ALiteratureSurveyonIoTBasedSafetyGadgetforChildSafetyMonitoringandNotification

Teamnumber:PNT2022TMID30354
Team leader: P. Karthiga,
Team member1: S. Barani ,
Teammember2: P. Gayathri ,
Teammember3: B. Kanimozhi .

***Abstract*: In Today's world, the wearable gadgets comprise an increase in market provisioning, wider openings forextemporized authority over security issues for kids in day care and schools. Likewise, women security keeps on beingone of the most vital issue that can be addressed today, consequently security of women at working environments, publicplacesisprogressivelynoteworthyissue.Thisundertakingmeanstogiveatotalstartforsecureandwellbeingframework. The thought fills in as confirmation for a wearable gadget with coordinated plan to shorten the need ofsecurity issues to women and children. The proposed device is equipped with two modes, adult mode and the child modethat operates accordingly. The sensor empowered gadget gives the real time location and well-being of women andchildren after accepting signals from sensors. The idea behind this proposedsystem empowers guardian to locatewomen and children effortlessly. Pi-camera is used to capture the image in case of emergency. Procurement of rawinformation from the sensors, trailed by action acknowledgment. Realtime checking of information is accomplished bywireless sensors data to an open source cloud platform [1]. This gadget is modified to consistently screen the subject'sparameters and make a move when any perilous circumstance occurs. It is accomplished by detecting the differences inmonitoredsignals, followedby appropriate actiontakenby means ofnotifications oralerts. In this manner, theattentiveness of implementation to SMS (short message services) content engaged correspondence medium between thewearable gadget and the guardian, nature for GSM (Global System for Mobile) convenient correspondence is for allintentsand purposes present everywhere. The secondary measure used as a piece of this endeavor is the generalpopulation show in enveloping of the tyke's and women 's who could in a brief instant react for their security till theguardian arrives or they could contact the guardian and help find them. To send mail to child's parents we are usingSMTP**

- **(ShortMessageTransferProtocol).Alltheseprocessesarecontrolledbymicrocontrollerandraspberrypitroughinternet ofthings.**

***Keywords*: different types of sensors, buzzer,pi-camera, GSM (global system formobile), SMS (Short messageservice)**

- **Introduction**

Internet of things (IOT) is the technology whichmakes device to sense and control the physical world bymaking objectssmarterandconnecting them throughanintelligent network.Internet of things uses variousconcepts,protocols,andtechnologies.Womenandchildsafetyisanextremelyhuge

worry in a nation like INDIA where women and child are assuming a remarkable job in every single field. India isa peace adoring nation and one of the safe stations for the visitors over the world. Many ladies or children evennow feel unsafe to move around outside in our nation due numerous cases of violence against women and child.To make women and child feel safe and secure we have proposed this project. The object and machine can besensed and controlled remotely though networks. Using IOT we can make things smarter and sensible withoutusinganywires orcables.IOThelps ustouseandconnectthethingswirelessly.

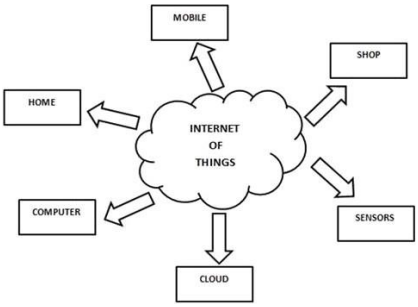

Fig.1.Internetofthings

Thefig.1showshowtheIOTisconnectingtounconnectedthings.TheIOTisapplicableinmanyareassomeofthemare listedbelow,[2]

- Smartcreatures
- Smartconnectedbuildings
- Connectedfactory
- Connectedroadways
- Smartphones

In our project IOT plays a major role which sense the child'sand women's every activity and alert to guardians.IOT sensor detects the child or women crying, heartbeat, temperature and alerts the guardians through SMS, mailand buzzer for the surrounding people. The camera captures the child and women's activities when in danger orpanicsituations. Thecomponentsandinternetofthingsiscontrolledbymicrocontroller.

