Real-Time Atonomous Military Robot Path Planning

Dr. Sandeep Bhat[1], Dr. M. Meenakshi[2]

[1]Assoc. Professor, Dept of E&CE, Srinivas Institute of Technology, Mangaluru, India
[2]Professor & Head Department of Instrumentation Technology, Dr.AIT, Bengaluru, India

Abstract: These days the robots are assuming an imperative job in the human life.In risky zones like military,medical , atomic reactor, and so on robots are utilized rather than human beings. To play out all these activities,the robot should be self-governing and furthermore fit for its way arranging by keeping away from snags. This paper clarifies about the ongoing execution of the self-governing robot way arranging and approved by utilizing an implanted framework stage.

Keywords: Autonomous, Blob Analysis,Path Planning ,Robot

I. INTRODUCTION

At the point when a service robot is asked to control an item, it ought to decide the bearings longside it can access and evacuate the article. The potential available bearings for the item are recovered from the article database. At that point, spatial prevailing upon the encompassing condition and the gripper geometry is summoned to confirm the bearings[1].An ongoing Multisensor data retrieval (MSDR), which awards offbeat access to the cloud from the robots. A market-based administration technique for proficient information recovery is approved by surveying a few quality-of-service (QoS) criteria, with accentuation on encouraging information recovery in close ongoing in regular cloud automated situations[2].

In practical cases, the human visual execution and that the robot has constraints in communication with human. The robot has constrained locally available movement and correspondence vitality and works in practical channel conditions encountering way misfortune, shadowing, and multipath[3].The issue of location and following of general objects with semi-static elements seen by a versatile robot moving in large environment. A key issue is that because of environment scale, the robot can just watch a subset of the articles at some random time. A model for the robot development in which the items normally just move locally, yet with some little likelihood they hop longer distances through what we call global movement.[4,5].

The Endoscopic Submucosal Dissection (ESD) CYCLOPS framework can accomplish powers of 46N, and demonstrated a mean error of 0.217mm amid a circular following assignment with the assistance of a robot. The workspace and instrument skill is appeared by pre-clinical preliminaries. The framework is as of now experiencing pre-clinical in vivo approval[6].

The Sum of Absolute Difference (SAD) algorithm is used for the implementation of the proposed image processing algorithm. It works on the principle of image subtraction. The developed algorithm is validated in real time by a change-based moving object detection method. The novelty of this work is the application of the developed autonomous robot for the detection of mines in the war field[7,8].

The organization of paper except this section is: Block diagram and its explanation is in the section II, Working principle is in the section III and the Results and analysis in section IV.Finally, the Conclusions are drawn in the section V.

II. BLOCK DIAGRAM AND ITS EXPLANATION

The block diagram of real-time robot's video capturing system under the servielance area is given in the figure 1.

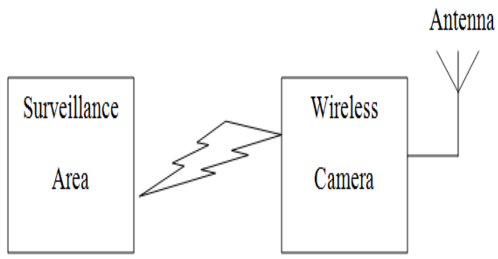

Fig. 1: The Video capturing set up.

First and foremost to check the existence of the obstacles present in the surveillance area. This is done by capturing the video from the supervision area and transmit it to the receiving system as shown in the figure 2.

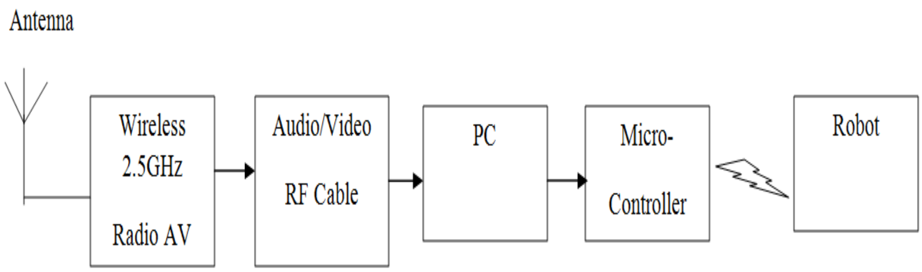

Fig. 2: Real-robot receiving system.

