Face Recognition Using Robotics

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Abstract— Face Recognition using robotics is a hardware-software system process for recognizing the face whichever provided to it. This project aims to provide flexibility in work where user needs to monitor robots and its features. We will have robots for this purpose; they are programmed and will function accordingly. As there are Robots so we need Arduino Microcontroller and we need to be familiar with Arduino Programming. We have a system where a face as an input suspect will be provided. Robots will search for particular face within some area and accordingly responses to the user machine. The system will be having OpenCV with JavaCV for processing of face. And the versions of OpenCV and JavaCV must be compatible with each other.

I. INTRODUCTION

Face recognition system using robotics is an embedded kiosk that will help us to identify and then recognize the human face as an image provided to it. A robot face recognition system is a computer application used to automatically identify or verify a person from a digital image from a video source. This is usually achieved through the comparison of selected facial features from the image and a facial database. Typically used in security systems and comparable to other biometrics like fingerprint or eye iris recognition systems, facial recognition software is based on the ability to recognize a face by measuring the various features of the face. Face recognition system has important task is verification. [1]

Faces are captured by wireless camera fitted on Arduino programmed robots. The robots are well programmed, user controlled moving robots. Instructions of the movements are given to the Arduino board via Arduino Bluetooth module. The robots will move according to the instructions and captures the human faces. Those faces will get detected and matched with input suspect image. System will show the result either face is matched or not. [2, 3]

II. SYSTEM DESCRIPTION

We are having OpenCV with JavaCV as both needed to be compatible with other then only they will function, so we have OpenCV 2.4.5 with JavaCV 0.5. A good working face recognition program is there by us in JavaCV. [4]
A java program is there so jdk 1.7 is used. It is required for JavaCV. So we will be having a proper platform. For robotics, Arduino UNO application software is used and for serial communication a Bluetooth module ranges 10 meter is used. [5, 6]

As multi robotics are there we have done with both DC Motor and Servo Motor. For DC Motor a L293D IC chip for rotation in both the directions is used to be communicated with the external system serial instruction supply. And for Servo there is servo program. Both Motors will be working externally with external power supply from battery. An external 9V battery supply is given to the Arduino board. [7]

A. Scope

The scope of the project is to implement this embedded product using Image processing. The product will be well known and used by the user in need for the same. The product has an attractive approach which increases interests of the user for future development. System provides a friendly environment to deal with images. The system is designed using javaCV hence platform independent.

B. Application

1. Aircraft Maintenance
2. Electronic Book Buying Coalitions
3. Military Demining
4. Wireless Collaboration And Communications
5. Military Logistics Planning

6. Supply-Chain Management.

7. Joint Mission Planning.

8. Financial Portfolio Management

III.   REQUIREMENTS

The hardware and software requirements of our project is as follow.

A. Software

➢ Operating system: windows XP onward (32 or 64 Bit processor).
➢ Java CV 0.5.
➢ Open CV 2.4.5.
➢ JDK 1.7.

**B. Hardware**

➢ Arduino Uno
➢ Servo motor
➢ Power supply
➢ USB wireless Camera
➢ Monitor
➢ Bluetooth module (HC-05)

IV.   IMPLEMENTATION

We are using wireless A/V camera for capturing the image. Wireless A/V Camera high receive sensitivity +18db, Receive signal picture sound 0.9G/1.2G.with high quality output. Transmitted distance up to 200Ft. [8]

A robotics is totally based on a single microcontroller that is "Arduino". Arduino is a microcontroller which provides a great interface to input the instructions and to get the feedback. Arduino uno provide the set of analog and digital I/O pin that interface to various expansion board and other circuits.the board provide the Universal Serial Bus(USB) for loading program from personal computer.It also provide the slot for external power supply.The arduino board have different number of I/O based on the Arduino board. [9]

