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Iot Based Medical Assistant Robot For Patient Monitoring

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ABSTRACT—This paper discusses about IOTbasedmedicalassistantrobot for patient monitoring. Which help to develop avirtualdoctor robot that allows a doctor to virtually move around at aremote location at will and even talk to people at remote locationas wanted. The paper explains the background of the study andwill also investigate some previous related workswhich helps todeveloprelevantsystems.Thesystemmakesuseofar oboticvehicle with 4-wheel drive for easy navigation and IOT basedphysiological parametersobservingsystem..The robot alsocontainsa controller boxfor circuitry and a mounting to hold ascreen.

Keywords—IOT,virtual

I. INTRODUCTION

Doctors are usually needed to work at every hospitalandemergencycentereverynowandthen.Buti tisnotfeasiblefor every doctor to be available at every place at desired time.The problem with video calling is that video calls need to bedone from a PC or laptop on a desk. This limits the doctor'scapacity to view patient or around operation theatre at will orevenmovethrough hospitalroomsasneeded.

Thedirectcontactwithdoctorsandmedicalas sistances can be According to the WHO We have less thanone physician per one thousand people for providing properassistance in medical health issues in the world. If a crisis likethecurrentcoronapandemic occurs,thisinsufficiencywillsignificantly be more observable. As a result, doctors, nursesand medical assistants are forced to serve more people and endupbeingmorevulnerabletotheirownfamiliesandth emselves.This, in turn, is increasing the rate of contact with affectedpeoplemoreandmore.Morepeopleneedmore medicalcaregiversforcheckupsandthisincreasesthele velofexpenditureinthehealthsector.Insuchsituations, arobotmay retrieve records of some vital bodily parameters (such as bodyTemperature, pulse rate, blood oxygen Saturation level) of thepatientwithoutthedoctorornurse'sdirectcontactwi ththem.Itcanconsiderablylessenthepatients'hasslere ducedbydeveloping an IOT based medical assistant robot, it overcometheshortage ofmedicalstaffs.Thismedicalassistantrobotwillconsi derablyreducethefeeofcheckupandunnecessaryhospi tal bills .through this the patient can experience securedandqualityhealthcareservicesatlow cost.

Fromthesestudies,wecertifyabundlesolutio nbydefining the parameters. We have gathered the entire solutioncan be reached out to by combining those factors. These are(i)Doctors ability to be at anyplace anytime (ii)Doctors canmovearoundinoperationtheatres(iii)Doctorscan movearoundthepatientwithease(iv)Doctorscanseem edicalreportsremotely via video calls (v)Doctors canaot to hospitals tolessen direct workload of nurses' and medical assistants. Aproof-of-idea and the model are introduced in this work. Testresults show experiences that this robot can be utilized as aclinicalassistant.

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II. LITERATURE REVIEW

Duringtheyear2010,BuenosAires,Argentina,onAugust31
-September4,proposedportableandattachabletele-echography robot system:FASTele. Focused assessment withsonography for trauma (FAST) is important for patients whohaveshockbyinternalbleeding.However,thepatienthas littletime, and transportation to a hospital may take too long. AsystemwhichenablesFASTmorequicklyisrequired. Therefore, we aim to develop a tele-echography (FAST)
robotsystemthatcanbeusedbyaparamediceasilyforshockpatientinambulanceoratinjuryscene.Todevelopthesystem,portabilityandusability(forparamedic)aresignificantissues.

We developed a tele-echography robot system which has 4-DOF. The robot is attached to each roughly FAST areas ofpatientbody(body-basedsetup)andremotelyfine-tunedposition by a specialist in a hospital. The robot can control thepostureofprobebycurvaturerails.Themechanismthatmaintains passively the contact force between the probe andpatient's body surface by using springs enables the robot smallandlightweight.Feasibilityexperiments ofFAST arereported.

Intheyear2017DepartmentofElectromedicEngineeringPoliteknikKesehatanKemenkesJakartaIIJakarta,IndonesiaSelf -monitoring enables patients to become moreactiveparticipantsintheirhealthcare,homepulseoximetrycanprovide objective data for determining health status and thepossible need for medical consultation or interventions. Pulseoximetryisanon-invasiveandcontinuousmethodformonitoring the blood oxygen saturation level. Pulse oximetryhas gained acceptance in the medical community caused
lowcostsandeasytooperation.Prototypepulseoximeterinprevious research still use system based on microcontroller.Microcontrollersystemisidealforbuildingroboticsystemsbutmicrocontroller system has a weakness in terms of processingthe signal. During the last decade, development of single boardcomputerhasprovidedsmaller,fasterandmoreaffordable.Theaimofthisstudy todevelop aprototypehandheldoxygensaturationbasedon
singleboardcomputer RaspberryPiforhome care. The added value of this research is using the singleboard computer system and the graphical user interfaces
weredesignedtobecomemoreinformative.Thisstudyusesexperimentalresearchwithaquantitativeapproach.Theresultsofthisstudysuccessfullydevelopedaprototypepulseoximeterequipped by LCD touch screen that can display the value ofoxygensaturation(SpO2),pulserate(PR)andphotoplethysmography(PPG).Thereliabilityofoxygensaturation and heart rate were quite stable from ±1% to ±2%compare gold standard, with standard deviation range of 0.577to1.

