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Cloud based Smart Healthcare Management System Using Blue Eyes Technology

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Abstract- *In the present current world, medical care the board framework is becoming as an arising research region. In medical care, still manual work invest in some opportunity to quantify numerous boundaries of a patient. Likewise, as of late there is a broad interest for talented laborers in the field of medical care. To lessen the manual work, an answer is proposed to mechanize all the patient observing exercises through Blue Eyes Technology. The primary thought is to involve the BET for the advancement in medical care the board framework and to screen a patient with the assistance of BET. It estimates different boundaries that incorporate feelings, mind-set varieties, circulatory strain, pulse, skin temperature , and electrocardiogram. The significant advances included are interaction of empowering detecting to a gadget, so it can detect a few fundamental measurements of an individual, then, at that point, human feeling discovery includes the most common way of noticing various feelings of a human which incorporates joy, trouble, dread, outrage, shock and repugnance lastly, answer suitably and appropriately assuming any basic circumstance happen*

Keywords: *Blue Eyes Technology, Health care management, IoT, Cloud*

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I. INTRODUCTION

Inmostofthecountries,thepatientmonitoringisdonemanuallybyanurseor acaretaker whohastoperformcontinuous measurement of patient parameters such as heartrate, blood pressure, temperature, ECG, etc . Also, thesework gets delayed if done manually. The Health care systemsare facing variousissues that includes lack of public healthcareknowledge,shortageofemployeesinthehospitals,extremecostsforadvanceddegrees,etc.Nowadays, morepeopleneedhealthcaresupport.

In many hospitals, Health monitoring requires additional customhealthcaresoftwareandthereprevailsadoubtfulreliability due to variations of accuracy . Moreover, Real-Time Health Monitoring Equipment'sdeployment is highlydependentonanextensivewirelesstelecommunicationsframework, which may not be available or feasible in ruralareas.Tosurmountheseissues, anautomatedpatientmonitoring system is proposed to provide an excellent care tothepatients.

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II. LITERATUREREVIEW

Withtheadvancementsinvarioustechnologies, there isanotableincreaseinprocessautomation.Someofthetechnologies that will be helpful for implementing automationinthefieldofheathcareareasfollows:

a) BlueEyesTechnology

International Business Machines conducted a research onBlue Eyes Technology at Almaden Research Center (ARC)in California since the year 1997. The technology providesuser-friendly facilities. It enables a machine to understand ahumanbeingandreactappropriately.Thesystemcomprisesoftwoimportantdevicesnamely, theemotionmouse and the expression glass. It also includes AI speechrecognitiontogatherphysiological data; MAGIC (Manualand Gaze Input Cascaded) for the selection of a target andreduce the cursor movement; SUITOR (Simple User InterestTracker)fortrackingauser'sbehaviourandaneyemovementsensor tomeasuretheeyemovement . ThemainfeatureofBETistoimparthumanpower to acomputer.

b) InternetofThings

Internet of Things – IoT is a platform through which datatransferismadereliable.IoTdeviceshastheability togenerateahugeamountofdatawhichcanbethenusedby

Artificial Intelligence.UsingIoTthefollowingbenefitsareachieved:

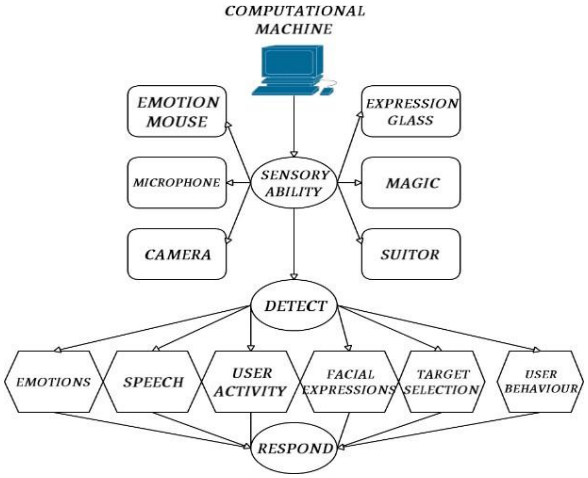

Fig1.BasicarchitectureofBlueEyes Technology

- Easierdatatransmission.
- Communicationandcontrolaresimplified.
- Costeffective, savestime

