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Effective Automatic Attendance Marking System Using Face Recognition with RFID

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ABSTRACT

In this RFID system, the student shows RFID tag which initiates the camera and a face is captured and recognized so that attendance is marked. During the class hours Ultrasonic sensor is activated. If a student leaves in between the class hours or comes late to the class, Ultrasonic sensor is triggers the camera is initiated, which captures the Image and it will be sent to the server. Hence student information is updated in the Records by the Department In-charge & SMS Alert is sent to parent mobile.
Keywords: Face Recognition, RFID, Sensor, Neural Networks.

I. INTRODUCTION

Face recognition is a well-developed technology used for person authentication. Illumination, pose, facial expression, aging, hair and glasses are the challenges in face recognition. Radio-frequency identification (RFID) tags are used for access control system which contains electronically stored information. Traditional RFID-based access control system presents a registered RFID card will pass the authentication even he/she is not the card holder. To avoid this problem, face recognition was involved in the RFID-based access control system. The proposed access control system is implemented and performed in a multinational enterprise. The purpose of this system is used to inspect who has the permission to enter the factory for work. All the operations will be recorded with time. HR manager could check the records from the database. Experimental results show that the proposed access control system has strong ability to reject the person presents others RFID card. First, employees are required to present his/her RFID card. Only the person presents a registered RFID card will undergo the face recognition. In face recognition, a face detection technology is applied to extract faces. The normalization process is used to adjust the size and intensity of the extracted faces. The SURF algorithm is then performed to align the extracted and registered faces. Finally, the CW-SSIM is adopted to calculate the similarity of the extracted and registered faces.

II. METHODS AND MATERIAL

First, employee is required to present his/her RFID card. Only the person presents a registered RFID card will undergo the face recognition. In face recognition, a face detection technology is applied to extract faces. The normalization process is used to adjust the size and intensity of the extracted faces. The SURF algorithm is then performed to align the extracted and registered faces. Finally, the CW-SSIM is adopted to calculate the similarity of the extracted and registered faces.

A. Face Detection

Robust Real-Time Face Detection is a powerful face detection technology with high accuracy [5]. The algorithm consists of three major methods includes integral image, Ada Boost, and cascade detection. In this paper, the Robust Real-Time Face Detection is used to detect faces.

B. Face Extraction

Since the background and hair significantly affect recognition, background and hairstyle of detected faces are removed. Only the "inner face" is used to identify the card holder in the proposed method.

C. Normalization

To fix the size of the detected faces, all inner faces are adjusted to 100*100 pixels. To reduce the influence of illumination variation, the histogram equalization is performed.

SURF Algorithm

The SURF algorithm is based on the same principles and steps as SIFT but details in each step are different. The algorithm has three main parts: interest point detection, local neighbourhood description and matching.

Interest Point Detection

The SIFT approach uses cascaded filters to detect scale-invariant characteristic points, where the difference of Gaussians is calculated on rescaled images progressively. In SURF, square-shaped filters are used as an approximation of Gaussian smoothing .Filtering the image with a square is much faster if the integral image is used, which is defined as:

$$S(x,y) = \sum_{i=0}^{x} \sum_{j=0}^{y} I(i,j)$$

The sum of the original image within a rectangle can be evaluated quickly using the integral image, requiring four evaluations at the corners of the rectangle.

SURF uses a blob detector based on the Hessian matrix to find points of interest. The determinant of the Hessian matrix is used as a measure of local change around the point and points are chosen where this determinant is maximal. In contrast to the Hessian-Laplacian detector by Mikolajczyk and Schmid, SURF also uses the determinant of the Hessian for selecting the scale, as it is done by Lindeberg. Given a point p=(x, y) in an image I, the Hessian matrix H(p, σ) at point p and scale σ, is defined as follows:

$$H(p,\sigma) = \begin{pmatrix} L_{xx}(p,\sigma) & L_{xy}(p,\sigma) \\ L_{xy}(p,\sigma) & L_{yy}(p,\sigma) \end{pmatrix}$$

where $L_{xx}(p,\sigma)$ etc. are the second-order derivatives of the grayscale image.

The box filter of size 9×9 is an approximation of a Gaussian with σ=1.2 and represents the lowest level (highest spatial resolution) for blob-response maps.

Scale-space representation and location of points of interest

The interest points can be found in different scales, partly because the search for correspondences often requires comparison images where they are seen at different scales. In other feature detection algorithms, the scale space is usually realized as an image pyramid. Images are repeatedly smoothed with a Gaussian filter, then they are subsampled to get the next higher level of the pyramid. Therefore, several floors or stairs with various measures of the masks are calculated:

$$\sigma_{\text{approx}} = \text{Current filter size} * \left(\frac{\text{Base Filter Scale}}{\text{Base Filter Size}}\right)$$

The scale space is divided into a number of octaves, where an octave refers to a series of response maps of covering a doubling of scale. In SURF, the lowest level of the scale space is obtained from the output of the 9×9 filters.