The captured video is transmitted to the receiver,for the further processing. The receiver system consists of a radio audio- video device to get back the video,which is already transmitted. This video is applied to the personal computer (PC),to identify the presence of obstacles using MATLAB tool with the help of the Blob analysis. Depending on the presence or absence of the obstacle,the PC sends an appropriate command to the robot through the RF communication link.

III . WORKING PRINCIPLE

The real-time robot's working principle is as described in the figure 3.

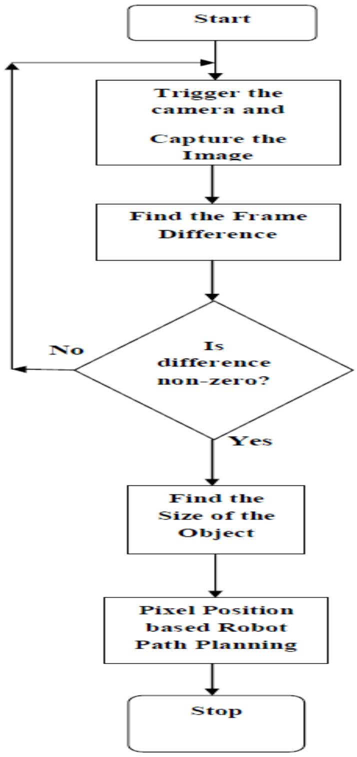

Fig. 3 : The real-time robot working principle.

First, turn ON the camera which is located in the supervision area,where actually the robot has to be worked. When the camera starts to capture the video,the PC converts the video into frames. Here, each frame is compared to its previous frame;if the difference is nonzero, then the obstacle is found. Later, the size of the obstacle is calculated using image processing based Blob algorithm. Depending on the size of the obstacle the appropriate command is transmitted through RF link in the form of ANSI code to the robot. The robot,which is developed on an embedded platform receives the command and plans its path accordingly.

IV. IMPLEMENTATION AND RESULTS

The real-time set-up of the wireless video transmission/reception system is as shown in the figure 4. The battery operated wireless camera with built-in antenna is as depicted in the figure 4a. Next, a 2.4GHz RF A/V device is shown in the figure 4b. Further, the RF A/V receiver is connected to a PC via USB dongle,as illustrated in the figure 4c.

a b c

Fig.4: The video transceiver system.

The video captured with the help of an RF system along with MultiViewer software is illustrated in the figure 5. This video is further processed for the real robot path planning applications.

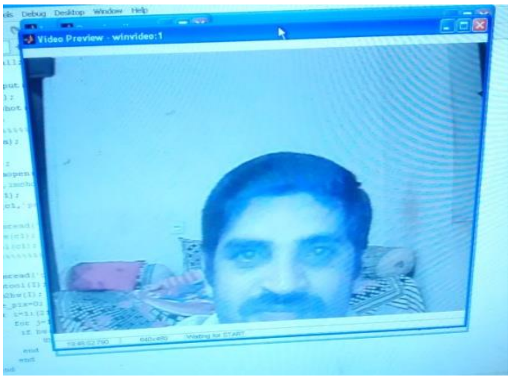

Fig. 5: Video Captured through Wireless RF Reception System.

The transmitter and receiver section of the RF communication robot are as given in the figure 6. This module is mounted on the robot and connected to the microcontroller unit to receive the video from the surveillance area.

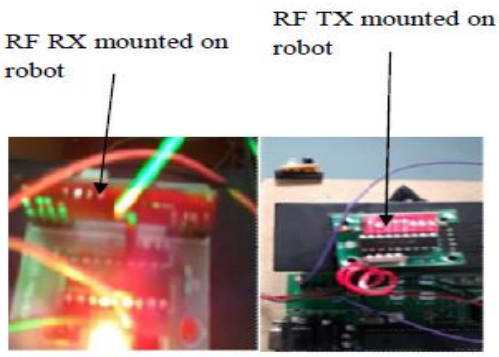

Fig. 6: The RF transceiver module.

