HUMAN DETECTION USING DEPTH SENSING CAMERA

[1]Lahari Vaidya, [2]Harshini, [3]Namratha, [4]Lekhana Bhandary, [5]Sachin Bhat

Department of Electronics and Communication
Shri Madhwa Vadiraja Institute of Technology and Management
Udupi, Karnataka, India

***Abstract*-Human detection robot in today's technology plays a very crucial role in detecting and differentiating intruder from our soldiers in sensitive zones, where to do so human reach out is not possible. Generally, robots are programmed to perform specific tasks, which humans cannot. To increase the use of robots where conditions are not certain, such as war zones, robot can be made to fallow the instruction of the human operator and perform task. In this way decisions are taken according to the working conditions given by the operator and the task is performed by the robot. Human detection robot in today's technology plays a very crucial role in detecting and differentiating intruder from our soldiers in sensitive zones, where to do so human reach out is not possible. We have military robot which implements an application of detecting and recognition of human being. A depth sensing camera is mounted on the robot for human detection aimed at both static and dynamic modes of operation. This is done by using Matrix lab (MATLAB) using viola Jones algorithm aimed at face detection. Further by using Euclidian formula we adopt concept of human recognition.**

***Keywords*- MATLAB, detection, recognition, bluetooth signal, webcamera.**

I. INTRODUCTION

Human detection robot has been a topic discussion for both science fiction and academic speculation even before any robots existed. Proposed Study on Robotics describe that robot may not injure a human being or allow a human being to harm. It obeys any orders given to it by human beings. Along with that robot must protect its own existence. Robots and humans share a workspace where it goals at task achievement. Scientists work to improve robot's utility and evaluate risk that benefits new" friend" for modern society. Robots are artificial agents which work with perception and action. They are used in factories, found in domains such as search and rescue, military battle and bomb detection. Let us consider a scenario of a battlefield where robot performs tasks like man efficiently and effectively than human soldiers. It is true that there are many pros of using robot in military activities instead of human beings because, they perform and execute work in a better way compared to humans without causing any damage to their lives. We have developed a base model of a military robot which goals at performing action like a soldiers in the war field. Hence the robot performs two activities: Firstly, it senses the object captures the image and detects only if it is a human. Secondly on recognition, if it finds that the intruder is not our soldier then it points the weapon on the intruder along with this, the robot keeps moving and senses further to figure out detection of intruders. There has been research followed since year about advanced robotics for military purpose done by co-operation and government institutes. However, we focus here onto human face detection by various techniques as complete review of people detection in real time is beyond scope, but related work can be done. To our best of knowledge, approach towards human face detection is done using this robot where IR sensors are used as object detector.

II. LITERATURE SURVEY

Researches proposed human detection and recognition in real time that include a web camera mounted over a robot for image capture and identification using a concept of human detection and recognition using depth sensing camera. It is possible to capture the image of intruder thereby recognition is done. Further robot works accordingly as featured. As per the research conducted over years and report made, advanced robotics for military purpose can be done by co-operation and government institutes.

ln[1], Hashin Masod Kahily, A.P Sudheer developed "Real time human detection and tracking from a mobile armed robot using RGB-D sensor", which goals at building a prototype of military robot which implements an application of real time human detection and tracking. It aims at detection of human detection of humans both in static and dynamic modes of operation.

In[2]," Visual People Detection" describes the challenges & problems in computer vision due to large variations caused by articulation, viewpoint and appearance. At the same time, it also describes detecting people and has a wide range of applications including robotics, image and video indexing, surveillance and automotive safety.

In[3], Michael D. Breitenstein, Fabian Reichlin, Bastian Leibe, Esther Koller-Meier, Luc Van Gool developed "Robust tracking-by detection using a Detector Confidence Particle Filter" which has a goal to automatically detect a variable number of targets in complex scenes using a monocular, potentially moving, uncalibrated camera. In order to cope with uncertainty for the object locations, e.g., measurement noise, clutter, changing background, and significant occlusions detection method is used.

In[4], "Rapid Object Detection using a Boosted Cascade of Simple Features" describes a machine learning approach for visual object detection which is capable of processing images extremely, rapidly and achieving high detection rates. It constructs a framework for robust and extremely rapid object detection.

In[5], "Histograms of Oriented Gradients for Human Detection"describes robust feature set that allows the human form to be discriminated cleanly, even in cluttered backgrounds under difficult illumination. It studies the effects of various implementation choices on detector performance, taking pedestrian detection (the detection of mostly visible people in more or less upright poses).

In[6], Matthias Luber Luciano Spinello Kai O. Arras developed "People Tracking in RGB-D Data With On-line Boosted Target Models" describes a 3D people detection and tracking approach using RGB-D data. It combines a novel multi-cue person detector for RGB-D data with an on-line detector that learns individual target models.

ln[7], " People detection using range and intensity data from multi-layered laser range finders" describes laser reflection intensity as a novel feature for people detection, achieving significant improvement of detection rates. In concrete, it proposes a method for calibration of laser intensity data, a method for segment separation using laser intensity, and introduce two new intensity-based features for people detection: the variance of laser intensity and the variance of intensity differences.

