

A Review Paper on IoT based Cognitive Robot for Military Surveillance

Vaibhavi Wanjari¹, Chandrashekhar Kamargaonkar²

¹M.Tech Student, Dept. of Electronics and Telecommunication Engineering, SSGI, Bhilai, Chhattisgarh, India

²Associate Professor, Dept. of Electronics and Telecommunication Engineering, SSGI, Bhilai, Chhattisgarh, India

Abstract- In today's era the monitoring of military areas is the need of the hour due to increased attacks of the enemies and emissaries hence surveillance in tightly constrained spaces is demanded in many military covert operations. IoT based cognitive robot is an upgraded adaptation of many unmanned ground vehicle and unmanned aerial vehicle which has been already proposed. In this proposed project, design and development of the cognitive robot will be done, which will move from one place to another by sensing all required environmental conditions. Detection of human motion, location, metal or mines, spectrum, etc will be confined at a node such that real-time monitoring will be done allowing the soldiers to access the real time information simultaneously with the command headquarters using IoT protocols. We are expecting to use the predicted data by the cognitive robot which will compare the data and give the accurate output details such that an episodic memory can be created for the robot thereby increasing efficiency of the system.

Keywords: cognitive robot, IoT, military surveillance, detection, sensors

1. INTRODUCTION

Nowadays, research on cognitive sensors have been evolving with a fast pace, such that multiple sensor are used to demonstrate environmental conditions as well as for human motion detection, obstacle avoidance, location detection, metal detection, spectrum detection, etc which can be used in this proposed project. Depending on the nature of the sensing application, the sensor nodes can be arranged either randomly or in an organised fashion. Once deployed, the sensor nodes collect data, which is used to perform tasks such as surveillance and remote monitoring using internet of things.

In such challenging environment, logistics constraints strongly recommend to have very low power devices having miniature architecture which are able to operate months or years without maintenance. The evolution of the Internet of Things (IoT) has brought great changes for non-contact and non-destructive sensing and diagnosis required for continuous taking care of soldier. So we are focussed to design a miniature cognitive robot using IoT which will hoard the data for further prediction to improve the competency.

2. LITERATURE REVIEW

P.Raja, Swapnil Bagwari et al (2018) presented a MASS(military assistance and surveillance system) that uses different type of sensor to monitor the soldier such as their location, health conditions, surroundings, sending data to base station, etc. being a wearable device it monitors the pulse rate as well as send the respective data to the base station and by using GPS module the location can also be monitored by military base station. Since it is wearable installation will be cost effective and will add a heavy pack load for soldier.

Minal S.Ghute, Kanchan P.Kamble, Mridul Korde et al (2018) described a military surveillance robot system consists of a single unit, which will monitor the environment in various hazardous conditions and provide live video feedback. Gyro sensor has been used to move robot in hilly areas, metal detection for landmines. It uses Bluetooth connectivity for wireless communication through mobile application which make it range limited.

Aditya prakash, Rahee walambe et al (2018) described about a simple military surveillance robot with the commands for moving front, back, right, left and stop are being received from the remote controller and accordingly the input is fed to the Raspberry pi 3 which makes the robot setup respond as per the instructions given. The Kinect sensor works like a camera with an additional feature of depth measurement i.e. it depicts the distance of object from itself by representing the object in the form of grayscale values ranging from 0 to 255 where 0 amounts to black which implies the object is closer and 255 amounts to white which implies the object farther.

Siva karteek bolisetti, Mohammad patwary, Mohamed abdel-maguid et al (2017) proposed RF sensing based target detector which is expected to give an energy efficient solution to the problem of target detection under the sensing conditions. The sensor nodes are required to operate in harsh sensing environments in the presence of clutter and interfering signals. Using a simple low complexity target detector at the individual sensor nodes may be considered where the sensor nodes are capable of making a preliminary decision before transmitting the data to the control centre. This reduces the frequency of data exchange between the sensor nodes and the control

centre thereby increasing the lifetime of the IoT. 70% reliability has been achieved.

Ghanem Osman Elhaj Abdalla, T. Veeramanikandasamy et al (2017) implemented a Spy Robot for A Surveillance System using Internet Protocol of Raspberry Pi a Raspbian operating system based spy robot platform with remote monitoring and control algorithm through Internet of Things (IoT). The information regarding the detection of living objects by PIR sensor is sent to the users through the web server and pi camera capture the moving object which is posted inside the webpage simultaneously.

Majdghareeb, Alibazzi, mohamadraad, shamihabdulnabi et al (2017) presented Wireless robo pi for landmine detection as a low cost automated mine detector that will replace the current human detectors in the mission of detecting and extracting mines in a suspected area of land. This detector will wirelessly connect with a server to send the location of detected mines or metal and captured image of land where it is found. Since the detector is raspberry pi based we can make it as iot based for further communication.