The Arduino UNO microcontroller board based on the ATmega328P.it has 14 digital I/O pins out of which 6can be used as Pulse Width Modulation(PWM) output,6analog inputs and reset button.this board can be operate on 5v.
PIN diagram and physical snap of Arduino:
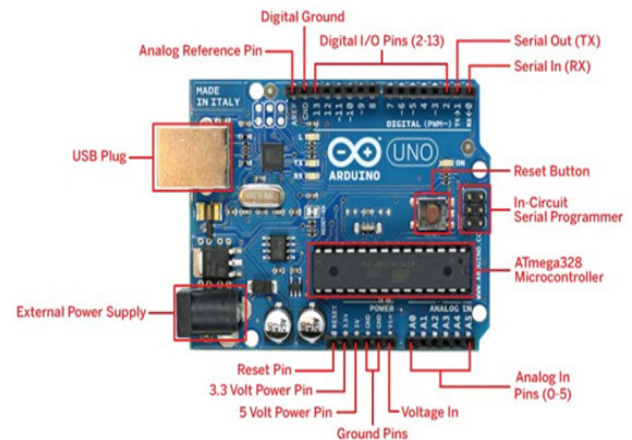
We are having a DC Motor for robot, and L293D IC to make DC motor to rotate in both the directions. So PIN configuration for L293D is shown and also interfaces with Arduino via Bluetooth. [10]
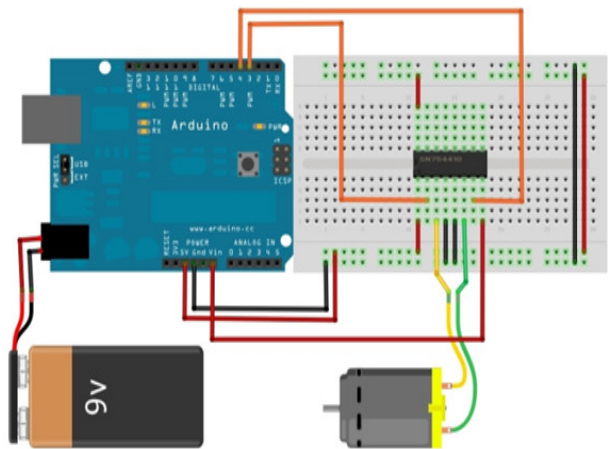
The above diagram show the connection of DC motor using L293D through Arduino board.The pin description of IC are as follow.
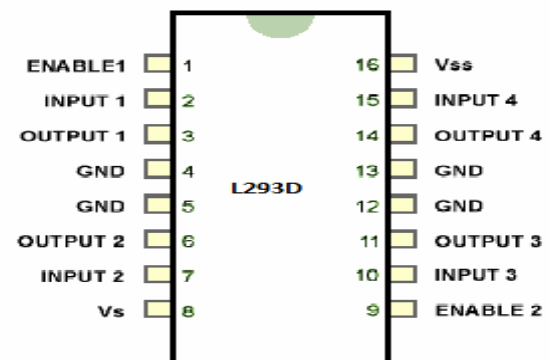
L293D is atypical motor driver IC which allow dc motor to move in both direction.L293D is a 16-pin IC which control a set of 2 DC motor simultaneously in both the direction.it means we can control the two DC motor with the help of single L293D IC.L293D contains two inbuilt H-bridge driver circuite.There are 2 enable pin 1 and pin 9 to drive two motor respectively. For working of any one of the motor pin 1 and pin9 are enable accordingly. The four input of this IC pin 2 and 7 on the left and pin 15 and 10 on the right are regulate the left and right motor respectively. The motor are rotated on the basis of the inputs provided. At the input pin as LOGIC 1 or LOGIC 0.Pin 3 and 6 are used for output for motor 1 .pin 4and 5 are used for ground connection. Pin 11 and 14 are used for the output for motor 2.pin 8 and 16 are used for supply of external battery it may be 9-12 volt but also used up to 32 volt.Pin 4,5,12 and 13 are used for ground connection.[11]

Algorithms

Algorithm developed by taking reference of "Andrew Davison" Algorithm for face Tracker: [12]

1) Start
2) Set important properties:

1. Set delay time to refresh frame DELAY _TIME = 100 ms
2. Set CAMERA_ID =0
3. Set image scale as IM_SCALE=4
4. Set a small move of image as SMALL_MOVE =5
5. Set the delay time to detection face as DETECT_DElAY = 500 ms
6. Set maximum number of task to executed at a time TASK =4

3) Import haar -cascade XML file.
4) Saving detected face:
1. Face directory as FACE_DIR="save face"
2. Face name as FACE_NAME ="face"
3. Face width as FACE_WIDTH= 125
4. Face height as FACE_HEIGHT=100

5) Declare JAVA_CV variable
1. CvHaarClassifier
2. CvMemStorage
3. IplImage
4. CanvasFrame

6) Taking input of image.

7) Call Haar- cascade file and compare if classifier is null system is close.
8) Create a memory storage during the operation of object detection.
        Storage =CvMemStroge.create ();
9) Create a grabbering the image and grabber the picture with respected CAMERA_ID and call FRAME_GRABBER()
10) FRAME_GRABBER ()
        {
    1. Grabber the frame
    2. Set image width(320)
    3. Set image height(200)
    4. Start Grabber
        }

11) Create snap for image using IplImage (FrameGrabber grab, camera ID)
        IplImage ()
            {
                grabber.grab ()// taking snap for image
            }

12) Stop the grabber

    CloseGrabber(FrameGrabbergrab,cameraID)

    {
        grabber. Stop () Grabber. Release()
    }

13) Find the face in current image and cut into rectangle
14) If (rectangle! = null)
        {
            Set rectangle (rect)
            If(SaveFace)
            {
            Clip Face(img)
            SaveFace=false
            }
        }

15) Find the single face using Haar Detector
        CvSeq face =CvHaarDetectObject();
16) Scale image convert into grayscale

17) Buffered the image for in rectangle face

18) Storing image into FACE_DIR with name "face"+increment value.

