Acne, most sorts of dermatitis (or peroral-dermatitis), which is a general term for rash-like skin conditions, prompt redness, bothersome and swollen which requires quick treatment.

RFDD frameworks can help dermatologists in accomplishing quantitative assessments of the facial skin sicknesses. There is no RFDD framework yet that can recognize/distinguish the facial issue areas in advanced photos like those previously mentioned. In any case, there have been a few endeavors towards acknowledging RFDD frameworks in the writing. For instance, picture division methodologies, for example, the Level Set Methods (LSMs) [15] that depends on dynamic shape strategies in distinguishing skin growth areas because of a few focal points. As a matter of first importance, change of a division issue into a Partial Differential Equation (PDE) system is conceivable. Second, PDEs can be settled by limited contrast strategies. In addition, picture division can be accomplished intelligently by PDEs in a low computational cost. The principle thought behind the LSM is to speak to a dynamic form as the zero level arrangement of a smooth capacity, which is a higher dimensional capacity called the Level Set Function (LSF), to advance this shape to the edge of the coveted protest. Additionally, an imperative preferred standpoint of the LSM is that geometric properties of the shape can be acquired utilizing a level arrangement of the surface. Since the circular segment length parameterization and the bend subsidiaries are natural and invariant to Euclidean changes [16]. Besides, taking after the shape advancement in three dimensional spaces is like tailing it in two dimensional spaces. What's more, that is on the grounds that engendering surfaces are effectively gotten by broadening the clusters and inclination administrators of the LSF. Likewise, LSFs are marked separation capacities which characterize the nearest remove between every pixel and the zero level set. In this manner, dynamic forms can consolidation or break amid development and handle topological changes. What's more, the LSF stays all in all capacity on the settled Cartesian framework that gives effective calculations. We, then again, go for giving a thorough cloud-based approach in the IoT period for our

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 5, May 2017

RFDD structure that considers these and different strategies, as will be appeared in Section IV.

III. SYSTEM MODELS

In this section, we describe the utilized models in our proposed RFDD system.

A. Peak Traffic Model

We denote the requested peak traffic demand at each candidate region i as [Mbps], where = { : i ∈ R} and R is the set of all candidate regions. we assume another random variable, called , to represent the average arrival rate from a picture generator (camera) i. Where the measuring unit of is [Mbps].

B. Cost Model

Cost is assumed to be a flat rate per number of bytes transmitted/published by the picture generator. Thus, we denote the cost in this research as C, where

$$C = \sum_{j=1}^{k} \sum_{i \in \mu_i} l_i P_i \qquad (1)$$

C. Level Set Method (LSM)

LSM is intermittently re-instated in our proposed RFDD structure as a marked separation work in customary LSMs [15]. The re-introduction issue is settled by changing the technique into a vitality minimization issue and LSM is regularized at every emphasis. The run of the mill introduction process was executed as double for effortlessness and computational effectiveness in our approach. The twofold estimations of the LSM was given as,

$$\emptyset_0(x) = \begin{cases} -k, & if\ x \in R_0 - \partial R_0 \\ 0, & if\ x \in \partial R_0 \\ k, & if\ x \in R - R_0 \end{cases} \qquad (2)$$

where k > 0 is a constant value, R_0 is a subset region in the image Ω , and ∂R_0 corresponds to the edge of the R_0 . Regularization of the LSM is required to avoid degradation and it's achieved by Gaussian filtering to smooth the LSM and keep its regularity.

D. Model for Communication

In this work, we utilize the ZunPhy move locale in view of correspondence model in [21] in the wake of altering for open air conditions. Violating the twofold circle formed model, the transitional area display recognizes an area between the associated and detached areas inside which the likelihood of having the gotten flag quality over a limit esteem equivalent to 80%. We utilize the log ordinary shadowing way misfortune correspondence demonstrate, with qualities for way misfortune type n=4 and standard deviation of the zero-mean Gaussian arbitrary variable X_σ, σ=4. The radios impart in the 2.4GHz ISM band (λ=0.125m), at an information rate of 250kbps [22].

