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HUMAN TRACKING SYSTEM FOR VICTIMS TRAPPED FROM COLLAPSED BUILDING

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ABSTRACT

In this paper, a new technique used for monitoring and deducting human beings from natural and human-made disasters. Each and every year we seeing various collapses of Natural and Artificial (Made by Humans) like buildings, bridges and by naturals like earth quakes held in various parts of world. In those cases, humans are being trapped from the cavities after three or four days either in conscious or in unconscious state. Recently human made building collapsed at MOULIVAKKAM in July-2014, nearly 60 lives were saves from the cavities as per BBC News. And also huge natural disasters happened at NEPAL in APRIL-2015 more than 8,500 peoples were died. In previous we used well trained Dogs and peoples were used to deduct the victims. If we deduct the victim's earlier means we gave medicines and save the victims' life. Lot of humans died because of these natural and human made disasters when they hit the region. Another one of the major Natural disaster held at Gujarat in January-2001, Gujarat losses large number peoples and properties from that accident. The Urban search and Rescue (USAR) tells the rescue operations completed within 48 hours, we save victims is high probability and then the probability becomes zero. Alive human detection system proposed here in this paper is highly reliable. Here this system moves one disaster area and give information and data to the rescue team and which mainly helpful to save the humans under the debris.

Keyword: tracking system, PIR, multisensors, victims, disaster area.

1. INTRODUCTION

This system is used to detect the alive human beings from disaster area without any help of the humans. Heart of this system is PIR sensor. The PIR sensor means passive infrared or pyroelectric sensor. Here multiple PIR sensors are used to cover all the directions of disaster area. At the time of rescue operations several teams such as policeman, fire fighters and medical assistant are used. These people performs their role in dangerous situations caused by destructed surroundings they work in collapsed building, landslides, crater etc., by this the rescuer gets opportunity to save the victims who needs rescues. This system is designed to make the task in easiest way and aiding the person who needs help. Nowadays people used robots in homes for perform simple tasks such as grass cutting and vacuum cleaning.

The humans were used in the dangerous situations like a building on fire partially collapsed by earthquake is not safe. Instead of this robot using is safe and also easy to control the robot later tether is used. The robot are used for bomb disposal, mining and also for cleaning of toxic wastes. Here tether did not support to perform the task is very heavy and not flexible one, for those reasons wireless communication is used as new technique. This wireless communication is also difficult communicate the robot from outside and control it. So we need to operate the robot automatically.

Autonomy is the degree of capable the robot makes decisions without any external control as input, but instead use information collected from on board sensors.

1.1 Need of human tracking system over conventional System

Existing ways to detect the peoples under the rubble, earth quake and collapsed buildings are used by trained dogs, optical devices and acoustic life detector. The dogs can detects only the dead humans by smell but this system saves the precious time, which is use to save the alive victims, and the optical devices have limited number of angles of freedom to perform the function require expert operators and cannot be used in inaccessible area. Acoustical detector like geophones are easy to use but they need quiet working surrounding; it cannot reach in critical situations.

Information about the buried persons location will know means it would be great support for the rescue personnel. So this help to reduce the time of operation and which is use to help and save more lives.

In rescue operation and also in some surveillance operations there is not only the need of detect life signals but also to identify the people in a particular area to facilitate rescue team operation if any emergency cases.

2. EXISTING SYSTEM

Here intelligent service robot is development is an important and critical issue for human community application. This system performs not only self-localization and mapping but it also used to detect the moving object or people in the building. At first new augmented approach of graph based optimal estimation

was derived for concurrent robot posture and moving object trajectory estimate.

Due to extraordinary progresses in the sensing and computing technologies recent years the light sensing and ranging (LIDaR) sensor vision / omnidirectional camera and stereo-based vision device can be mainly applied on the intelligent robotic research works.

The LIDaR sensor having high resolution as well as it travels through long distance, stereo based vision is for image processing and near-field depth measurement.

