Intelligent Wheel Chair based on Internet of Things

Shyla. R
4TH SEM M. tech
Dept of Digital Electronics & Communication Systems
VTU PG Centre Mysuru, India

Megha Shree A.C
Associate Professor
Dept. of Digital Electronics & Communication Systems
VTU PG Centre Mysuru, India

***Abstract*:- Pervasive gadgets are turning into piece of individuals' everyday life. Shrewd gadgets help to individuals' life as well as are turning into vital piece of physically tested and matured Individuals. requirement for protected and free versatility for the elderly and physical tested individuals is of prime concern. paper manages making of an Intelligent Wheel-Chair (IWC) that For most part concentrates on specified issue in an extremely moderate manner and to more prominent degree. Wheel-Chair is controlled by RTOS as its center working framework. It comprises of touch-screen based route navigation alongside obstacle avoidance and fall identification, Live streaming, GPRS is utilized for area assurance and GSM is utilized to impart in those situations where certain irregular occasions like falling, mischance or medical problems are trigged. constant cooperation capacities are outlined with rationale to make client working wheel-seat totally self-ward and his communication with earth can resemble of an ordinary individual.**

Keywords:- IWC, RTOS system, real time, fall detection, obstacle avoidance, live streaming, navigation.

1. INTRODUCTION

Proposed IWC can be all around explored by touch screen android gadget that could either be associated by means of USB or by Bluetooth arrangement. engines are driven with assistance of H-extension or driver circuits. fall-location framework utilizing MEMS 3-hub accelerometer is executed. With assistance of GPS correct area of seat can be resolved and might discover where fall has occurred. Additionally, framework comprises of GPRS, live streaming module which can be helpful to track wheelchair. Wheel chairs joining every one of these elements are too expensive for everyday citizens.

2. LITERATURE SURVEY

Previous works on semi-automatic vision assistance can be well studied in [2], [8], and [12]. Works on fall detection and accident prevention can be well refereed from [4], [5], [6], and [7] which were originally implemented for vehicles and elderly people but not for Wheelchair purposes. One of easiest ways of constructing Intelligent wheel-chair was proposed [1] but RFID tags cannot be placed everywhere which limits its scope of usage. Satisfactory Intelligent Wheel Chair proposition was kept by [8] and [12] but it didn't consist of real-time ability to interact with environment. people with physical disability can use manual wheel chairs if they are quite strong enough to peddle the wheels, similarly pediatric wheel chairs for childrens to move within compound independently. Electric fueled wheel seat, stair climbing wheel seat and so forth generally these seats utilize ideas of button control system, picture preparing based, eye following, touch screen controlled procedures and so on for controlling development of wheel seats. [15] Configuration wheel seat that is autonomus, to reach said area in not predefined condition without abundantly need of others. [16]. In this wheel seat gives virtual picture of encompassing condition, utilizing LIDAR method client can choose alternatives to move left, ideal, forward and so on with the goal that client can achieve goal. For elderly individuals, it is hard to force manual wheel seats. For these individual's configuration, electrically fueled wheel seats, which works utilizing battery. Utilized as part of indoor condition, for example, inside compound of house, inside school grounds or inside multinational organizations and so on is reasonable with ease for everyday citizens. [17]

3. PROPOSED METHOD

Proposed/complete system is subdivided into 5 sub systems

Center Control: control framework shapes central handling unit of IWC. control framework comprises of microcontroller installed with RTOS. RTOS is especially used to have more exact reaction or provoke reaction of IWC as for encompassing condition. control subsystem comprises of microcontroller and working framework ported on microcontroller. working framework is inserted into microcontroller and is in charge of time unsurprising conduct of framework i.e. IWC. control framework controls IWC as well as is in charge of time unsurprising and deterministic conduct of IWC

Obstacle avoiding: This subsystem is in charge of distinguishing any moving/stationary questions inside predefined scope of IWC. Range is pre-chosen to keep away from sheltered mishap aversion with predefined range being of approx. 3.5 meters.