In the year 2012 Kyushu University, Fukuoka, Japan Controlsystems for Autonomous mobile deliveryrobots have beendescribed before. However, the control they provide is limited,leaving potential for serious errors. The current mobile robotsystemsconcentrateonpositionaccuracyandoperationalfunction but leave open management of safety hazards such asentering the dangerous and not intended areas as stairway. Inorder to increase the safety of the robot, it is as important towork with sensors installed in the external environment as thesensors installed on the robot. For this purpose, visible lightcommunication(VLC)isapromisingdevicetobeusedwiththerobotsystem.VLCcreatesanin-houseGPSsystemby
installing special LED lights that can replace standard lightingin key locations in the hospital. We have developed an in-hospitaltransportationrobot,calledHOSPIinwhichthecontrolsystemhasbeenenhancedbycombiningthenavigationalsensors of the robot and a VLC using installed lighting in thebuilding. By using VLC, robots can obtain more informationabouttheenvironment.Asthefirststepforthepracticalapplication of VLC to robot system, we use VLC to overcomeproblemsinconventionallocalizationapproaches,andtoprovideanadditionallineofdefenseinthecaseofcatastrophicfailures.Thispaperalsodescribesexperimentalandactualoperational results in detail of robots equipped, in an actualhospital,with thedescribed process

In20206thinternationalconferenceoncontrol,Automationandautomation Path finding for multiple robots is one of mostimportant problems in robotics when to find a way to moverobots from their starting positions to reach their respectivegoals without collisions. However, in the case of a complexenvironmentwiththepresenceofhumansandotherunpredictable moving objects, fixing a single path to the goalmay lead to a situation where there are a lot of obstacles on theplannedpathandtherobotsmayfailtorealisethemovingplan.To address this issue, a new approach of

using multiple pathplanning where each robot has different options to choose itspath to the goal is introduced in this paper. The informationaboutplannedmovingpathsaresharedamongtherobotsintheworkingdomain,combinedwithobstacleavoidanceconstraintsin local ranges, and formulated as an optimisation problem.Solution of the problem leads to the optimal moving plans ofrobotstheeffectivenessofthepropose dapproachisdemonstratedby experimentalresults

Tuan Nguyen Gia Dept. of Information Technology UniversityofTurkuFinland,presentstheimplementationofanintelligenthome-based elderly patient monitoring system. Four patient'sphysiologicalparametersarebeing continuouslymonitored,namely,temperature,glucose,and3Daccelerometerandgyroscopedataforfalldetection.Contextualsensorsaremounted across the home to observe the patient's surroundingenvironment such as temperature and humidity. All sensors,wearable and contextual, transmit their measured data to smartgateways (fog layer) via nRF communication protocol. At thefoglayer,diversefunctionsarebeingcarriedout,fromcollectedmeasurementstransfertohealthcareprovidersforfurtherprocessingandanalysisviaInternet(cloudlayer),sendingpushnotifications and reports to patient's mobile phone, to alertingambulanceorcivildefenceauthoritiesincaseofanemergency.To insure power autonomy and eliminate the need for frequentsensornodebatteryreplacement,anefficientthermalenergy harvestingsystemisdeveloped.Associatedwithaboostconverter,thethermalenergyharvestingsystemisabletosustain 3.3 OCV leveraging a temperature difference of 20°Cbetween patient's body and room temperature, while achievinganefficiency of82.6%. In2019ElsevierB.V.Bodytemperatureisanimportant physiological indicator in the whole process of pig breeding.Temperature measurement is also an effective means to assistindiseasediagnosisandpighealthmonitoring.Intheconventionalmethodofmeasuringbodytemperature,amercury column is used to obtain the rectal temperature. Theoperation of this method is complicated and requires a largeamountoflabor.Thiskindoftemperaturemeasurementmethodiscontactandcanmakethepigstressed,whichisdisadvantageousforthehealthygrowthofpigs.Therefore,rectal temperature measurement no longer meets the needs ofthe large-scale pig industry in China's welfare agriculture. Inrecentyears,theemergingpigbodytemperaturedetectiontechnologiesareelectronictemperaturemeasurementtechnology, infrared temperature measurement technology andso on. Infrared temperature measurement technology has beenthe main means of measuring the temperature of pig bodysurface with its advantages of non-contact, long distance andreal-time.Atpresent,infraredtemperaturemeasurementtechnology and infrared image processing technology used inpig breeding are still in the exploration stage. Nowadays, theinfrared temperature measurement equipment based on point-by-pointanalysisrepresentedbyinfraredthermometerand temperaturemeasurementequipmentbasedonfull-fieldanalysisrepresentedbyinfraredthermalimagerhavebeenapplied to pig breeding industry. These types of temperaturemeasurementaremoreinlinewiththeneedsofthepigbreedingindustry to transform and upgrade to the automation, in linewith the development concept of welfare farming and smartagriculture,andits developmentprospectsare veryimpressive IST-Africa 2019 Conference Proceedings Paul CunninghamandMiriamCunningham(Eds)IIMCInternationalInformationManagement Corporation, 2019: There is a need for a systemthatrespondtovarious queriesinreal-time,toadviceandinformexpectantmothersduringtheirpregnancy.Severalsmartservices have been deployed, bundled with health informationsystems, and other digital services. While such solutions betterservices in the healthcare settings, they may not be available tothemassesintherural.Besidestheyrarelydispensethisinformationpreciselyandoraccurately.Anewdigitalecosystem, represented by chatbots seem to offer promisingsolutionbyembodyingthe functionofavirtualhealthcareexpert,whoisalwaysavailabletoprovideinformationinthe\ requiredprecision.PoweredbyAIandmachinelearningalgorithms, chatbots are forecasted to bring forth accuracy,precisionandavailabilityofinformationwhenused.Thispaperdiscussestheneedtodevelopchatbots tobeintegratedinsmartphones; intended to provide support to to-be mothers duringtheirjourney in pregnancy.