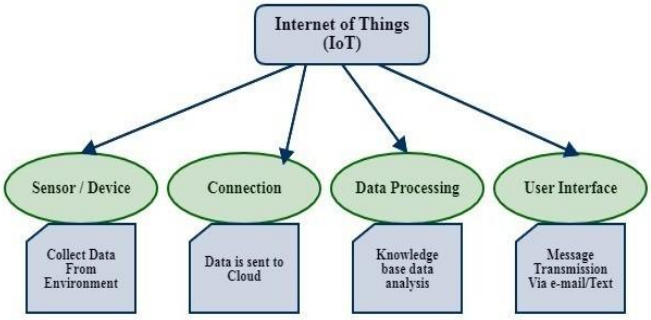

Fig2.IoTPlatform

c) CloudComputing

Insimpleterms,cloudcomputingoffersavarietyofcomputingservices,includingservers,storage,databases,networking,software,analytics,andintelligenceovertheInternet. Inthehealthcare industry, cloud computingenablesbetter storage at a minimal cost, use of big data toenhancethepatients'treatment,improvedcollaboration,effectivedatasecurityandmanyotherrelatedbenefits.

III. PROPOSEDSYSTEM

Onacompleteanalysisontheexistingpatient monitoringsystem, the following solution that involves implementation ofBET in patient monitoring system is addressed. The proposedsystemobservesapatient'sheartrate,bloodpressure,temperature,emotionlevelandECG.Theobjectivei

s toensure 24/7 monitoring for patients and reduce manual work.Here, inthissystem, aspecializedautomatedcarecanbeimplemented. Theaim of Blue Eyes Technology is to givehumanpowerorabilitiestoamachine.IoTisanemerging

interconnectiontechnologythatfacilitatescommunicationbetweendevices.Here,theamalgamationofBlueEyes TechnologywithInternetofThingscreatesatremendouschangebyassuringbestpersonalizedcare.Thesystemco mprisesofthreemajorunits.They are:

1. Data AcquisitionUnit(DAU)
2. CentralSystemUnit(CSU)
3. Thesoftwareunit.(SU)

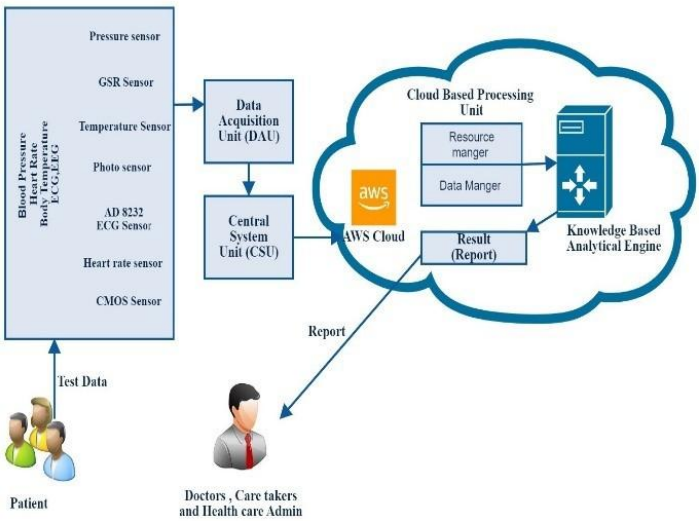

Fig3.Overviewofproposedsystem

A. *DAU*–Usedtogatherphysiologicalinformationandforward the gathered information to Central System Unit fordataprocessingandverificationpurpose.

PIN - PersonalIdentificationNumber codesandIdentitycards aregenerated to the entireoperator's authentication purpose .The Bluetooth module of DAU provides a wireless interfacebetweentheCSUandtheoperator.

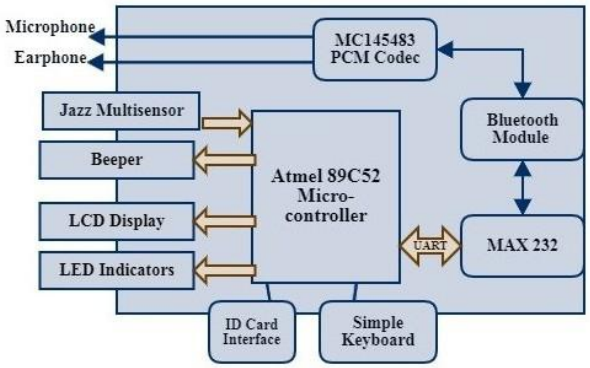

Fig4.DAUComponents

B. ***CSU*** **–** The main job of CSU is to process the data andreactproperly.TheCSUmainly encompassesa codec andawirelessBluetoothmodule[5].