sensors HC-SR04 fitted on fringe of IWC are utilized to identify hindrance inside endorsed run. directionality assumes

Location monitor :. This subsystem includes GSM and GPS module. GPS is utilized to screen area of client persistently and GSM is utilized to contact concerned individual

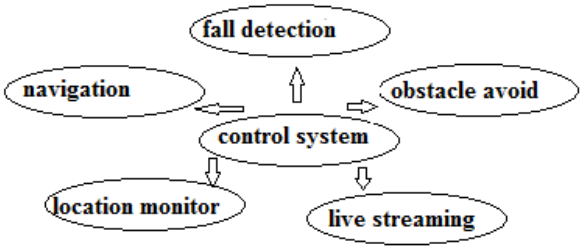

figure 1. Subsystem

Fall detection : Fall recognition subsystem is executed with MEMS accelerometer situated on-leading body of STM32F3 Discovery board. The accelerometer based fall location is then associated with GSM and GPS framework. variable is utilized to store initial estimation of accelerometer as "no fall". After that if fall more prominent than limit is distinguished it enacts caution and furthermore triggers GSM input and sends the area of client where fall has occured to concerned individual.

Live streaming:: comprises of advanced mobile phone and portable workstation. Advanced mobile phone appended to wheel seat, demonstrates way of wheel seat to concerned individual of client. Get live video of wheel seat moving utilizing back camera, front camera. Advanced mobile phone is appended to portable PC which indicates way gone by client. This guarantees greater security.

3.1 Ultra sonic sensors: HCSR04 ultrasonic sensor uses sonar rays' reflection and reception mechanism to calculate distance from object. It gives superior distance measurement and its predefined range is from 2cm to 4m. More over its readings are not affected by lightning conditions or other environmental conditions. Both ultrasonic transmitter and receiver are fitted up into module.

3.2 IR Sensor: Used to discover any obstruction show in way of wheel seat. IR remains for infra red, utilizes infra red signs to decide impediments inside some predefined extend.

3.3 Global System for Mobile Communication: GSM (Global System for Mobile Communications, initially Groupe Spécial Mobile) is standard created by European Telecommunications Standards Institute (ETSI) to depict conventions for second-era (2G) computerized cell systems utilized by cell phones, first conveyed in Finland in December 1991. Starting at 2014 it has moved toward becoming accepted worldwide standard for portable correspondences – with more than 90% piece of overall industry, working in more than 219 nations and domains.

3.4 DC Motor: Practically every mechanical development is expert by an electric engine. Electric machines are methods for changing over vitality. Engines take electrical vitality and create mechanical vitality. Electric engines are utilized to power several gadgets utilized as part of regular daily existence. Engines come in different sizes.

3.5 Alpha numeric LCD Display (16 X 2): Alphanumeric displays are used in wide range of applications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc. 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols.

3.6 Global Positioning System : Is worldwide route satellite framework gives geo area and time data to GPS collector anyplace on or close Earth where there is an unhampered observable pathway to at least four GPS satellites. Further more, it works free of any telephonic or web gathering, however these advancements can improve helpfulness of GPS situating data.

3.7 Crash Sensor: Control unit introduced midway in vehicle contains sensors which decide example and seriousness of frontal or side effect at an early stage. Extra, remote crash sensors are additionally situated on vehicle to help with crash recognition. Sensata Technologies' 360° Resettable Crash Sensors straightforwardly closed down fuel pump or fundamental contactor upon vehicle affect, lessening danger of flame and electrical stun in post-crash circumstances

3.8 Accelerometer ADXL335: ADXL335 is small, thin, low power, complete 3-axis accel-erometer with signal conditioned voltage outputs. Product measures acceleration with minimum full-scale range of ±3 g, measure static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

3.9 Microcontroller: LPC2141/42/44/46/48 microcontrollers depend on 16-bit/32-bit ARM7TDMI-SCPU with ongoing imitating and installed follow bolster, that consolidate microcontroller with implanted rapid blaze memory running from 32 kB to 512 kB. 128-piece wide memory interface and extraordinary quickening agent design empower 32-bit code execution at greatest clock rate.