Weareusing PIC16F877Amicrocontrollerto controlover

all system and IOT. RPI3(Raspberry Pi 3) is used to connect to internet of things, sounds, buzzer, mail, SMS,emergency switch, mode switch. All these things are connected to battery to supply the power. RPI is credit cardsized computer that plugins into a computer monitor or TV, and uses a standard keyboard and mouse. It is acapable little device thatenablespeopleof allages to explore computing, and to learn how toprogram inlanguages like python, C, C++, Java. IOT is used for smart city and smart home to benefit the people. Smartautomation method is implemented in this project to get alerts of women and child's activities and for the purposeofsecuritythroughIOT developed.

Table1
Existingversusproposedsystem

Features	PreviousSystem	ProposedSystem
Connectivity	Bluetooth4.1	Wi-Fi
Hardware	Arduino	Raspberrypi3
HealthMonitoring	Notmonitoring	Monitoringpresent
Camera	Notpresent	Present
PowerSupply	Batterylifelow	Enhancedbatterylife

- **Systemdesignandarchitecture**

In this busy world parents have no much time to take care of their babies and women have no much time to takecare about themselves so, the world is moving towards smart technology through internet of things. In our projectwe are implementing and developing adults and child security using IoT [6]. Here, we mainly concentrate ontemperature, heartbeat, crying, alerting guardians through smart phone using IoT with the help of raspberry Pi. Thearchitectureisshowninfig. 2.

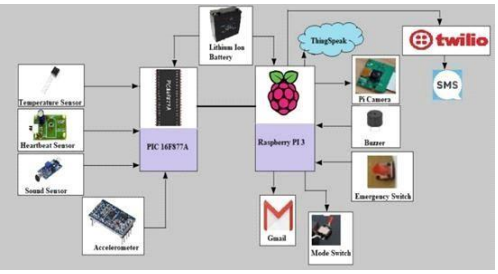

Fig.2.Architecturediagram

All IoT sensors have analogue ports and they give output as Analog. In order to interface analog values toraspberry Pi Analog to Digital conversion is used. Analog to Digital is a modulation and demodulation process.ThedifferentsensorsusedareTemperaturesensor,Heartbeatsensor,Accelerometerandsoundsensor.Temperatur e sensorgive valuesintermsofvoltagetoICas0.35etc. Heartbeat sensorgivesvaluesintermsofpulsePIC microcontroller act as a counter to count Heartbeat rate. Sound sensor gives analog values. Some threshold isset whenever the external value crosses the threshold. It will detect as child/ women is crying. Accelerometerdetects position depending on the coordinates. It gives result in form of X, Y and Z values. All these values fromvarioussensorsareanalog

values, they cannot be interfaced directly with Raspberry pi. So, Analog to Digital microcontroller is used i.e. PIC16F877A that converts analogue values to digital form. All these values from various sensors are sent to PICmicrocontroller that does all A- D conversions. Finally, the converted values/information aresent by serialcommunication by single wire to Raspberry pi3. Raspberry pi3 collects all data from PIC controller and upload itto server. Server used is thing speak cloud. That could be used to monitor health and safety of child/women.
Thedevicehastwomodes.Childmodeandwomenmode.Onecaneasilysetthemodeto0or1.0ischildmodeand1 is women mode. The system has lithium ion battery which is used for power supply with minimum dischargerate. It also has pi camera that is used to capture image of the people in front or the situation. There is anemergency switch which can be pressed manually either by child or women. When an emergency switch ispressed buzzer is activated which is used to alert nearby people so that they can come to the child/women rescue.Depending on the conditions set parents/guardian are notified via SMS and e-mail. SMS through Twilio could besent along with details of temperature. Heartbeat rate and position of the ward. Email is also sent simultaneouslyalong with the images and other data. Location is also sent in both SMS and e-mail with longitude and latitudevaluestoparent/guardian.

- **Requirements**

- *Hardwarerequirements*

Thevarioushardwarecomponentsusedinoursystemarelisted below.

