

# Effect of Telerobotics using Real-time Face Detection on a Raspberry Pi

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**ABSTRACT:** Effective and Real-time face detection is to be used for the telerobot accurate action. For that since the procedure demand having the ability to perform autonomous work and controlling operators command actions corresponds directly to action in the device controlled. The major components of operator are the usual and control applications. Placing the camera on a perspective that allows intuitive control is based on real time face detection on Raspberry Pi graphical processor. The telepresence robot follow an interlocutor face using two Raspberry Pi3 model b is demonstrated. It is a combination of two major subfields teleoperation and telepresence. The results confirmed that visual based performance of robot within a low cost with acceptable performance. Thus, making this with less budget constraint.

**KEYWORDS:** Face detection, Haar classifier, LBP, robot, Raspberry Pi, GPU, OpenCV.

## I. INTRODUCTION

Telerobotics is the area of robotics concerned with the control of semi-autonomous robot from a distance. It is a combination of teleoperation and telepresence. Teleoperation indicates operation at distance having a telemanipulator(or teleoperator) is a device that is controlled remotely by a human operator. Command action is controlled by using face detection technique. Telepresence refers to the set technologies which allows a person to feel as if they were present, or to have an effect, via telerobot, at a place other than their true location. For the purpose of scientific discovery in unmanned area, it is having a wide range of applications. E.g. for research, health care, office, school also for general purpose use[1]. Commercial robots are not affordable so ultra-low cost computer for education [2], the Raspberry Pi(RP), considered. The Raspberry Pi is a series of small single board computers developed in the United Kingdom by the Raspberry Pi foundation to promote the teaching of basic computer science in school and in developing countries.

Real time face detection is a key step for controlling telerobot. Key factors in face detections are image based face tracking and face recognition and matching for authentication can be performed using that. There are several real time face detection techniques have been used in high performance telepresence robot, but here it is using pure RP computers. Tripathy and Daschoudhury[] presented a technique for face tracking using Haar classifier on the graphical processor(GPU) of RP computer.

Haar Feature-based Cascade Classifier for Object Detection. The object detector described below has been initially proposed by Paul Viola and improved by Rainer Lienhart. First, a classifier (namely a cascade of boosted classifier working with haar-like features) is trained with a few hundred sample views of a particular object (i.e., a face), called positive examples, that are scaled to the same size (say, 20×20) and negative examples – arbitrary images of the same size. After a classifier is trained, it can be applied to a region of interest (of the same size as used during the training) in an input image. The classifier outputs a “1” if region is likely show the object (i.e., face), and “0” otherwise. To search for the object in the whole image one can move the search window across the image and check every location using the classifier. The classifier is design so that it can be easily “resize” in order to be able to find the objects of interest at different sizes, which is more efficient than resizing the image itself. So, to find an object of an unknown size in the image the scan procedure should be done several times at different scales. Haar-like features are

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the input to the the basic classifier, and calculated as described below. The current algorithm uses the following Haar-like features:

## II. PROPOSED SYSTEM

The system include Hardware & Software. A general block diagram shown below.

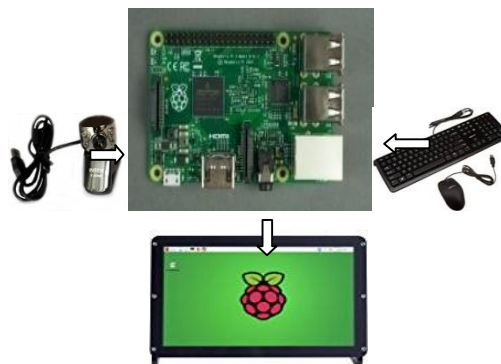


Fig 1. System Implementation

The Raspberry Pi is the heart of the system. We make use of Raspberry Pi 3 Model B which has size specifications.....



Fig 2. Raspberry Pi Specifications

The system program using python programming language. We have developed algorithm for face detection.

- A. Face detection from a given image through web cam:  
Histogram equalization is done on the input image. Haar classifier is used for image calculation process and once face is detected face, a red bounding box is drawn on the detected face. Detected face and sub faces are save and time taken for detection printed.
- B. Real-time face detection:  
Video is captured real-time using the webcam. As long as a face is detected, a red bounding box is drawn and the video is displayed in the output window. The same algorithm is efficient enough to detect multiple faces also.

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The system program using c programming language for telerobot. We have developed algorithm for moving telerobot.

- C. Wireless Communication between teleoperator and telerobot: Wireless communication between teleoperator and telerobot using Bluetooth model. As per above mentions that Raspberry Pi 3 Model B having Wi-Fi and Bluetooth facility for wireless communication. That Bluetooth connect with Bluetooth model placed on telerobot. As per program in RP model send the result to telerobot via Bluetooth.
- D. Controlling action of robot  
According to result received from RP, PIC microcontroller which is mounting on telerobot. we are using PIC here, according to program PIC take action on to that and motors run accordingly.

## III. RESULTS

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## REFERENCES

- [1] KritJanard and WorawanMarurngsith "Accelerating Real time Face detection on Raspberry Pi telepresence Robot" Fith International Conference on Innovative Computing Technology (INTECT 2015)
- [2] A. Kristoffersson, S. Coradeschi, and A. Loutfi, "A review of mobile robotic telepresence," *Adv. In Hum-Comp.Int.*, vol.2013, pp.3-3, 2013.
- [3] R. Heeks and A. Robinson, "Ultra-low-cost computing and developing countries: Raspberry Pi and its potential in the "global South", *Communications of the ACM*, vol.56, pp.22-24, 2013.
- [4] S. S. Prabha, A.J.P. Antony M.J. Meena, and S.R. Pandian, "Smart cloud robot using raspberry pi," in *the ICRITIT 2014*, 2014.
- [5] Pankaj R. Bhusari and Vrushali G. Raut "Real time face detection and recognition system" *International Journal of Computer Science and Technology (IJCST)* vol.5, SPL-1, March-2014
- [6] *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075, Volume-2, Issue-6, May 2013
- [7] Zhen Lei, Stan Z. Li Center for Biometrics and Security Research & National Laboratory of Pattern Recognition, Institute of Automation, Chinese Academy of Sciences
- [8] *International Journal & Magazine of Engineering Technology, Management and Research* ISSN NO: 2348-4845
- [9] Automatic Face Recognition System using P-tree and K-Nearest Neighbor Classifier Mohammad Kabir Hossain, Abu Ahmed Sayeem Reaz, Rajibul Alam, and Dr. William