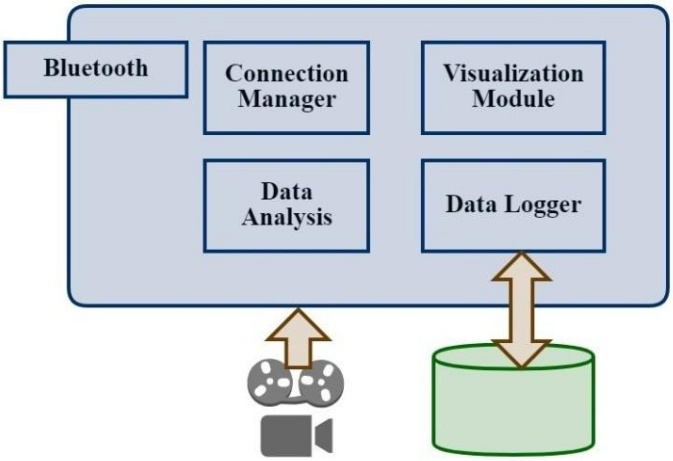

Fig5.CentralSystemUnit

C. ***Software Unit*** - The operator is constantly monitored byasoftwaretermedasBlueEyeTechnologysoftware. Thesoftware enablestransfer of messages between the managerand the data analyzer. The software will respond in real timeaccording to the operator's physiological changes. Here, thesoftwareactsasasupervisor.

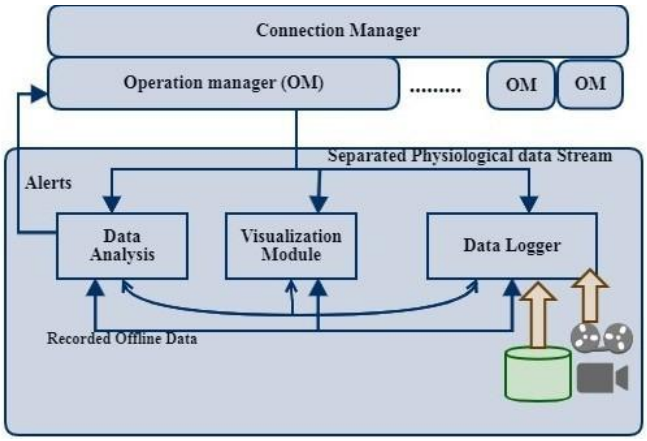

Fig6. SoftwareAnalysisDiagram

IV. STEPSINVOLVEDINMONITORINGAPATIENT

a. Processofgivingsensingcapacity.
b. HumanEmotiondetection
c. Respondappropriatelyandproperly.

Atthebeginning, patient observation is done by the systemusingvoicerecognitionsoftware,highresolutioncameras,biometric sensorswhich includesAD8232 ECG SENSOR andheart ratesensor.

In voice recognition software, an ADC translates the analogwaves of the patient's voice into digital data by sampling thesound;highresolutioncamerascapturepicturesandtheincoming "picture" hits the image sensor chip, which splits itup into millions of pixels. The CMOS image sensor evaluatesthe brightnessand colour of each pixel and records it as auniquenumber;AD8232ECG Sensor measurestheelectricalmovement of the heart by using electrodes placed on the skinandtheheartratesensormeasuresapatient'sheartratein

BeatsperMinuteemployinganopticalLED lightsourceandanLEDlightsensor.
Thenextstepofhumanemotionleveldetectionisdoneusing
thefollowingdevice:

a) Emotionmouse:

Emotion Mouse is used as an input device to record theemotions of a patient or a user by a simple touch on it.The Emotion Mouse is designed to evaluate and identifytheuser'semotionssuchassurprise,fear,anger,happiness, sadness, disgust etc. whenhe/she isinteractingwith computer. The main objective of the Emotion Mouseis to gather information about the

user's physiological aswell as physical condition by a simple touch . Thisgadgetalsocalculatesthebloodpressureandbodytemperatureofapersonwiththeappropriatebuilt-insensors.

b) Newsensingmethodology:

Oursystemaimsatcreationofmachinesthathaveperceptualandsensingcapabilities.Itemploysnon-obtrusivemethodofsensingwhichmeasuresphysiologicalquantitiestoidentifyuseractivities.Continuousmonitoringof patientactivitiesis enabledwith the use of speech recognition and facial recognitionsoftware.