Hence, unlike previous methods, scale spaces in SURF are implemented by applying box filters of different sizes. Therefore, the scale space is analysed by up-scaling the filter size rather than iteratively reducing the image size. The output of the above 9×9 filter is considered as the initial scale layer, to which we will refer as scale s=1.2 (corresponding to Gaussian derivatives with σ=1.2). The following layers are obtained by filtering the image with gradually bigger masks, taking into account the discrete nature of integral images and the specific structure of filters. Specifically, this results in filters of size 9×9, 15×15, 21×21, 27×27, etc. In order to localize interest points in the image and over scales, non-maximum suppression in a 3×3×3 neighbourhood is applied. The maxima of the determinant of the Hessian matrix are then interpolated in scale and image space with the method proposed by Brown et al. Scale space interpolation is especially important in this case, as the difference in scale between the first layers of every octave is relatively large.

Local Neighbourhood Descriptor

The goal of a descriptor is to provide a unique and robust description of an image feature, e.g. by describing the intensity distribution of the pixels within the neighbourhood of the point of interest. Most descriptors are computed thus in a local manner; hence, a description is obtained for every point of interest identified previously.

The dimensionality of the descriptor has direct impact on both its computational complexity and point-matching robustness/accuracy. A short descriptor may be more robust against appearance variations, but may not offer sufficient discrimination and thus give too many false positives.

The first step consists of fixing a reproducible orientation based on information from a circular region around the interest point. Then we construct a square region aligned to the selected orientation and extract the SURF descriptor from it.

Furthermore, there is also an upright version of SURF (called U-SURF) that is not invariant to image rotation and therefore faster to compute and better suited for application where the camera remains more or less horizontal.

Orientation Assignment

In order to achieve rotational invariance, the orientation of the point of interest needs to be found. The Haar wavelet responses in both x- and y-directions within a circular neighbourhood of radius 6s around the point of interest are computed, where s is the scale at which the point of interest was detected. The obtained responses are weighed by a Gaussian function centered at the point of interest, then plotted as points in a two-dimensional space, with the horizontal response in the abscissa and the vertical response in the ordinate. The dominant orientation is estimated by calculating the sum of all responses within a sliding orientation window of size $\pi/3$. The horizontal and vertical responses within the window are summed. The two summed responses then yield a local orientation vector. The longest such vector overall defines the orientation of the point of interest. The size of the sliding window is a parameter which has to be chosen carefully to achieve a desired balance between robustness and angular resolution.

Descriptor based on the sum of Haar wavelet responses

To describe the region around the point, a square region is extracted centred on the interest point and oriented along the orientation as selected in the previous section. The size of this window is 20s.

The interest region is split up into smaller 4x4 square sub-regions, and for each one, the Haar wavelet responses are extracted at 5x5 regularly spaced sample points. The responses are weighted with a Gaussian (to offer more robustness for deformations, noise and translation).

Matching

By comparing the descriptors obtained from different images, matching pairs can be found.

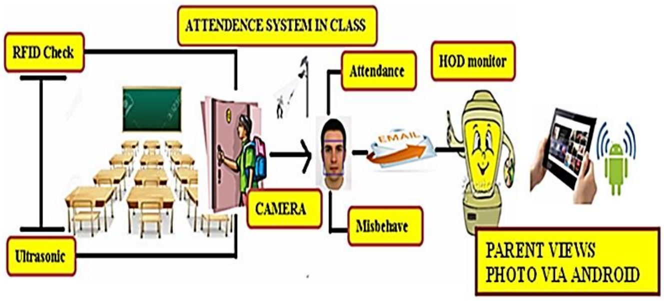

Figure 1. Architecture Diagram

III. RESULT AND DISCUSSION

We are going to create an User application by which the User is allowed to access the data from the Server of the Cloud Service Provider. Here first the User want to create an account and then only they are allowed to access the Network. Once the User create an account, they are to login into their account and request the Job from the Cloud Service Provider. Based on the User's request, the Cloud Service Provider will process the User requested Job and respond to them. All the User details will be stored in the Database of the Cloud Service Provider. In this Project, we will design the User Interface Frame to Communicate with the Cloud Server through Network Coding using the programming Languages like Java/ .Net. By sending the request to Cloud Server Provider, the User can access the requested data if they authenticated by the Cloud Service Provider. Register to the RFID Card and face reorganization. We are going to implement such a thing like student attendance system at the same time we are integrating student behavior monitoring system during the class session.