III. METHODOLOGY

A. Block diagram

The system makes use of a robotic vehicle with wheelsdriveforeasynavigation.Therobotalsoincludesacontrollerboxforcircuitryandamountingtoholdamobilephone or tablet. The mobile or tablet is used to hold livevideo calls. The doctor can use an IOT

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based panel tocontrol the robot. The control commands sent sent onlineare received by the robot controller. The robot controlleroperates over wifi internet. The received commands arereceived in real time and the robot motors are operated toachieve the desired movement commands. Also the roothas other functions including battery status alert to remindof battery charging on time.the various sensor outputs areconnectedtotheMicrocontroller.Iftheoutputofthes ensorisanalogandtheADCconnectedtocontrollercon vertsthesignal to digital form. The sensed digital data is comparedwiththestandardvalueifdoesnotmatchesthe nthepatients are made aware of the disease using the monitordisplayconnectedtothe PC.TheRoboticsystemgivesthenecessary medicines for the disease of the patient and alsotreats thepatientin ahospitalitymanner.

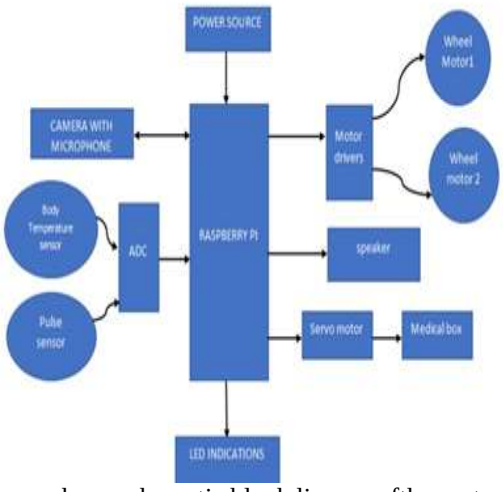


Figure showsschematic blockdiagramofthe system

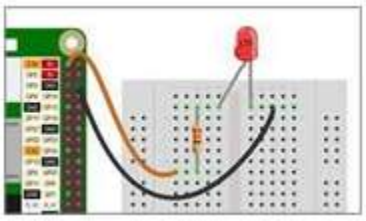
Powersupply

PCB power supply design can encompass more than just anactualpowersupply;systemsrangingfrompersonalc omputersto home appliances need a power supply to convert AC powerfromthe walltoDCpowerwithlownoisecontent.PCB powersupply design is about more than just converting between ACand DCpower.