Nowadays different simultaneous localization and mapping (SLAM) methodologies have been improved.

SLAM technologies can three major problems,

a) It cannot move on the robust association the object is occlusive or blanked.
b) The moving object or target perception is visible to the service robot.
c) The correct position is estimated to the moving robot.

These are the major drawback in SLAM; to overcome this TORO was introduced. TORO means Tree Based Network Optimizer. This is more convenient than SLAM.

Later Target of Interest (TOI) is extracted from laser ranger and Region of Interest (ROI) will cover the TOI and map on to the stereo vision.

Scale-Invariant Feature Transform (SIFT) is applied for stereo depth estimation, this technique represents all the objects. The graph based optimal estimation is for the relationship between the robot and the moving object.

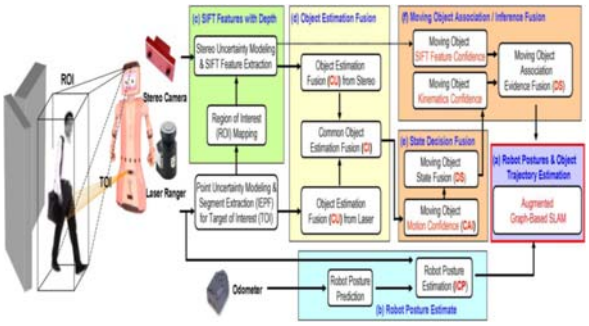


Figure-1. Flow diagram of the synergistic fusion for concurrent environment mapping and moving Object detection.

Here this system monitoring the moving objects in the whole building by stereo camera by ROI and TOI. This synergistic fusion for concurrent environment mapping and moving object detector consists of six blocks. They are

a. Robot postures and objects trajectory estimation.
b. Robot posture estimate
c. SIFT feature with depth
d. Object estimation fusion
e. State decision fusion
f. Moving object association / inference fusion

Here they used stereo camera and laser ranger which consists of ROI and TOI which finds the moving objects and if any moving objects detects means stereo camera captures the movement and fed to next stage further operations are shown in the above figure.

3. PROPOSED SYSTEM

3.1 Materials used

Here we used PIC16F877A, PIR sensors, ULN2003. L293D, 16MHz crystal oscillator, gear motors, fixed voltage regulator, LCD, buzzer and etc.

PIC16F877A is 40 pins IC. It has five ports Port-A, Port-B, Port-C, Port-D, and Port-E. Each port is eight bits except port-E. Port-E is four bits. It has four timer timer-0, timer-1, timer-2, timer-3, 10 bit A/D converter, USART etc.

PIR sensor means pyroelectric or passive infrared. It has three pins. They are Out, VDD, Ground. This detects motion and measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by check for a high signal on a single input pin. It is compatible will all parallax microcontroller. It operates voltage in 3.3v to 5v. This sensor is made up of crystalline material which generates electric charge when infrared hits on it. It contains a special filter called a Fresnel lens, which focuses the Infrared signals on to the element.

ULN2003 it consists of seven Darlington array. It contains 16 pin IC, seven inputs and outputs pin and it operate 5v DC. Here four input pins are connected in PIR and four output pins are connected to PIC.

L293D motor driver it is also called as quadrant motor driver. It contains 16 pins. Four input pins and output pins, two enable pins and four ground pins. Input pins are connected to PIC and output pins are connected to gear motors.

Liquid Crystal Display (LCD) is the combination of both liquids and crystal materials and switched in between them, LCD's are light weighted only few millimetres thickness. So it consumes less power. The LCD's don't generate light and so light is need to read the display using back light reading is possible in the dark. Here we used 16×2 display.

3.2 Method analysis

In method analysis consists of three sections. They are

i. PIR section
ii. Pull down section
iii. Pull up section

i. PIR section

Here we used four PIR sensors. The arrangement of PIR sensor is explained below. The first PIR sensor is placed to cover West and East area. The second PIR sensor is cover North-West and South-East directions. The third PIR sensor is placed to cover South and North directions. Fourth sensor is placed and covers South-West and North-East and directions. Each sensor are placed 2 cm distance gap. The schematic diagram of PIR sensors is shown below.