III. METHODOLOGY

Imagine robots in battle field, where robots are capable of doing tasks just like or more efficiently than human soldiers. There are many advantages of implementing robots in military activities. The goal of our project is to develop a prototype of a military robot that aims to perform like a soldier in a battlefield the major advantage of using a robot is that they are capable of performing duties similar to soldier duties without actual damage to human life. Two major modes of operation that robot is capable of performing is, one being able to detect human and recognize for identification of soldiers and differentiating from intruders and another being able to aim the weapon when the recognized person is found to be an intruder.

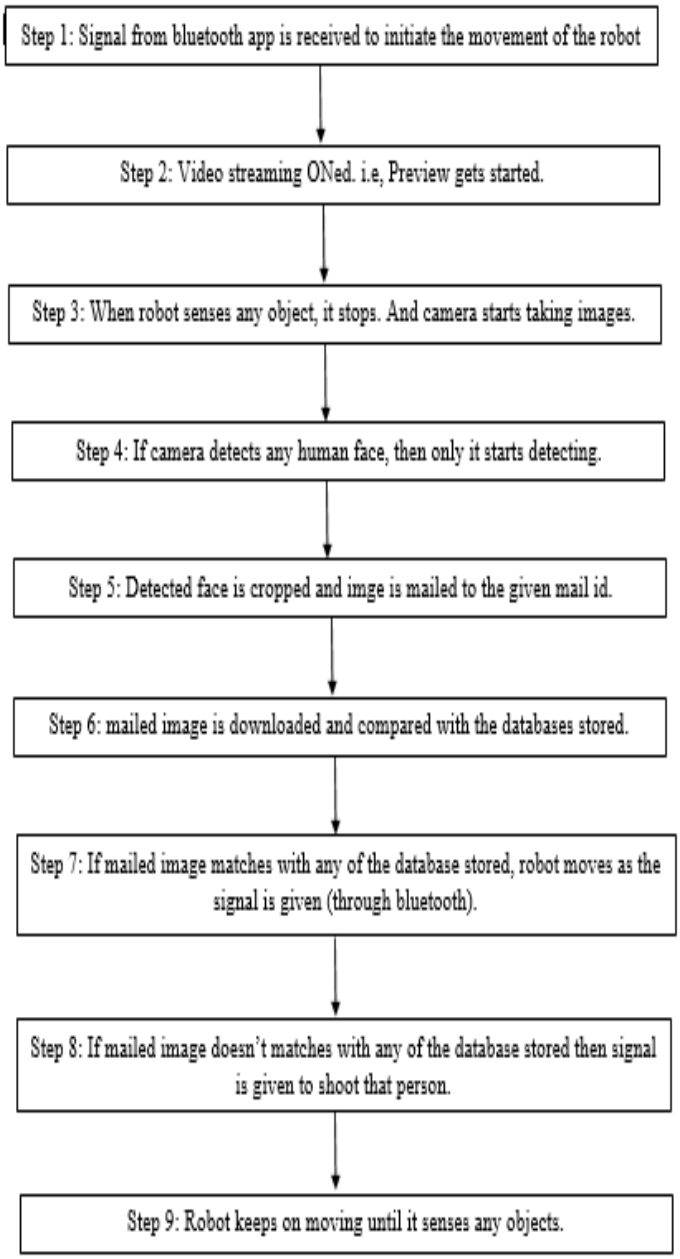

Fig 1: Algorithm Representation

As shown in Fig 1 Signal from Bluetooth app for robot movement is received. Received signal can be for the robot movement forward, backward, right or left. When object is detected by IR sensor signal is received then web cam mounted on robot is turned on for image acquisition purpose. Then the snap shot of image is taken using viola Jones algorithm that is, vision cascade object detector, face detection is done. The detected image is sent via email to the server room. Along with that detected image is cropped and saved in test data base. Using same procedure that is applying viola Jones algorithm data base is created in train data base. Now the saved image in test data base is compared with train data base using Euclidian formula recognition of the image is done. If the recognition fails, then a message is sent for laser point out else robot starts performing accordingly.