RaspberryPi

Raspberry Pi is the name of a series of single-board computersmade by the Raspberry Pi Foundation, a UK charity that aimsto educate people in computing and create easier access tocomputing education .The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV,and uses a standard keyboard and mouse. It is a capable littledevicethatenablespeopleofallagestoexplorecom puting,andtolearnhowto programinlanguageslikeScratchandPython

LEDIndication



Red and green lights are used to show different functions. Aflashing green LED light indicates that a program is running;meanwhile, a flicker displays how the program is functioning.Red LED lights indicate whether or not the Raspberry Pi isreceiving enough power

MotorDriver

A motor driver takes the low-current signal from the controllercircuit and amps it up into a high-current signal, to correctlydrivethemotor.Itbasicallycontrolsahigh-currentsignalusinga low-current signal. There are different types of motor driversavailable in themarket,intheformofICs

Speaker

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Aloudspeakerisanelectroacoustictransducer,thatis,a devicethat converts an electrical audio signal into a correspondingsound

Servermotor

A servomotor (or servomotor)isa rotaryactuatoror linearactuatorthat allows for precise control of angular or linearposition, velocity and acceleration.It consists of a suitablemotorcoupledtoasensorforpositionfeedback. Italsorequiresa relatively sophisticated controller, often a dedicated moduledesignedspecifically forusewith servomotors.

MedicalBox

Overcomemedicalemergenciesandkeepyourmedicin esorganized withMilton'scompactmedicalbox.Madefromhighqu ality and durable plastic, this medical box features a see-through lid for easy accessibility. Armed with an ergonomichandle,thisisperfectforportableuse.

ADCADS1115

The analog-to-digital converter(ADC) is a common accessoryfor Raspberry Pi. This is a 4-channel ADC based on TexasInstrument'sADS1115,whichisaprecision,low -power,16-bitADC chip. We make this ADC into a compact Raspberry PiZero form factor and integrated an analog Grove connector sothatyou can alsouseanalogGrovemoduleswithit.

Bodytemperaturesensor

A temperature sensor is a device used to measure temperature.Thiscanbeairtemperature,liquidtempera tureorthetemperatureofsolidmatter.Therearedifferen ttypesoftemperaturesensorsavailableandtheyeachus edifferenttechnologiesandprinciplestotakethetemper aturemeasurement

Pulse sensor

HeartbeatSensorisanelectronicdevicethatisusedtome asuretheheartratei.e. speedoftheheartbeat.Monitoringbodytemperature, heart rate and blood pressure are the basic thingsthatwedo in orderto keep ushealthy
Many modern DSLR cameras and video cameras will haveinternal microphones. These cameras will also generally havemicrophone inputs to connect higher-quality microphones forimprovedaudio

B. FLOW CHART

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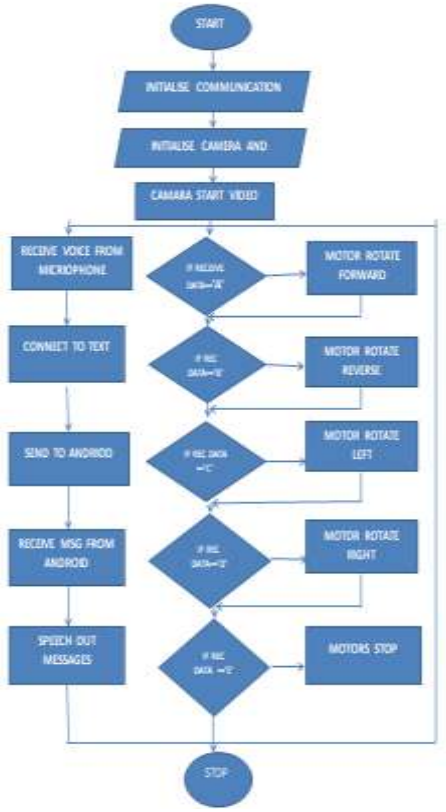

Figure shows flow chart of the system

IV. RESULT & DISCUSSION

We tested the body temperature of patient with the developedsystem .The patients data with the comparable data is given inTABLE I .Then we tested the pulse rate and oxygen saturationlevel of patients and these data with comparable data is givenintheTABLEII.

TABLE I.DEVICE MEASURE BODY TEMPERATURDATAOFFIVEPATIENTSOFDIFFERENTAGES

Mindraypulse(Bpm)	Sensor pulse(Bpm)	MindrySpO2() %)	SensorSpO2(%)
102	101	99%	98%
95	94	85%	86%
93	93	92%	92%
72	72	95%	95%
109	107	93%	93%

TABLE II.DEVICEMEASUREDPULSERATE ANDOXYGENSATURATIONLEVELDATAOFFIVEPATIENTSOFDIFFERENTAGES

Patient No.	Gender	Age	Mindray Temp	Sensor Temp
1	Male	24	30	30
2	Male	21	32	31
3	Female	30	39	39
4	Female	26	35	35
5	Female	22	32	33

V. CONCLUSION

In this paper we have worked on designing and implementinganIOTbasedmedicalassistingRobot.ThisrobothelpsDoctorsandNursestomonitorpatientsvirtually.ItalsosupportsdisabledpatientsItincludeIOTbasedphysiologicalmonitoringsystem.

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