Facial recognitionsoftwaremonitorsanddiagnosesapatient'sgenetic,medicalandbehavioralconditions.Deepvision AI offers a wide range of AI-enabled facialrecognition services. Visual face, offered by Deepvision,isone of the best-suited facial recognition software forpatient monitoring. The biometric software extracts datafromthecaptureddigitalimagesandmeasurescharacteristicfacialfeatures.

c) Response generation:

Once the emotion levels, heart rate, blood pressure andother suchparametersare detected, the supervisor checkswhetherthemeasuredparametersarewithinanappropriaterange. If themeasured valuesare within agiven range, the system continues its job of monitoring,else it generates a response message, also called as alertmessage. These alert messages are sent in the form oftextnotificationthroughe-mailorSMStothecaretakeraswellasthedoctor.

V. PROTOCOLS Bluetooth:

BluetoothisastandardIoTprotocolforwirelessdata transmissionand itsupports short range communication.Inour system, bluetooth enableswirelesscommunicationamongtheunitsofBET.

AdvancedMessageQueueingProtocol(AMQP):

AMQPProvidespoint-to-pointconnectionandsupportsseamless and secure exchange between connected devices andcloud. It helps the servers handle immediate requests in a fastand efficientmanner.

MessageQueueTelemetryTransport(MQTT):

MQTTcollectsdatafrom variouselectronic devicesandenablesremotedevicemonitoring.Thisprotocolhelpsintransfer of informationbetweenthe supervisor and the caretakeraswellasthedoctor.Itreducesdatacongestion.

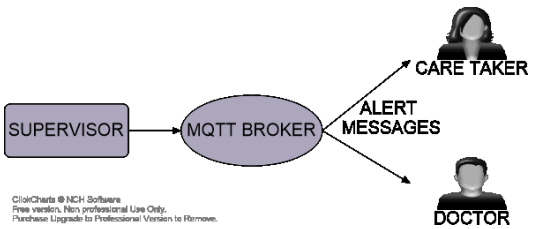

Fig7.WorkingofMQTTProtocol

The above-mentioned protocols bring efficient informationdistribution among the system. The patient data gathered fromthesystems'remotedeviceslikehighresolutioncamera,emotionmouse,heartratesensor,ECGSensorandmicrophone is transferred to the supervisor with the ease ofAMQP Protocol. At the nextstage, the supervisor analysesthedata andsendsalert messagesto the care taker and the doctorduring critical conditions. These alert messages are sent usingtheMQTTProtocol.

VI. APIsUSED

a) EmoVu

EmoVuAPIwasproducedbyEyeris.EmoVu facialdetectionAPIintegratesmachinelearningandmicroexpressiondetection. EmoVugathers information about theemotionof a patient by observing micro expressionsusingwebcams. It offers wide platform assistance, including manytrackingfeatures, likeheadposition, tilt, eyetracking, eyeopen/close,andmore.

b) Nviso

NvisoAPIimplementsemotionrecognitionsoftwaretocaptureandanalyzetheemotionalresponseand visualattentionoftheuser.Nviso specializesinemotionvideoanalytics,using3D facial imaging technology to supervisemany different facial data points to produce likelihoods for 7mainemotions.