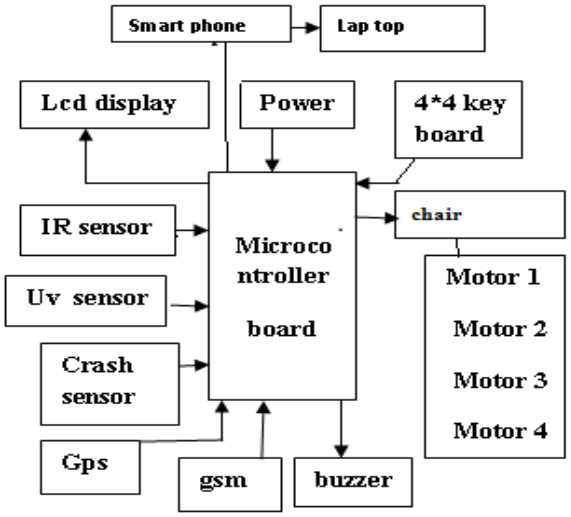

Figure 2: Functional Block Diagram

4. DESIGN:

when wheel seat begins moving to achieve goal. Sensors accelerometer, uv sensors, IR sensors will continuously screen wheel seat. Advanced cell connected to seat will constantly track way gone by wheel seat using front and rear camera which will be displayed on laptop or desktop. This assures much more safety to user. Accelerometer Controls Wheel Direction Left, Right, Forward and Reverse. Control system checks for F> 0 or accident, If F count is greater than zero means falling of user happened, immediately message forwarded to related person of user indicating emergency. Related person of user can view video live sitting at home or where ever they are. This feature helps for very fast response in case of emergency.

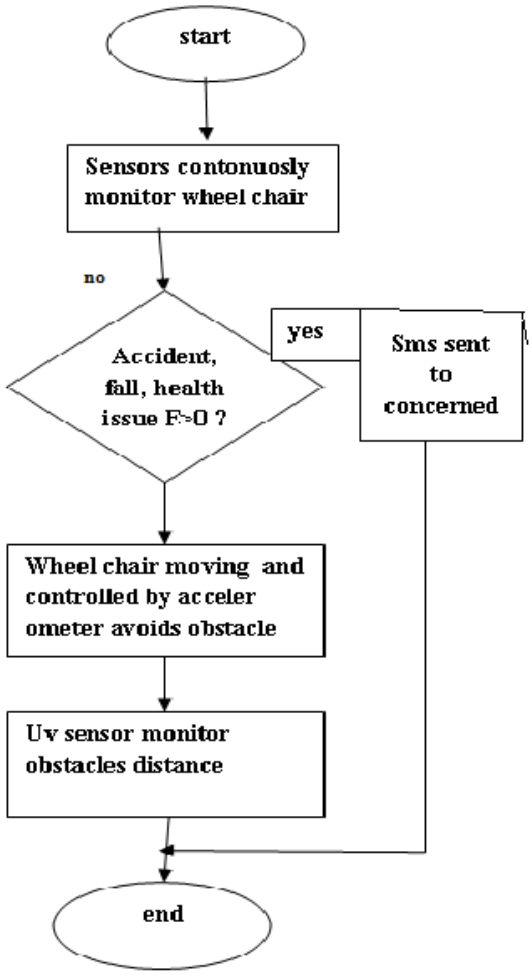

Figure 3: Flow chart

5. EXPERIMENTAL RESULTS

System designed is as shown in figure where in lcd display, motors, microcontroller board, power supply, sensors etc all are attached to chair.