- RaspberryPi3
- PIC16F877A
- HeartbeatSensor
- TemperatureSensor
- SoundSensor
- Accelerometer
- EmergencySwitch
- Buzzer
- PiCamera
- Battery

- *RaspberryPi 3*

Raspberry Pi 3 is neither a microchip nor a microcontroller, really it is a solitary board PC which contains aSOC(SystemOnChip-hasmulticoreprocessor,GPU,ROM,I/OPeripheralsinsideit.),DDRRAMmemory,

Ethernetport,USBhave,smallscale HDMIonit.RaspberryPidon't comprise ofaninbuiltfixeddisk, yetthiswillutilizeaSecureDigitalcardforstart-upandconsistentcapacitywiththeModelB+utilizingaMicroSD.

ComingupnextaretheportsontheRaspberryPiboardandaportionoftheiruses.Theportsmaysimilarlybeusedforunexpectedpurposesincomparisontorecordunderneath.

- *USB:*MainlyutilizedforperipheralslikeKeyboard,

  mouseandaWi-FiAdapter.AcontrolledUSBcenterpointcanbeassociatedandbeextended.

Fig.3.RaspberryPi3

- *HDMI:*ThisistheHighDefinitionMultimediaInterface[HDMI]andisusetoassociatewithaDisplayunitlikeTVorMonitororsomeofthetimeaprojector
- *StereoAudio:*Audioassociations utilizinga3.5mmjack
- *SDCard:*SDcardisutilizedasabootgadgetandfurthermorerelentlesscapacity.Morestockpilingcanbeconnectedtotheusb
- *MicroUSB:*Theminiaturizedscale USBportisutilizedforprovidingenergytotheunit
- *CSIConnector:*CSI [CameraserialInterface]isutilizedfor associatingacameratotheunit
- *Ethernet:*Usedforinterfacingwithasystem utilizingasystemlink
- *DSI Connector:*DSI[DigitalserialInterface]isutilizedforassociatingaLC

- *PIC16F877A*

ThePICmicrocontrollerPIC16F877Ashowninfig.4isastandoutamongstthemostprestigiousmicrocontrollers in the business. This controller is exceptionally helpful to utilize, the coding or programming ofthis controller is additionally simpler. One of the principle preferences is that it very well may be compose deletewhatevernumberoccasions as couldbe expected underthe circumstances since it utilizes FLASH memoryinnovation.Ithasacompletenumberof40pinsandthereare33pinsforinputandoutput.

Fig.4.PIC16F877A

PIC16F877A discovers its applications in an enormous number of gadgets. It is utilized in remote sensors,security and wellbeing gadgets, home computerization and in numerous modern instruments. The expense of thiscontrollerislowand

it’stakingcareofislikewisesimple.It’sadaptableandcanbeutilizedinzoneswheremicrocontrollershaveneverbeenutilizedasincoprocessorapplicationsandclockcapacities.Thepindiagram isgivenbelowinfigure5.

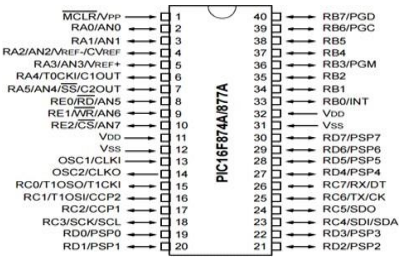

Fig.5.Pindiagramof16F877A

Asithasbeenmentionedbefore,thereare40pinsofthismicrocontrollerIC.[8]

- 4pinsareusedforpowersupply.
- 2pinsareusedforcrystaloscillator.
- 1pinisformemoryclear.
- Remaining33pinsareforgeneralpurposeinputandoutput.
- Thereare5portspresentinthismicrocontroller.
- PortA:A/DConverter inputs.
- PortB:Externalinterruptinputs.
- PortC:Serialport,TimerI/O.
- PortD:Parallelslaveport.
- PortE:A/DConverter inputs.

- *HeartbeatSensor*

Heart beat sensorshownin fig. 6 is expected to give automated yield of warmth beat when a finger isdetermined to it. Exactly when the heart beat locator is working, the beat LED flashes as one with each heartbeat.This mechanized yield can be related with microcontroller authentically to evaluate the Beats Per Minute (BPM)rate.Itdealswiththeruleoflightregulationbybloodcoursethroughfingereateveryheartbeat.