VII. IMPLEMENTATION

The construction of the system in the hospital involvesbuildingupofisolatedwardsforeachpatientwho getsadmittedandseeksfor an intensive supervision. The patient issurrounded by a 24/7 monitoring unit which encompasses, ahigh-resolution camera, which includes a CMOS Sensorwithhighquantumefficiency–certainly important forconstant observationof a patient, anemotionmouse tobe keptin physical contact with the patient's hand which is used toobtain the emotion levels of the patient. The emotion mousehasasetofsensorswhichincludes,abuilt-inpressuresensor –usedtodetectthe bloodpressure, a GSR sensor – measuresthe sweat gland activities, a temperaturesensor – enables bodytemperature measurement and a photo sensor – confirms theabsenceor presence of an object. AD 8232 ECG Sensor isplacedonthepatient'sbodysurface closer toheart for aregular measurement of heart rhythm . Also, a heart ratesensor isstrappedaroundthepatient'schest to record thepatient'sheartrateinreal-time. Amicrophoneisused toenablepatient'sspeechrecognition.

a) Configurationofthesensorsused:

Pressure sensor - Sensor Type: Load Cell, Accuracy: ±1%,Voltage–Supply:5V,GSRSensor–Sensortype:Temperature,pressure,Voltage–Supply:2.5V~5V,TemperatureSensor-Voltagesupply:4to30V,Typicaloperating voltage: 5V, Current drain: 60 µA, Accuracy: ±05˚C,Rangingtemperature:−55˚to+150˚C,Photosensor–Wavelength:1080nm, OutputType:Voltage,Workingvoltage:12-24VDC 24-240VAC (AC-DC power are applicable), AD8232 ECG Sensor - Operating Voltage - 3.3V, Analog Output,Leads-OffDetection,3.5mmJackforBiomedicalPadConnection,Heart rate sensor - OperatingVoltage:+5Vor +3.3V, CurrentConsumption: 4Ma,CMOS Sensor - output8/10-bit image data of various resolutions such as full frame,sub-sampling, zooming and windowing, 15 frames per second(upto30framesfor1080Pimages,60 framesfor 720Pimages,and120framesforQVGAresolution).PCConfiguration:Intelcorei7processor,16GB Ram, 240GbSSDandWindows10Professional.

ForactivatingtheCMOSsensorpresentinthehigh-resolutioncamera,FPGAsareused.Alltheabove-mentionedsensorsareprogrammedusingJAVA,aprogramminglanguagebest-suitedfor healthcare applications.Speech recognition isdone on a computer with the aid of ASR(automaticspeechrecognition) software programs. Many ASRprogramsrequesttheuserto"train"theASR program toidentifytheir voice so that it can more exactly convert thespeech to text. The APIs involved with this system are EmoVuand Nviso. Emovu and Nviso APIs uses GPU capability forincreasedprocessingstrength,returningnearly20uniquemetricsper user. In order to activate these APIs Node.js isinstalledonourmachineandanAuth0accountiscreated.
Table1holds patient ID,gender,age,dateandtimeof
measurement of the parameters and a list of values includingtemperature,bloodpressure, ECG, heartrateandemotion.Table 1 consists of three different set of readings per patientrecordedat atimeinterval of4hours.

VIII. CONCLUSION

The paper projects that the proposed solution enhances thequalityofhealthcareservicesandreducesthehumaninvolvementinpatientmonitoring.Implementation of blueeyes technology in health care serves as a best solution forautomated monitoring of patients in the health care industry.The proposed system will be able to take care and pamper apatientall byitsown and will provide a great care to thepatients. The day isvery near, that this Blue Eyes Technologywilladvancethewaytowardshealth care.

Table1.PatientAnalysisTable

ID	Gender	Age	Date	Time	Temperature	BloodPressure	ECG	HeartRate	Emotion
1	Male	23	12/01/2020	9.00 A.M	97°F	117/77mmHg	Normal	72bpm	Sadness
				1.00 P.M	97°F	120/79mmHg	Normal	78bpm	Sadness
				5.00 P.M	99°F	120/81mmHg	Normal	81bpm	Happiness
2	Female	63	12/01/2020	9.00 A.M	101°F	137/87mmHg	Normal	89bpm	Fear
				1.00 P.M	99.5°F	139/88mmHg	Normal	92bpm	Fear
				5.00 P.M	104°F	142/92mmHg	Abnormal	102bpm	Fear
3	Male	65	12/01/2020	9.00 A.M	99.5°F	82/77mmHg	Normal	80bpm	Disgust
				1.00 P.M	99°F	89/70mmHg	Normal	78bpm	Disgust
				5.00 P.M	97°F	90/60mmHg	Normal	75bpm	Anger

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