The author's prototype of the robot with a wireless camera and RF receiver is as illustrated in figure 7.

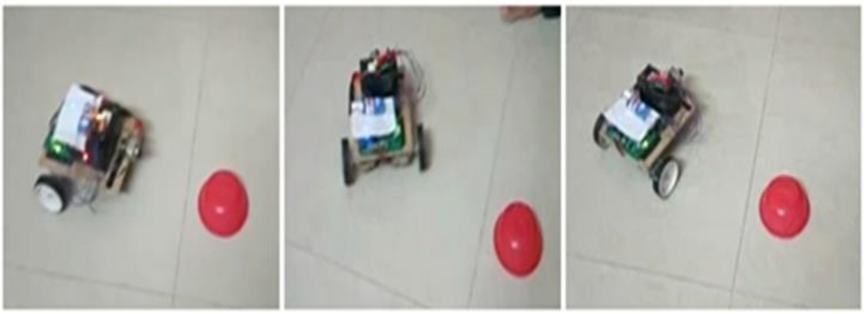

Figure 7: The final robot prototype and its movement by avoiding the obstacle(red in colour)

V.CONCLUSION

This paper offered answers for comprehend, exceptionally unsafe military applications are performed by remote robots. These applications are performed by preparing personal computer from accepting video of the observation region with the assistance of FM modulation and demodulation process. Here, in the wake of handling the video to recognize the hindrance along the way of the robot, the microcontroller interfaced with PC sends the fitting direction to autonomous robot by ASK modulation technique along with the RF modules. Thus, the upgraded way of the robot is resolved.

REFERRENCES

[1] Han-young Jang ; Hadi Moradi ; Suyeon Hong ; Sukhan Lee ; Junghyun Han, "Spatial Reasoning for Real-time Robotic Manipulation" , IEEE/RSJ International Conference on Intelligent Robots and Systems, 2006 ,pp. 2362-2367.

[2] Lujia Wang ; Ming Liu ; Max Q.-H. Meng , "Real-Time Multisensor Data Retrieval for Cloud Robotic Systems", IEEE Transactions on Automation Science and Engineering, Volume: 12, Issue: 2, April 2015, pp. 507 – 518.

[3] Hong Cai ; Yasamin Mostofi ,Human–Robot Collaborative Site Inspection Under Resource Constraints, IEEE Transactions on Robotics , Volume: 35 , Issue: 1 , Feb. 2019 ,pp. 200 – 215.

[4] Jalal Heshmatpanah ; Siavash Boroumand ; Mehdi Tale Masouleh, "FPGA design and implementation for real time vision applications on NTACO mobile robot", Second RSI/ISM International Conference on Robotics and Mechatronics (ICRoM), 2014 ,pp. 17-21

[5] Nils Bore ; Johan Ekekrantz ; Patric Jensfelt ; John Folkesson, "Detection and Tracking of General Movable Objects in Large Three-Dimensional Maps", IEEE Transactions on Robotics, Volume: 35 , Issue: 1 , Feb. 2019 ,pp. 231 – 247.

[6] Timo J.C. Oude Vrielink ; Ming Zhao ; Ara Darzi ; George P. Mylonas , "ESD CYCLOPS: A New Robotic Surgical System for GI Surgery" ,Timo J.C. Oude Vrielink ; Ming Zhao ; Ara Darzi ; George P. Mylonas, IEEE International Conference on Robotics and Automation (ICRA), 2018,pp.107-110.

[7] Sandeep Bhat,M.Meenakshi, "Vision Based Robotic System for Military Applications -- Design and Real Time Validation", Fifth International Conference on Signal and Image Processing (ICSIP), 2014 ,pp.123-125.

[8] Mustafa Engin,IEEE international conference on "Embedded and real time system design: A case study fire fighting robot",5th Mediterranean Conference on Embedded Computing" "(MECO)2016, Montenegro , June 2016,pp.18-21.