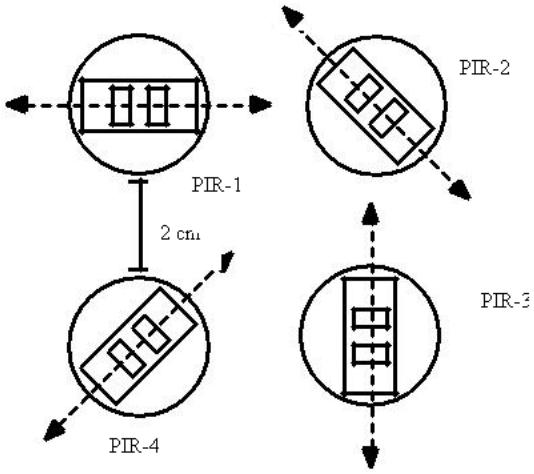


Figure-2. The Schematic Diagram of PIR sensors.

ii. Pull down section

Here the PIR's output is only in zeros and ones. If the output is one then this can be directly fed in to PIC and the output zero means the output is also zero in order to increase the voltage up to 3.3v to support Vdd. So that pull up section is used and then connected to the PIC by using L293D which used to interface PIR and PIC.

iii. Pull up section

This is used to run the motor from zero position. It moves in following direction forward, right and left.

4. WORKING PRINCIPLE

Here we used four PIR sensors which are connected in Port-C of PIC using ULN2003. In LCD it consists of 16 pins. The eight pins are connected in Port-B and four pins are connected to Port-E. Four motors are having four terminals. The two terminals are connected to Port-C and another two pins are connected to Port-D. Here buzzer is used because if the system moves to long distance. So if any human detects under debris it gives sound from that we get alert. The buzzer is connected to Port-D.

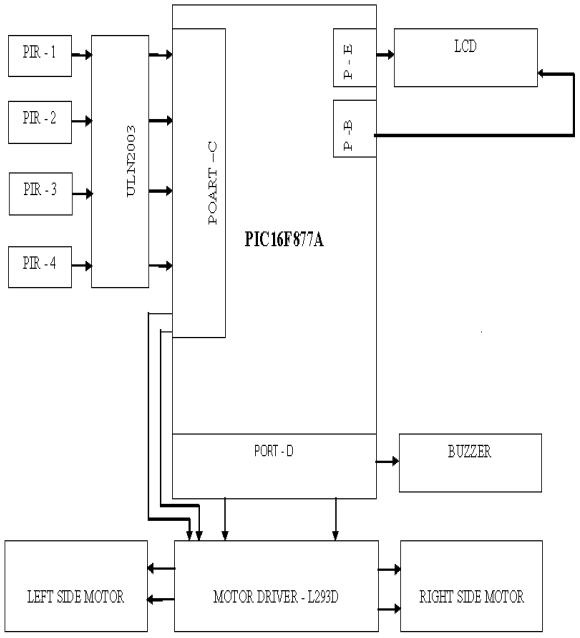


Figure-3. Block diagram of Human Tracking system.

This system consists of four PIR sensors which are numbered like 1, 2, 3 and 4. This system runs on collapsed area, if any human detects at sensor 2 means the display shows sensor 2 Y. This system runs in all directions. We designed this system as when we ON it will moves in right direction and then straight it moving directions can be change manually according to the distance of disaster area. This consists of four switches, one is to start, second switch is used to select the system to run in left direction, Third switch is for increasing the running time of the system and the fourth switch is used for decreasing the running time. The LCD display's brightness was adjusted by adjusting the contrast switch. Reset switch also provided. This switch is used to rest the system when will needed. This system also contains EEPROM by this the previous timings were known that were used.