Fig.6.Heartbeatsensor

- *Temperature sensor*

Fig.7.Temperaturesensor

Temperaturesensorshowninfig.7is utilizedtogaugethemeasureofwarmthvitalitythatpermitstodistinguishaphysicalchangein temperaturefromaspecificsourceandchangesovertheinformation foragadgetor client.

- *Sound sensor*

The sound sensor module showninfig. 8 gives a simple method to recognize sound and is commonly utilizedfor distinguishing sound power. It utilizes a mouthpiece which supplies the contribution to an amplifier, peakdetectorandbuffer.Atthepointwhenthesensorrecognizes asound,itformsayieldflagvoltagewhichis senttoamicrocontrollerthenperformsessentialpreparing.

I.PiCamera


ThePicameramoduleinfig.11isaversatilelightweightcamerathatunderpinsRaspberry Pi. It communicates with Pi utilizing the MIPI camera serial interface convention. It is ordinarilyutilized in picture handling, AI or in reconnaissance frameworks. The module comes alongside a strip link, thislinkmustbeassociatedwiththeCSI(CameraSerialInterface)portofthePi.

- *Accelerometer*

Fig.8.Soundsensor

Fig.11.Pi-camera

J.Softwarerequirements

- *RaspbianStretch(OperatingSystem)*

RaspbianisacomputeroperatingsystembuiltspeciallyforRaspberrypiandtheterminalisshownin fig. 12.

- Raspbian stretch isoneversion ofRaspbian.
- ItcanbeusedfOr allversionsofRaspberryPi.

Accelerometer shown in fig. 9 is a transducer that is utilized to measure the physical or quantifiable quickeningexperienced by an article because of inertial powers and changes over the mechanical movement into an electricalyield.Itischaracterizedasrate ofprogress ofspeedregardingtime.

-
- ItisarecommendedSoftware.

- *ThingSpeak*

Fig.12.Raspbianpiterminal

H.Emergencyswitch

Fig.9.Accelerometer

-
- Thing speak is an internet of Things Platforms tocollect and store sensor data in the cloud. Fig. 13 gives as anideaofhowdataisupdatedinthecloudandtheanalysisdonein[4].
- SensordataisenttotheThinkspeakcloudthroughtheRaspberryPi.

The switch shown in fig. 10 can be operated manually and automatically. In case of manual, whenever thechild/woman feels that they are in danger, they can press the switch so that the buzzer is activated. The automaticoperation of the switch happens when the values for temperature, heartbeat, sound and position varies from normalconditions.

Fig.10.Emergency switch

-
- Thesensor valuesarestoredin Thingspeakandcanbeusedfor analysis wheneverrequired.
- Theguardianortheparentareabletoseethetemperature,heartbeatvaluesremotelybyaccessingThinkspeakaccount.

Fig.13.SensordataupdatedtoThingSpeak cloud

- *Twilio*

Thisisacloud-basedapplicationthatisusedtosendandreceiveTextmessages.Infig.14thetwilioaccountcreationsnapshot isgiven.

Fig.14.Twilioaccount snapshot

- *VNCViewer*

VNC Viewer provides you with remote access to your picked PC. Virtual Network Computing (VNC) is agraphical desktop sharing framework to remotely control another computer [5]. Its aids in making a virtual workarea condition. In the event that your host PC is on a similar neighborhood arrange (for example associated with asimilar Wi-Fi or Ethernet organize), at that point you can make a direct VNC association with your Raspberry Pi.Fig.15isthesnapshotofVNCviewer.