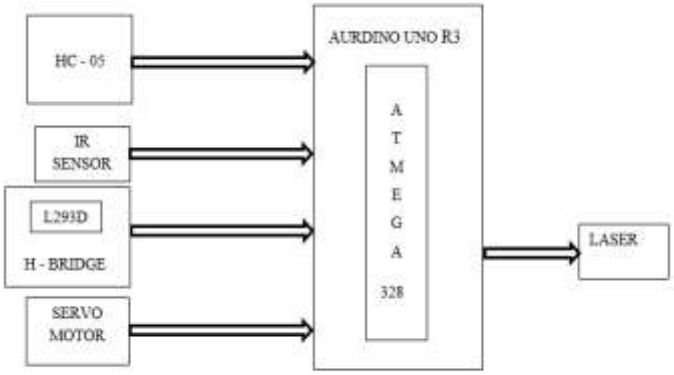

Fig 2: Block diagram

Fig 2 explains the Prime aim of human detection and recognition using depth sensing camera. The prototype of robot developed is used to detect an object and then take a snap shot of it. Further, if human is detected face detection takes place and then detected face is sent for recognition purpose. ARDUINO Uno ATMEGA328P is used as open source computer hardware, software system which act base of entire hardware system of robot. ARDUINO-Bluetooth is interfaced. When message from Bluetooth (HC-05) app is sent to ARDUINO on receiving of signal from Bluetooth the robot movement can be controlled. HC-05 Bluetooth is wireless serial connection setup that is used in the system. IR sensors are used with a range of 0.75um to 3um for low range object detection. When object is present sensor senses, led glows and robot stops. Detected signal is sent to the ARDUINO IDE server. H-Bridge is a motor driver that is interfaced with ARDUINO for driving two motor simultaneously either way and a servo motor is used at the top were rotation of the web cam 180 degree is required when IR sensor detects the object. These are the initial working, once the detection and recognition part is done on identification of intruder signal from control room for aim of weapon is sent, thereby laser glows.

IV. RESULT

The IR sensor used sense the object, thereby camera captures the image and following working takes place.

- Preview is on
- Captures the image
- Snapshot is taken
- Face is detected
- Detected face is recognised.

Meanwhile the detected image is sent to the mail ID at the control room which is downloaded and then matched with the database present to be recognized. When the image is sensed a message "Detected" is displayed in ARDUINO software. The signal for robot movement control is given through Bluetooth app in control room, instruction will be displayed in server of ARDUINO.

Fig 3: Human detection and recognition

Human detection and recognition is shown in Fig 3 were if the recognized person image doesn't match with the data base present, then the signal is sent to robot for aiming of weapon on the intruder. Interfacing of software and robot is shown in Fig 4.

Fig 4: Robot interfaced with software

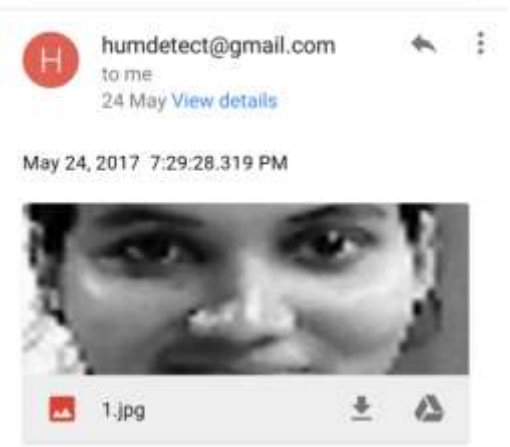

Fig 5: Detected image sent to user mail id

V. CONCLUSION

The proposed work has been developed using IR sensor, MATLAB interfaced along with embedded technology. The work proposed considers the priority of human detection particularly face detection and then recognition. The accuracy of IR sensor plays a vital role in detection of humans. On identification a message is sent from control room to aim a weapon on intruder, if recognition doesn't match with the present data base. The proposed database is very important in current technology for human detection and recognition purpose in the war zone where human reach out is not possible.

The prototype of military robot whose aim was to detect human beings in static and dynamic mode and to aim weapon on intruder thereby blinking of led is implemented successfully. Along with this we also recognize the person's

image when captured by the camera mounted on robot if the data base is present in the system else the action of aiming weapon by robot is done when instruction is given. Meanwhile detected image is sent to user mail ID as shown in Fig 5.The whole frame work of human detection robot using depth sensing camera focuses on human detection and recognition which is applicable in battlefield.

REFERENCE

[1] Hashin Masod Kahily, A.P Sudheer, "Real time human detection and tracking from a mobile armed robot using RGB-D sensor",2016 world conference on futuristic trends and innovation for social welfare.

[2] Schiele B, Andriluka M, Majer N, Roth S, Wojek C. "Visual people detection: Different models, comparison and discussion", Proceedings of the IEEE ICRA Workshop on People Detection and Tracking; May; 2009.

[3] Breitenstein M, Reichlin F, Leibe B, Koller-Meier E, Van Gool L, "Robust tracking-by-detection using a detector confidence particle filter", Computer Vision, 2009 IEEE 12th International Conference on; Sept; 2009.

[4] Viola P, Jones M. "Rapid object detection using a boosted cascade of simple features", Computer Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on; Vol. 1;2001.

[5] Dalal N, Triggs B. "Histograms of oriented gradients for human detection",Computer Vision and Pattern Recognition, 2005. CVPR 2005. IEEE Computer Society Conference on; June; Vol. 1; 2005. p. 886-893 vol. 1.

[6] Luber M, Spinello L, Arras KO. "People tracking in RGB-D data with online boosted target models", Proc. of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS). San Francisco, USA; 2011.

[7] Carballo A, Ohya A, Yuta S "People detection using range and intensity data from multi-layered laser range finders", Intelligent Robots and Systems (IROS), 2010 IEEE/RSJ International Conference on; Oct; 2010. p. 5849-5854.