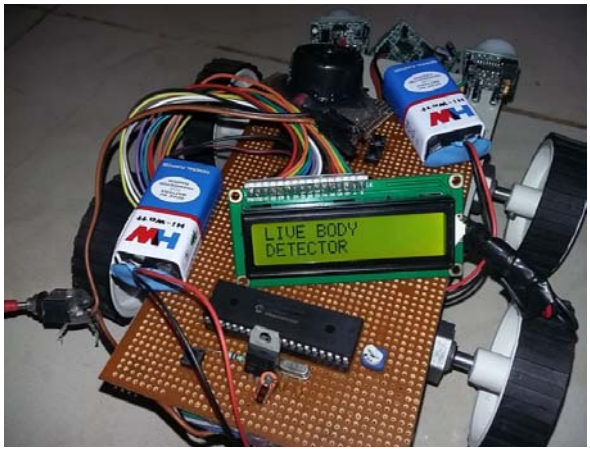


Figure-4. Outputs 1.

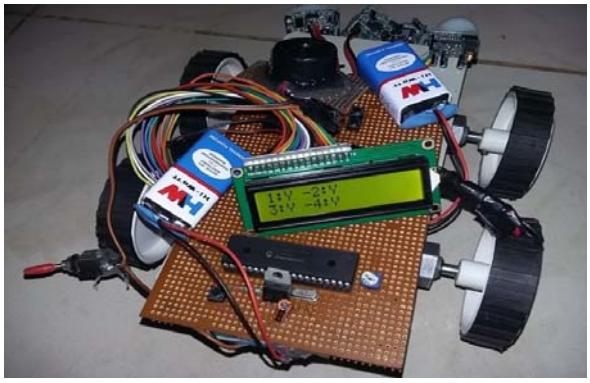
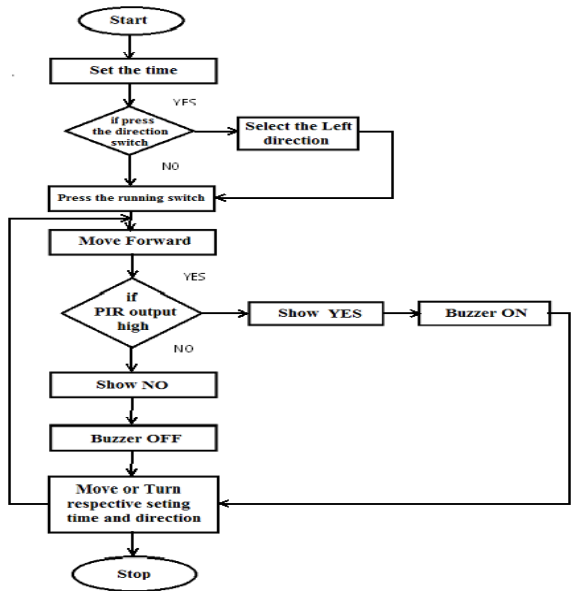


Figure-5. Outputs 2.

5. HUMAN TRACKING SYSTEM FLOW CHART



6. ALGORITHM OF HUMAN TRACKING SYSTEM

Step 1: Start.
Step 2: Setting the running time of Human Tracking System.
Step 3: Select the Human Tracking System moving direction. If the Human Tracking System wants to move in left direction means select the switch otherwise the system moves in right direction.
Step 4: Press the running switch.
Step 5: Move forward.
Step 6: PIR output is High means displays "YES" and buzzer will "ON" Else Low means displays "NO" and Buzzer is in "OFF" state.
Step 7: Move or turn respective setting time and direction.
Step 8: Repeat the step-5.
Step 9: Stop.

7. RESULT AND DISCUSSIONS

By this project it will be great help indeed to rescuers in detection of the human beings at the disaster sites. It moves in all directions and finds the alive humans presence and save their life. This system is user friendly easy to communicate, it is economical, semi-autonomous and efficient device by software programming interfacing for detection. It consists of two sections. One is moving section; here the robot will run on the disaster area and searches the alive humans. The second section is control section which interaction between the rescue team to control the movement of the Robot.