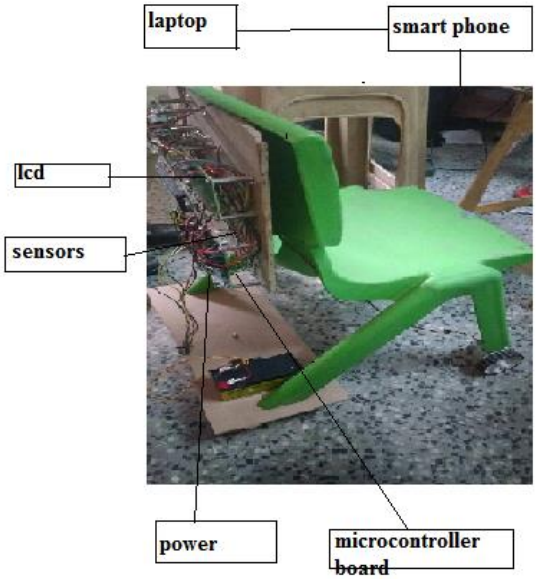

Figure 5 system

4.CONCLUSION AND FUTURE SCOPE

System utilizes fall location and accident prevention counteractive action module and reaction is within time restrict set. module consistently a screen crucial indications of client and the database is refreshed each 5s. fall-recognition module and can trigger GSM in instances of complexities (i.e. at point when fall is recognized or when imperative indications of body go irregular) to enact it and send messages to the concerned individual as to area and the issue that has occurred. obstacle avoidance module itself flips Wheel-Chair and keeps the client from head-on crash. Hence proposed system addresses topic of sheltered and autonomous portability of physically tested and in addition elderly individuals all things considered. cost of Wheel-Chair so created is practically as less as 60% of Smart Wheel-Chairs that are accessible today.

future work for more elevated amount of paces support for airbag to be given which would be initiated before crash to keep any wounds to client. Increment self-sufficient abilities of IWC, the GPRS framework can be added to framework and framework for programmed/self-sufficient driving system can be designed. client simply needs to enter destination address at beginning wheelchair will be coordinated to reach place with no client interaction required.

ACKNOWLEDGMENTS

Our thanks to **MEGHA SHREE A.C** Associate Professor, Dept. of Digital Electronics & Communication Systems, VTU PG Centre MYSURU, who contributed towards development of template.

REFERENCES

[1] "A Novel Multipurpose Smart Wheelchair", Deepesh K Rathore, Pulkit Srivastava, Sankalp Pandey, Sudhanshu Jaiswal, Department of Electronics and Communication, National Institute of Technology, Bhopal , India ,2014 IEEE Students' Conference on Electrical, Electronics and Computer Science

[2] "An Approach of Human - Smart Electric Wheelchair Interaction in Intelligent Space", Mihoko Niitsuma, Terumichi Ochi, and Masahiro Yamaguchi,[1] Hideki Hashimoto [2], : Dept. of Precision Mechanics, Chuo University, Tokyo, Japan [1], Institute of Industrial Science, The University of Tokyo, Tokyo, Japan [2], 2011 IEEE Conference, Japan

[3] "Embedded system design for real-time interaction with Smart Wheelchair" P. Doshi Siddharth; Shripad Deshpande 2016 Symposium on Colossal Data Analysis and Networking (CDAN) Year: 2016 Pages: 1 - 4, DOI: 10.1109/CDAN.2016.7570917 IEEE Conference Publications Link: http://ieeexplore.ieee.org/document/7570917/

[4] "embedded system design for real time interaction with smart wheel chair" 2016 symposium on Colossal Data Analysis and Networking, by Doshi Siddarth P. VLSI and Embedded system design, GTU PG SCHOOL, gandhinagar, Shripad Deshpande, Syncspace solutions Pvt. Ltd..pune

[5] "HOLDS: Efficient Fall Detection through Accelerometers and Computer Vision", Antonio Fernández-Caballero, Marina V. Sokolova, Juan Serrano-Cuerda and José Carlos Castillo [1] , Verónica Moreno and Rodrigo Castiñeira [2], Instituto de Investigación en Informática de Albacete, Universidad de Castilla-La Mancha ,Departamento de Sistemas Informáticos, 02071-Albacete, Spain [1] ,INETSIS, Madrid, Spain [2], IEEE 2012 Eighth International Conference on Intelligent Environments