IV. RFDD STRUCTURE

Our proposed RFDD system comes in twofold. In the first place, every anomalous locale in the gathered pictures are generally sectioned utilizing the red parts of the RGB shaded unique photo. The produced picture from this initial step is utilized as a part of the second step in which fine division of the required strange district is connected utilizing grayscale of the hued picture. Identification of limits for each coveted part is accomplished by limiting the comparing vitality work that depends on data about edges and the locale that will be portioned out. Subsequently, our proposed RFDD technique comprises of two stages, which are unpleasant and fine division. The main stage discovers all redness generally with the shading data on the first picture. The created picture from the main stage and the grayscale picture that is gotten from the first picture are utilized as a part of the second stage for fine segmentation.As a rule, our proposed RFDD structure acts as appeared in Fig. 2. It takes facial picture. It sends it to the cloud remotely or by means of an Ethernet association. In the cloud examination and division calculations are connected to distinguish any infection accessibility. If there should be an occurrence of an ailment, the patient is educated by means of a cell phone application and additionally informing framework. Lastly a doctor is reached if vital.

V. USE-CASE

In this section, we give an example in which an RFDD approach was successful in identifying and extracting a facial disorder in a real case study. Our use case is described in two phases according to the aforementioned RFDD framework as follows.

A. RFDD 1st Phase

The objective of this stage is to concentrate every single unusual locale from the first picture as indicated by power of shading segments (i.e., red, green and blue hues). Redness on a RGB shaded picture distinguishes that the estimations of red shading segments are higher than the

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 5, May 2017

estimations of the other hues' segments (the green and blue hues). Thusly, a picture is gotten by taking the distinction between the red and green hues' qualities while keeping up the figured cost in Eq. (1). After the distinction operation, the produced picture will demonstrate a rosy area as splendid dim or white. We can see the rosy part brighter in the wake of normalizing the power values. In this manner, the standardized picture is then utilized for grouping of power qualities utilizing K-implies calculation, which is an unsupervised approach [17]. In the wake of figuring angle of the bunched image, edges of reddish regions are obtained.

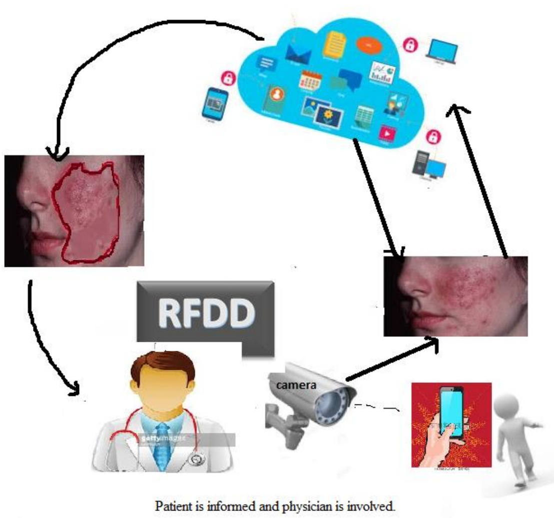

Fig. 2. An overview of the proposed RFDD Framework.

B. RFDD 2nd Phase

In this stage, a fine division approach is connected to give precise division of sub-pixels utilizing Eq. (2). Introductory data, which is the underlying shut bend drawn by a client inside the anomalous ruddy locale that will be extricated, is utilized. The underlying bend assesses iteratively beginning from its underlying area and stops when it achieves the edges of the ruddy locale as opposed to halting at a given greatest number of emphases, which can vary starting with one picture then onto the next. It is not clear how the best number of emphases ought to be resolved. Consequently, the fine division stage gives exact and quick outcomes that expansion its productivity as far as required handling time.

In like manner, run of the mill Wireless Sensor Networks (WSNs) in the period of IoT can advance various human services applications [18]. In our proposed RFDD design, restorative sensors can be at first put on the body of the patient and additionally in medicinal offices, thusly, to detect and gather the patient's information, similar to pulse rate, beat rate, body-temperature et cetera. At that point, the medicinal experts may acquire ongoing detecting information by means of officially existing remote correspondence frameworks and show it on cell phones and hand held gadgets [19][20].

VI. CONCLUSION

In this paper, we proposed two phase RFDD framework for image segmentation in the IoT era healthcare applications. In the first phase, K-means algorithm is applied and all reddish regions are clustered roughly. In the second phase, active contours are used for detection and segmentation of the desired boundaries of the abnormal facial region. RFDD does not include a training stage, which is essential in any real-time application in IoT. Also, this makes the proposed method more reliable than supervised methods.