Widodo Budiharto et al (2014) designed a Tracked Robot with Remote Control for Surveillance, the performance of the robot is in terms of the distance and the capability to deliver video streaming from the output raspberry pi and 2.4 GHz Video transmitter. Experimental results with various distance show that the best distance for transmitting the commands not more than 20 meters. The sensor system is very cheap because it only uses 1 distance sensor. The average speed raspberry pi to display a video streaming is 33 fps that sufficient for surveillance. The main weakness of type of ultrasonic sensor is the interference between different sensors and the limited ability to identify the obstacle.

Andrea Claudi, Francesco Di Benedetto, GianlucaDolcini, Luca Palazzo, Aldo Franco Dragoni et al (2012) proposes a mobile autonomous robot, called MARVIN, to be used in video surveillance applications. The main goal of the robot is to detect human faces in the monitored environment, and to autonomously move to keep a face in the exact center of the frame. The architecture of the robot is conceived to achieve a good trade-off between reactivity and accuracy. In terms of speed, the experiments showed that LBP is suitable as real-time face-detection algorithm, processing a single frame contain-ing 6 faces in about 40 ms. The performances of ORB are not sufficient to recommend its use under the conditions of the reference scenario. In terms of accuracy, LBP with a small search window can provide an accuracy of about 73%, with a considerable penalty in terms of timing performances.

Change Zheng et al (2009) presented the mechanical design including a kind of miniature flexible driving mechanism, as Miniature autonomous surveillance robot-BMS-1 for covert surveillance using set of sensors and the control system for tasks such as to secretly enter into and hide in potentially dangerous region and feed information back. It uses pyroelectric sensors that are designed specifically for detection of human motion. This light sensor is much suitable for detection of cover, because it is only sensitive to visible light and has low infrared and ultraviolet sensitivity without the help of optical filters. The output voltage of this sensor can be sampled by the ADC module of the DSP controller in BMS-1. In our robot, the two facing upward photovoltaic sensors are outfitted on the two ends of BMS-1. This allows for detection of dark location of BMS-1.

3. CONCLUSION

This paper highlights the insecurity of armed forces in the war zone. So as to provide a effective surveillance to them multiple sensors has been restored together to form a cognitive robot system which will be able to receive and transmit data and simultaneously predict the data such as geographical information and sensor data including atmospheric conditions, animal and human detection messages allowing the soldiers to access the real time information simultaneously with the command headquarters using IoT. Since the IoT has been used, the data will be shared at both ends (soldier and control room) such that making life reliable for military.

REFERENCES

- [1]A. U. Bokade, V. R. Ratnaparkhe, "Video surveillance robot control using smartphone and Raspberry pi", 2016 International Conference on Communication and Signal Processing (ICCSP), pp. 2094-2097, 2016.
- [2] R. Karthikeyan, S. Karthik, TR Prasanna Vishal, S. Vignesh, "Snitch: Design and development of a mobile robot for surveillance and reconnaissance", 2015 International Conference on Innovations in Information Embedded and Communication Systems (ICIIECS), pp. 1-4, 2015.
- [3]Nagaraju Sakali, G. Nagendra, "Design and implementation of Web Surveillance Robot for Video Monitoring and Motion Detection", IJESC, vol. 7, no. 2, February 2017.
- [4]R. Thilagavathy, J. Murali, P. Kamal, P. ArunPandiyani, "Intelligent Unmanned Army Robot", IJARCT, vol. 4, no. 2, February 2015.

[5]S. Suzuki, Y. Mitsukura, H. Takimoto, T. Tanabata, N. Kimura, and T. Moriya, "A human tracking mobile-robot with face detection," in Proc. of the IEEE Annual Conference of the Industrial Electronics Society (IECON). IEEE, November 2009, pp. 4217-4222

[6]Syed Ali Imran Quadri, P.Sathish, IoT Based Home Automation and Surveillance System on International Conference on Intelligent Computing and Control Systems ICICCS 2017.

[7]Military Robotics: Robots in the Military", EngineersGarage, 2017, [online] Available: <https://www.engineersgarage.com/articles/military-robotics>

[8]Ghanem Osman Elhaj Abdalla, T. Veeramanikandasamy, Implementation of Spy Robot for A Surveillance System using Internet Protocol of Raspberry Pi, on Recent Trends In Electronics Information & Communication Technology May 19-20, 2017, India.

[9] Chun-Chieh Wang¹, Kuo-Hsien Hsia³, Chyun-Luen Lin², Yi-Chun Hsieh⁴, Obstacle Avoidance and Wireless Network Surveillance of a Weapon Robot, IEEE 2010