[6] "Obstacle Avoidance Embedded System for a Smart Wheelchair with a Multimodal Navigation Interface", Amberlay Ruíz-Serrano, Miriam C. Reyes-Fernández, Rubén Posada-Gómez, Albino Martínez-Sibaja, Alberto A. Aguilar-Lasserre, División de estudios de posgrado e investigación, Instituto Tecnológico de Orizaba, Orizaba, México, : IEEE 2014 11th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)

[7] "Research of Fall Detection and Alarm Applications for the Elderly", Wang Ye, Bai Xiang-yu College of Computer, Inner Mongolia University, Hohhot, China

[8] "Smart Assistive Accident Free Wheelchair System (SAAFWS)", George Freiha, Roger Achkar, Michel owayjan, Mohammad Mokhadder, Department of Computer and Communications Engineering, Faculty of Engineering, American University of Science and Technology, Beirut, Lebanon, : IEEE 2013 International Conference on Robotics, Biomimetics, Intelligent Computational Systems (ROBIONETICS) Yogyakarta, Indonesia, November 25-27,2013

[9] "The Human-Environment Interface Design with a Vision Assistance Module for a Smart Wheelchair", Han-Yen Yu, Jiann-Jone Chen and Chung-Hsien Kuo, National Taiwan University of Science and Technology, Taipei 10673, Taiwan, IEEE 2014 Intelligent Conference on Advanced Robotics and Systems (ARIS-2014), June 6-8 20

[10] H. Nicolau, J. Guerreiro, and T. Guerreiro, "Stressing the boundaries of mobile accessibility," arXiv preprint arXiv: 1402.1001,2013.

[11] J. Abascal and A. Civit, "Mobile communication for people with disabilities and older people: New opportunities for autonomous life," Proceedings of the 6th ERCIM Workshop, pp. 255–268, 200011] Kamiuchi S and Maeyama S, "A novel human interface of an omnidirectional wheelchair." 13th IEEE international workshop on robot and human interactive communication, Roman 2004, Sept. 2004, pp. 101 – 106

[12] Kamiuchi S and Maeyama S, "A novel human interface of an omnidirectional wheelchair." 13th IEEE international workshop on robot and human interactive communication, Roman 2004, Sept. 2004, pp. 101 – 106

[13] S.-K. Kang, K.-Y. Chung and J.-H. Lee, "Development of head detection and tracking systems for visual surveillance," J. Personal and Ubiquitous Computing, pp. 515-522, Mar. 2014.

[14] Srinivasavaradhan L. and Chandramouli G, "Automated vehicles for physically and visually challenged." International Conference on Perspective Technologies and Methods in MEMS Design, MEMSTECH 2008, Polyana 2008

[15] Yoshio Matsumoto,Tomoyuki Ino, and Tsukasa Ogasawara, "Development of Intelligent Wheelchair System with Face and Gaze Base Interface," IEEE Workshop on Robot and Human Interactive Communications, 2001, pp.262-267.

[16] "smart wheel chairs- a literature review" by Snehalata Yadav, Poonum Sheoran Deenbandhu Chhotu Ram University of Science of Technology Murthal- 131039.

[17] Design of low-cost manual cum Electric-powered Whee lchair for Disabled person's to use in indoor Sateesh Reddy Avutu Dinesh Bhatia B. Venkateswara Reddy Research Scholar,IEEE Member Associate Professor and Head Research Scholar Biomedical Engineering Dept Biomedical Engineering Dept Dept of ECE North-Eastern Hill University North-Eastern Hill University JNTUH, Hyderabad Shillong, Meghalaya ,India Shillong, Meghalaya ,India Telangana, India sateeshreddy.eldt@gmail.com b2016 2nd International Conference on Next Generation Computing Technologies (NGCT-2016)

[18] LIDAR-Based Autonomous Wheelchair Harkishan Grewal, Aaron Matthews, Richard Tea, and Kiran George Department of Computer Engineering College of Engineering and Computer Science California State University, Fullerton Fullerton, California 92831