REFERENCES

[1]F. Al-Turjman, “Information-centric sensor networks for cognitive IoT: an overview”, Annals of Telecommunications, pp. 1-16, 2016.

[2]F. Al-Turjman and H. Hassanein, “Towards augmented connectivity with delay constraints in WSN federation”, Inderscience: International Journal of Ad Hoc and Ubiquitous Computing, vol. 11, no. 2, pp. 97-108, 2012.

[3]G. Singh, and F. Al-Turjman, “Learning Data Delivery Paths in QoI-Aware Information-Centric Sensor Networks”, IEEE Internet of Things Journal, vol. 3, no. 4, pp. 572 – 580, 2016.

[4]F. Al-Turjman, H. Hassanein, and M. Ibnkahla, “Towards prolonged lifetime for deployed WSNs in outdoor environment monitoring”,Elsevier Ad Hoc Networks Journal, vol. 24, no. A, pp. 172 – 185, Jan., 2015.

[5]G. Singh, and F. Al-Turjman, “A Data Delivery Framework forCognitive Information-Centric Sensor Networks in Smart OutdoorMonitoring”, Elsevier Computer Communications Journal, vol. 74, no. 1, pp. 38-51, 2016.

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 4, Issue 5, May 2017

[6]Rob J. McCready, "Real-Time Face Detection on a ConfigurableHardware Platform" University of Toronto, 2000.

[7]Duy Nguyen, David Halupka "Real-Time Face Detection and Lip Feature Extraction Using Field-Programmable Gate Arrays" 2006

[8]Messaoud Mostefai, Mechta Djamila, Youssef Chahir "Efficient Real Time Face Tracking Operator Study and Implementation with Virtex FPGA Technology" University of Bordj Bou Arreridj, Algeria. 2007

[9]Junguk Cho, Shahnam Mirzaei, Jason Oberg, Ryan Kastner "FPGA-Based Face Detection System Using Haar Classifiers" University of California, San Diego United States.

[10]Marzec, M., Koprowski, R., Wróbel, Z., Kleszcz, A., Wilczyński, S. "Automatic method for detection of characteristic areas in thermal face images". Multimedia Tools Appl. DOI 10.1007/s11042-013-1745-9. 2013.

[11]Chan, L.S., Cheung, G. T. Y., Lauder, I.J., Kumana, C.R. "Screening of fever by remote sensing infrared thermographic camera", J. Travel Med, vol. 11, 2004, pp. 273-279.

[12]M. Z. Hasan, F. Al-Turjman, H. Al-Rizzo "Evaluation of a Duty-cycled Protocol for TDMA-Based Wireless Sensor Networks", In Proc. of the International Wireless Communications and Mobile Computing Conference, Paphos, Cyprus, pp. 964-969, 2016.

[13]http://www.healthline.com/health/skin-disorders (April, 2015)

[14]http://www.dermnetnz.org/site-agespecific/face.html (April, 2015)

[15]S. Osher, R. Fedkiw, "Level Set Methods and Dynamic Implicit Surfaces", Springer-Verlag, New York, 2002.

[16]Kimmel R. "Numerical Geometry of Images: Theory, Algorithms and Applications". ISBN: 0-387-95562-3, Springer-Verlag, New York, Inc., 17-45, 2003.

[17]Anderberg M.R. "Cluster Analysis for Applications", New York, NY, USA: Academic Press, 1973.

[18]F. Al-Turjman, H. Hassanein, and M. Ibnkahla, "Efficient deployment of wireless sensor networks targeting environment monitoring applications", Elsevier: Computer Communications Journal, vol. 36, no. 2, pp. 135–148, Jan. 2013.

[19]F. Al-Turjman, "Impact of User's Habits on Smartphones' Sensors: An Overview", HONET-ICT International IEEE Symposium, Nicosia, Cyprus, pp. 70-74, 2016.

[20]F. Al-Turjman, "Hybrid Approach for Mobile Couriers Election in Smart-cities", In Proc. of the IEEE Local Computer Networks (LCN),
Dubai, UAE, pp. 507-510, 2016.