Fig.15.Virtualscreendesktop

- **Expectedoutcomes**

The platform on which this project will be implemented is the PIC16F77A microcontroller board that performsthe conversionof analog signals to digitalvalues. Thus, the controller acts as an analog to digitalconverter(ADC). The digital values are fed to raspberry pi and the functions of transmitting and receiving SMS, is providedby GSM Module using GSM network. Additional modules employed will provide current location of child andwomen in terms of latitude and longitude on the google maps that is sent to the guardians via SMS therebyproviding maximum accuracy [7]. In the scenario, a lost child or women in danger sends a predefined keyword asSMS to the wearable device which alerts by sending location to designated individual. Additionally, the wearableequipped with distress alarm buzzer which sets to active when the sensors value goes abnormal. Hence the buzzeris louder enough and can be heard by the people nearby from a substantial distance. The proposed wearable devicein the form of wrist band will be communicating with the guardians via SMS through GSM which ensures secureandreliablecommunicationlink.Customizationofwearablecanbe achievedasperourrequirementsbyreprogrammingthePICsystem.

Theprojectshallachievefollowingoutcomes:

- WithaidofGSMmodule,currentlocationofchildorwomencanbedetectedaccurately inashortspanoftime
- Predefinedvaluesinthesensorscanmonitorminimalhealthconditionofchildofchildinordertotakeimmediateac tionwhenthevalues increaseabovethethreshold.
- Topreventanindividualfromdrooping,wehaveaccelerometerthatdeterminesthechangeinbodypositionofchil d.
- InPanicsituationofchildorwomenthedevicenotifiesparentorguardianrevealingchild’s orwomen’sdistress.

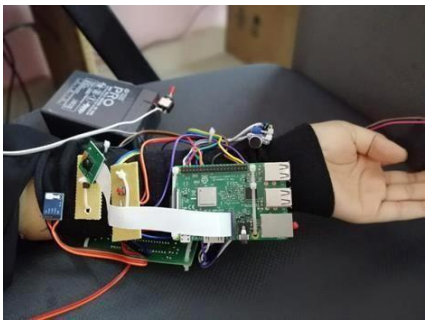

Fig.16.Expectedproduct

- **Futurescope**

- Thesize ofcomponentsusedintheprojectcanbedecreasedbyaprocesscalledmicrofabrication, sothatitcanbetransformedintoa wristwatch.
- Emergencycallingfeaturecanbeincorporatedwhereinwomenorchildunderpaniccircumstancescancontactpoliceforassistance.
- SMScanbesenttomorethanoneindividual.

- **Conclusion**

To save time and reduce crimes happening we are developing smart child and adult security system which iswearable. This helps guardians to locate their children and women faster and precisely using internet of things.The present work reduces the humaneffortandparticularly mother'sstressesinworking times about child.The device affords above scope for modifications for further improvements and operational efficiency, whichshouldmakeitcommerciallyavailableandattractive.

References

- A. Jatti, M. Kannan, R. M. Alisha, P. Vijayalakshmi and S. Sinha, "Design and development of an IOT based wearable device for thesafety and security of women and girl children," *2016 IEEE International Conference on Recent Trends in Electronics, Information &CommunicationTechnology(RTEICT)*,Bangalore,2016,pp.1108-1112.
- DavidHanes,Gonzalo,PatrickGrosetete,Robert,Barton,JeromeHenry"IoTFundamentalandNetworkingTechnologies,Protocols".
- "Programmers guide to Internet Mail: SMTP" Firstedition by JohnRhoton.
- L. Mhatre and N. Rai, "Integration between wirelesssensorand cloud," *2017 International Conference onI-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC)*,Palladam,2017,pp.779-782.
- T.Richardson,Q.Stafford-Fraser,K.R.Woodand A. Hopper, "Virtualnetwork computing," in *IEEEInternet Computing*, vol. 2, no. 1, pp. 33- 38, Jan.-Feb.1998.
- "DigitalParenting:TheBestWearableandnewsmart baby monitors. The latest smart baby monitorsand connected tech foryourpeace of mind,Tech2015, [Online] Available:http://www.wearable.com/parenting/the-best-wearblesbabies-smart-baby-monitors.
- H.Moustafa,H.Kenn,K.Sayrafian,W.Scanlonand Y. Zhang, "Mobile wearable communications [GuestEditorial]," in *IEEE Wireless Communications*, vol.22,no.1,pp.10-11,February2015.
- "Working Principle of PIC Microcontroller," [online]available at: https://www.edgefxkits.com/blog/know-peripheral-interfacecontroller-pic-architecture-working/