Face Recognition Using Multi-Agent System

Wasim Shaikh[1*], Hemant Shinde[2] and Grishma Sharma[3]

[1,2,3] Department of Computer, K.J.Somaiya College of Engineering, Mumbai, India

Abstract— Face Tracking and face recognition using Multiagent System that will help us to identify and then recognize the human face as an image provided to it.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.[1][2]

I. INTRODUCTION

Face recognition is important research topic in the world. Feature extraction is biggest challenge and as well as Face recognition. Traditional algorithm is developed for face recognition system but it decrease performance due to illumination. Many algorithm is used to face feature extraction like PCA algorithm for important region. This method reduced the effect of face recognition.[1] Here we create Face Recognition system using Multi-agent system, here we used multi camera for performing and we can solve problem of illumination. We make such system which cooperate and coordinate with each other without Human Intervation.We used Multi-agent system for Face tracking and face recognition. Agent based system solve this problem. Coordination and communication between agents is biggest challenge for us, we used Agent Theory concept to solve this issue. We use face recognition framework in agent based environment due to work of agent recognition of face.[1]

We use Multi-agent system using JADE (Java Agent Development Environment) framework for agent. We create two agent one agent for face capture in real-time from camera and tracking. As well as Second agent will recognize captured image, whether captured image is match with input image. The operation of searching face for recognition, these agent is communicate and coordinate with each other using Messages. These agents is connect with main container, and agent communicate via messages. Message contains the description about recognition, whether face is recognize or not. All the competitor agents work with face parameter like Eigen value of detected image and input image for recognition and in mean time we get result of operation.Parallism of agent environment which give result fraction amount of time, and speed of processing is also increased and Throughput also, this is and advantage of system.[1][3]

II. SYSTEM DESCRIPTION

Multi-agent system is contain multiple agent which interact within environment.It is an autonomous system in which agent takes perception and acheieve desired goal.These agent percept the face as parameter and according to given rule,agent perform their assigned task of face tracking and face rcognition.We use agent control system,Each agent in system take snapshot of face and match with input image,if match is found then agent transmit the message to second agent "match is found ",so that communication between agent will monitor by the JADE environment.Agent management system will take responsibility of communication between agent and user can monitor or simulate message passing communication between agents and description about face.[1][7]

A. SCOPE

This system can be used in Security domain, such like Anti-terrorism, face recognition system is used to recognize terrorist image as input image and match with detected image, if match is found particular authority can easily arrest the individual.

This system can be implement in aerospace for taking picture and recognize them in agent environment. This system can be used where Human involvement is

impossible, in such places this type of autonomous system is use.[7]

It will be used in agriculture domain to make system autonomous and do the work independently without human intervention, farmer can work on their place and it will be feasible for them[7].

III.   REQUIREMENTS

A.   HARDWARE

  I.   Wireless Camera
  II.   USB TV tuner card
  III. Sender-Receiver device

B.   SOFTWARE
  I.   JADE (Java Agent Development Environment)
  II.   JavaCV (with OpenCV)
  III. Windows 7 version onwards
  IV.   RAM-1GB, minimum storage 25GB

IV.   SYSTEM IMPLEMENTATION

A.   Face Detection &Recognition

Face recognition is information based system is used for recognition of an image, face detection module will extract facial feature from a captured face and match with input image with help of face region. We get result output image similar to the input image. Basically we implement that captured image is color image, we apply our algorithm for face detection which will resize and pre-process the image and convert RGB to Gray-scale image. After conversion resulted image is used to match with input image. The reason behind is Skin color is different same or different, in gray-scale image makes easy for matching parameter of face with given image. Face has unique pattern to differentiate from other object and hence a template can be generated to scan and detect face. We get large number images from video capture and captured images is saved as frame. Large amount of images is use for our accuracy of output for training/learning.[5][6][4]

For every agent, it will perceive the environment will get face parameter in real time environment.Agent will calculate various face position and its Eigen value and accept only best value for matching with input image.

B.   Agent mechanism:

In our system, each agent will get face feature and their parameter and calculated and communicated with other agent. Each agent has authority to capture image and recognize image so, if one the agent is found face of suspect then, it will send message of matching to second agent. These Agent use ACL language of message passing communication.[1][3]

C.   JADE Agent:

JADE (Java Agent Development Environment) is java based middleware which is used to Multi-agent system. It provide runtime environment to administrator and also provide library of classes which can directly use by agent to develop their agents. They provide GUI tools for monitoring and administering of the activity of agents. We also use Opens with JAVA (JavaCV) it provides library for face detection and recognition. We use these library with JADE, combine these technology to achieve our goal.[1]
We create two agent:
• Capture Agent
• Match agent
Capture agent capture the face from camera and match agent will match captured image with input image. We create both agent in Main container. After creation of an agent, system will indicate that sender agent (capture agent) and Receiver+_agent (Match agent) is ready for communication. As soon as both are ready for processing, we use sniffer tool for monitoring communication between agents during operation. In sniffer tool we sniff both agent and after sniffing operation face detection and recognition code will run and communication is establish between agent and both perform the task. It increase the performance of system.[1][3].