REFERENCES

[1] Linhong Wang. 2011. Human Infrared Signal Recognition Using Single PIR Detector. IEEE 4th International congress on Image and Signal Processing. pp. 2664-2668.

[2] Zade Gauri N, Badnerker S. 2011. A Modern Microwave Life Detection System for Human Being Buried Under Rubble. International Journal of Advanced Research and Studies, E-ISSN: 2249-8974, I (I).

[3] Lorenzo Crocco, Vincenzo Ferrara. 2014. A Review on Ground Penetrating Radar Technology for the Detection of Buried or Trapped Victims. IEEE International Conference on Collaboration Technologies and Systems, ISSN: 978-1-4799-5157-4, pp. 535-540.

[4] Tanapat Anusas-amornkul. 2014. A Victim and Rescuer Communication Model Collapsed Buildings/Structures. 20th IEEE International Conference on Parallel and Distributed Systems. pp. 811-816, Acc. No.15092990.

[5] David W. Paglieroni, Christian T. Pechard and N. Reginald Beer. 2015. Change Detection In Constellations Of Buried Objects Extracted from Ground-Penetrating Radar Data. IEEE Transactions on Geoscience and Remote Sensing. 53(5).

[6] Vijayaragavan. S.P, Hardeeppaulsharma, Gunasekar. C.H. Adithyakumar. S. 2013. Life Human Deducting Robot for Earthquake Rescue Operation. International Journal of Business Intelligence. 2(1).

[7] Rajeev Joshi, Pratap Chandra Poudel, PankajBhandari. 2014. An Embedded Autonomous Robot System for Alive Human Body Detection and Rescue Operation. International Journal of Scientific and Research Publications. 4(5), ISSN No: 2250-3153.

[8] Ashutosh Gupta, Besty Thomas. 2014. A New Revolutionary Infrared Life Detection System Using ATMEGA168. International Journal of Embedded systems and Applications. 2(3).

[9] [9] Sreejith K G, Raja L. 2012. A Surveillance Robot for Disaster Sites. International Journal of Emerging Trends in Engineering and Development, ISSN No: 2249-6149, Issue 2, Vol. 3.

[10] B Venkatadri, K Aswini. 2015. Design of User Friendly Human Alive Detection Robot to Avoid False Alarm and To Tackle Crisis Situation. International Journal of Emerging Trends in Engineering Research (IJETER). 3(6): 186-189.

[11] [11] Satheeshkumar V, VasanthkumarCh "A Live Human Deduction Robot Using Image Acquisition and Processing" International Global Research Analysis, Vol.2 Issue.11, ISSN No.2277-8160, Nov-2013.

[12] P. Hymavathi, T. Jyothy. 2014. Surveillance A live Human Dectection Robot using Zigbee Technology. SSRG International Journal of Electronics and Communication Engineering. 1(4).

[13] Yogesh V. angalkar, S. M. Kharad. 2015. Review Paper on Search and Rescue Robot for Victims of Earthquake and Natural Calamities. International Journal on Recent and Innovation Trends in Computing and Communication. 3(4), ISSN: 2321-8169, 2037-2040.

[14] Anjali Maggu, KiranRana, Mitesh Kumar, Mohit Dahiya and Soni Chaurasia. 2011. Life Detecting Robot for Rescue Operations. International Journal of Information Technology and Knowledge Management. 4(2): 653-657.

[15] Shubhangi C Deshmukh, Bhalchandra B Godbole, Shivaji MSangle. 2014. Detection of Live Human behind the Wall- A Review. International Journal of Innovative Research in Advanced Engineering (IJIRAE), ISSN: 2349-2163, 1(11).

[16] Asha Gupta, NidheePanchal, Dhruti Desai, Divya Dangi, Viral Patal. 2014. Live Human Detection Robot. International Journal for Innovative Research in Science and Technology, 1(6), ISSN (online): 2349-6010.