19) Build EighenFace of suspect images and Capture image
    1. Create a face bundle of specified number of eighenface

2. Create a eigenvector for image
3. Calculate the convariance of matrix
4. Calculate eigenvector convariance
5. Convert array images into matrix
6. double [][] data =new double[rows][column]

20) Convert into 2D matrix
    2Dmatrix (into row, int column)
           {
1. Calculate the mean face vector value
2. Get average of each column
3. Replace row to column
4. Normalize to array

          }

21) Calculate image distance
22) Match the result
         Matchresult(int value, int name)

23) End

V. WORKING PRINCIPLE

Below figure give full description about the working of project. The robotics capture the image from the environment and provided to the system. System processes on image which are obtained from the environment. The image which are obtained or the image which are stored in database are compared with the result which is provided to the agent through the system, agent identify and detect the image and send the feedback to the system.
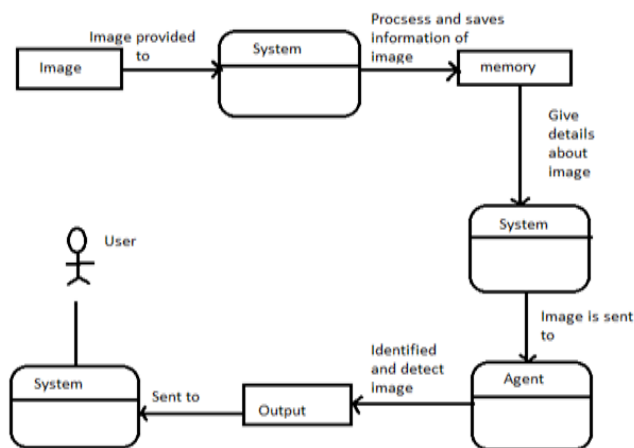
A. merit
1. Quality of things achieved.
2. Production rate of product increases.
3. More time save by using robots.
4. portable

B. Demerit
1. Expense of the system is more for purchase.
2. Expertise people need for handling the system.
3. It needs maintenance to keep it running.

VI. CONCLUSION

We have presented this project for modeling, specifying and developing a robot. The concept of system diagram showed us how the system is diagnosed and is reasoning about. The flexibility in systems facilitates to operate itself.

The technologies make easier to build robust systems in a short time. The paper reviews the study of the hard problem that derives actions and communication strategies for robot with the face recognition system. There are several advantages as well as disadvantage of system.

VII. FUTURE SCOPE

Since this system has been generated by using Object Oriented programming, there are every chances of reusability of the codes in other environment even in different platforms. Also its present features can be enhanced by some simple modification in the codes so as to reuse it in the changing scenario. In this project we have use Heuristic approach but if more advanced algorithm is found the application the results could be drastic.

REFERENCES

[1] J. W. Welsh and D. Shah, "Facial-Feature Image Coding Using Principal Components", Electronic Letters, vol. 28, no. 22, 1992.
[2] R. Fierro, F. Lewis, and A. Lowe, "Hybrid control for a class of underactuated mechanical systems", IEEE Transactions on Systems, Man and Cybernetics, Part

A: Systems and Humans, vol. 29, no. 6, pp. 649-4, Nov 1999.

[3]   http://www.instructables.com/id/Face-detection-and-tracking-with-Arduino-and-OpenC/

[4]   http://opencvlover.blogspot.in/2012/04/javacv-setup-with-eclipse-on-windows-7.html.

[5]   http://www.oracle.com/technetwork/java/javase/downloads/jdk7-downloads-1880260.html.

[6]   http://www.instructables.com/id/Arduino-AND-Bluetooth-HC-05-Connecting-easily/.

[7]   http://communityofrobots.com/tutorial/kawal/how-drive-dc-motor-using-l293d-arduino.

[8]   http://www.sproboticworks.com/products/camera/wireless-a-v-camera.html

[9]   https://www.arduino.cc/en/Main/ArduinoBoardUno

[10]   http://randomnerdtutorials.com/arduino-control-2-dc-motors-via-bluetooth/.

[11]   http://www.engineersgarage.com/electronic-components/l293d-motor-driver-ic.

[12]   http://fivedots.coe.psu.ac.th/~ad/jg/nui08/index.html.