Message passing is used between two agents using ACL (Agent communication Language). The message structure of Agent communication use ACL (Agent Communication Language) language, which can realize the communication and information exchange of the Agents conveniently. Here we use send Message() and receive Message() command to send and receive message, when the Control Agent send the best face feature to the Main Agent, we achieve this process through a group of Java serialized objects. All the messages no matter sent or received will follow queuing mechanisms, i.e. they are sequenced to wait for message processing. When the competition of all the Control Agent is over, in the meantime, there is no other messages will sent or received to the Main Agent, we define this moment that the face feature extraction is finished.[1][3][2]
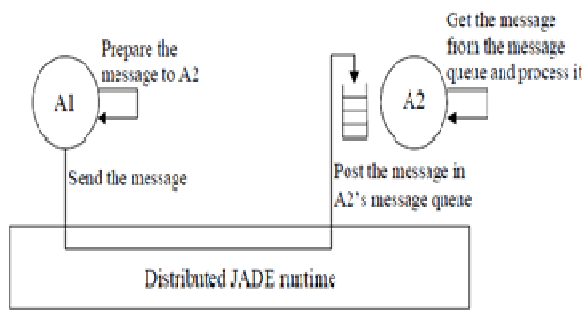
JADE uses Asynchronous Message passing mechanism. Each agent has of mailbox (agent message queue), whenever message is posted in the message queue the receiving-agent is notified. If and when the agent actually picks up the message from a message queue to process it is completely up to programmer however.[3]

D. ALGORITHM

1) Start
2) Set important properties:
   I.   Set delay time to refresh frame DELAY _TIME = 100 ms
   II. Set CAMERA_ID =0
   III. Set image scale as IM_SCALE=4
   IV. Set a small move of image as SMALL_MOVE =5
   V.   Set the delay time to detection face as DETECT_DElAY = 500 ms
   VI. Set maximum number of task to executed at a time TASK =4

3) Import haar -cascade XML file.

4) Saving detected face:
   I.   Face directory as FACE_DIR="save face"
   II. Face name as FACE_NAME ="face"
   III. Face width as FACE_WIDTH= 125
   IV. Face height as FACE_HEIGHT=100

5) Declare JAVA_CV variable
   I.   CvHaarClassifier
   II. CvMemStorage
   III. IplImage
   IV. CanvasFrame

6) Taking input of image
7) Call Haar- cascade file and compare ifclassifier 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 ()
            {
   I.   Grabber the frame
   II. Set image width(320)
   III. Set image height(200)
   IV. 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)
        {
                Setrectangle (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.
   I.   19) Build EighenFace of suspect images and Capture image Create a face bundle of specified number of eighenface
   II. Create a eigenvector for image
   III. Calculate the convariance of matrix
   IV. Calculate eigenvector convariance
   V.   Convert array images into matrix
   VI. double [][] data =new double[rows][column]

20) Convert into 2D matrix
2Dmatrix (into row, int column)

      {

  I.   Calculate the mean face vector value

  II.   Get average of each column

  III.   Replace row to column

  IV.   Normalize to array

      }

21) Calculate image distance
22) Match the result

      Matchresult(int value, int name)

23) End

V. FUTURE SCOPE

Such agent based system which is to be optimal with respect to time and performance, In future we can increase the optimality of agent based framework for best face recognition and detection.

VI. CONCLUSION

An approach of face Detection and recognition using multi-agent system which presented in this paper.Face recognition system and their application is used in crime prevention, video surveillance, and verification of person or any other security activities. Knowledge based face detection is used to find out, locate and extract faces in acquired images.

      Multi-agent system is used get more detail information for monitoring and administrating operation performed by Agents. Agent platform gives an advantage is that process becomes autonomy without human intervention and system become faster than traditional face detection and recognition system.Parallism increase performance of system and make interactive with message passing mechanism.

REFERENCES

[1] Yanfei Zhu, Qruqi, "Face Feature Extraction Based on Agents with Multi-camera System" International Journal of Information and Computer Science IJICS Volume 1, Issue 2, May 2012 PP. 34-38

[2] Cahit Gürel,, Prof. Dr. Abdulkadir Erden "FACE DETECTION ALGORTIHM WITH FACIAL FEATURE EXTRACTION FOR FACE RECOGNITION SYSTEM" The 20th Int. Conf. on Mechatronics and Machine Vision in Practice- M2ViP 2013 September 18-20, 2013, Ankara, Turkey

[3]Akram Qureshi and Ashok Kajla, "Intelligent Face Recognition", International Journal of Computer Sciences and Engineering, Volume-04, Issue-02, Page No (128-133), Feb - 2016, E-ISSN: 2347-2693

[4] OpenCV, http://opencv.org/ ,15th March 2016

[5] Face Detection, https://www.researchgate.net/publication/272487406_FACIAL_FEATURE_DECTION_AND_RECOGNITION_FOR_VARYING_POSES, 1st March 2016

[6]   Face Recognition,https://www.researchgate.net/publication/262875649_Design_of_a_Face_Recognition_System ,29th February 2016

[7] MAS(Multi Agent System), http://www.masfoundations.org/, 19th February 2016