A new student tracking technology using ultrasonic sensor and RFID technology. The system is being developed for economic with respect to School and College point of view. RFID tag based Attendance System of every user is implemented with cheap cost. Two types of implementation are integrated here. First one is student will be showing RFID tag in front of the Door, which initiates the camera and Photo is Captured During the class hours, Ultrasonic sensor which is placed in the above of the entrance detects any student movement. If someone leaves in between the class hours or someone comes late to the class, Ultrasonic is triggered and automatically camera is initiated which captures the image and sends it to the server. The Department Head or other department professors can view the list of students who bunked or came late using their android application. The application hits the server and the server replies with the list of students who bunked.

We cannot store lot of data in a mobile due to limited memory. So, there is no space to store new files. Also we cannot delete the old files. However, loss is there. Mobile Client is an Android application which created and installed in the User's Android Mobile Phone. So that we can perform the activities. The Application First Page Consist of the User registration Process. We'll create the User Login Page by Button and Text Field Class in the Android. While creating the Android Application, we have to design the page by dragging the tools like Button, Text field, and Radio Button. Once we designed the page we have to write the codes for each. Once we create the full mobile application, it will generated as Android Platform Kit (APK) file. This APK file will be installed in the User's Mobile Phone an Application.

IV. CONCLUSION

We proposed a novel access control system that integrates the RFID and face recognition technology. A real time face detection method was adopted to detect human faces. The similarity between the detected and registered faces was measured by CW-SSIM. To speed up the authentication process, user pass the authentication when the similarity larger than a predefined threshold. The SURF was performed to align the detected and registered image when the user misses the authentication in the first pass.

V. FUTURE ENHANCEMENTS

We proposed the system where the student can show their RFID tag which initiates the camera and a face is captured and recognized so that attendance is marked. Then, during the class hours Ultrasonic sensor is activated. If a student leaves in between the class hours or comes late to the class, Ultrasonic sensor is triggers the camera is initiated, which captures the Image and it will be sent to the server.

VI. REFERENCES

[1] Chuan-Yu Chang, Senior member, IEEE, and Jyun-Jie Liao National Yunlin University of Science and Technology, Taiwan, 2015 International conference on consumer electronics-Taiwan (icce-tw).

[2] Meng Joo Er, Member, IEEE, Shiqian Wu, Member, IEEE, Juwei Lu, Student Member, IEEE, and Hock Lye Toh, Member, IEEE transactions on neural networks, vol. 13, no. 3, may 2002.

[3] B.-L. Zhang and Y. Guo, "Face recognition by wavelet domain associative memory," in Proc. Int. Symp. Intell. Multimedia, Video, Speech Processing, 2001, pp. 481–485.

[4] Z. Jin, J.-Y. Yang, Z.-S. Hu, and Z. Lou, "Face recognition based on the uncorrelated discriminant transformation," Pattern Recognition, vol. 34,pp. 1405–1416, 2001.

[5] S.Wu and M. J. Er, "Dynamic fuzzy neural networks: A novel approach to function approximation," IEEE Trans. Syst, Man, Cybern, pt. B: Cybern, vol. 30, pp. 358–364, 2000.

[6] A. Esposito, M. Marinaro, D. Oricchio, and S. Scarpetta, "Approximation of continuous and discontinuous mappings by a growing neural RBF-based algorithm," Neural Networks, vol. 12, pp. 651–665, 2000.

[7] E.-D. Virginia, "Biometric identification system using a radial basis network,"in Proc 34th Annu.

IEEE Int. Carnahan Conf. Security Technol., 2000, pp. 47–51.
[8] T. Tan and H. Yan, "Object recognition using fractal neighbor distance Eventual convergence and recognition rates," in Proc. 15th Int. Conf.Pattern Recognition, 2000, pp. 781–784.
[9] R. Lotlikar and R. Kothari, "Fractional-step dimensionality reduction,"IEEE Trans. Pattern Anal. Machine Intell., vol. 22, pp. 623–627, 2000.
[10] C. Liu and H. Wechsler, "Learning the face space—Representation and recognition," in Proc. 15th Int. Conf. Pattern Recognition, Spanish,2000, pp. 249–256.
[11] G. Donato, M. S. Bartlett, J. C. Hager, P. Ekman, and T. J. Se jnowski,"Classifying facial actions," IEEE Trans. Pattern Anal. Machine Intell.,vol. 21, pp. 974–989, 1999.
[12] S. Z. Li and J. Lu, "Face recognition using the nearest feature line method," IEEE Trans. Neural Networks, vol. 10, pp. 439–443, Mar 1999.