ÇANKAYA ÜNİVERSİTESİ

Department of Computer Engineering

Biometric Identification based on Face and Iris Recognition

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Problem

- Illimunation
- Pose and Facial Expression
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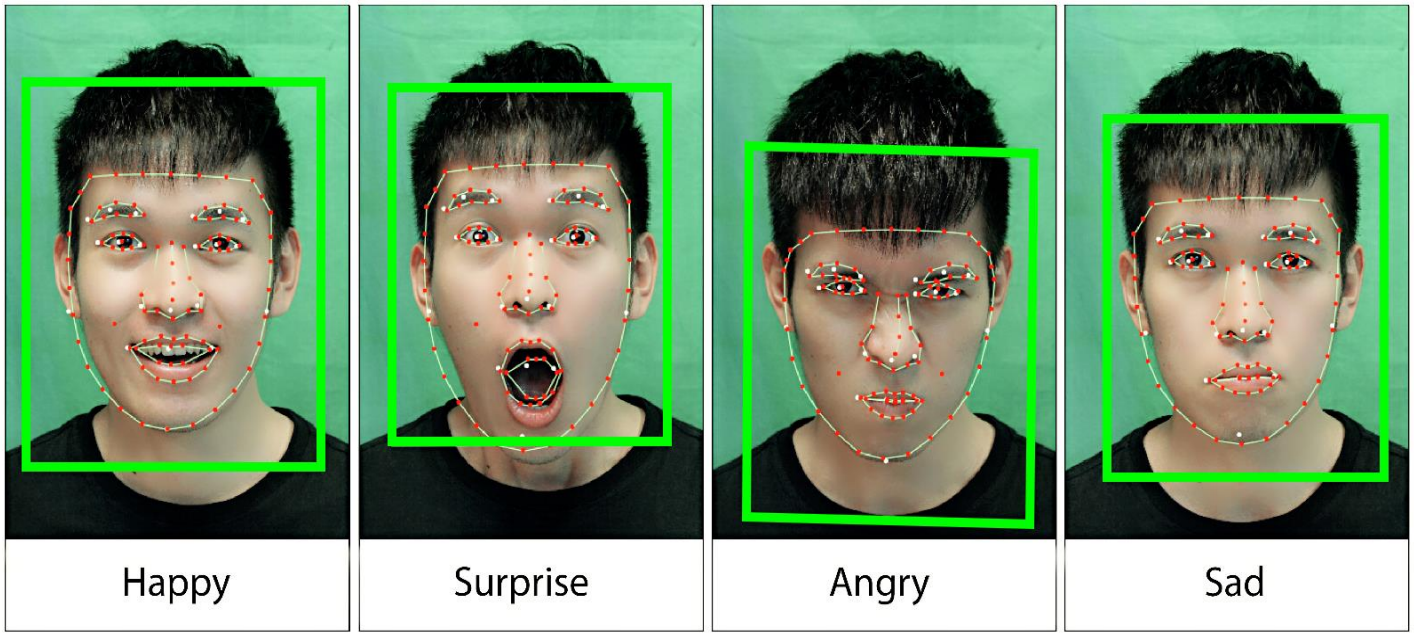
- Distance

Analysis of Illimunation

- The difference of illumination effect to face recognition in a bad way like lighting of ambient can change among indoor and outdoor environments and because of the 3D of human face shape, illumination angle makes shadow some points on the face, so nodal points can be affected in a bad way and some information cannot be reached, so experts still struggle with this problem and they go on improving new image preprocessing algorithm for illumination variations.

Analysis of Pose and Facial Expression

- Changing the pose and facial expression can cause loss of nodal points on the face because of changing the measure of existent parts at a human face like lip and nose, so recognition fail rate can increase than before and experts need to robust the algorithms to ensure consistency.



Analysis of Image Quality

- Iris Recognition devices can be fooled by using HD image. Also, researchers encounter with the rate of rejection of poor quality image, so they need to reduce delay the enrollment and verification because it can annoy the employee while that all things happen consistently and they need to decrease failure to enroll rate (FTE).



Analysis of Alcohol Consumption

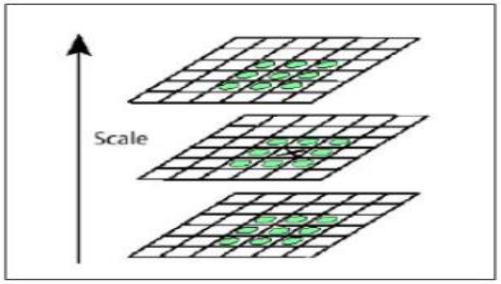
- Researchers can trick Iris scanners with digital codes of stored Irises and also alcohol consumption affects pupil like dilates/constricts and it leads to deformation in the iris patterns, so it increases the rate of the false matches, so company owner should apply some restriction about consuming alcohol or system admin can re-register the employees to the system every certain period.

Analysis of Distance

- If the employee who does not know about the Iris Recognition system, s/he may have some trouble because the employee needs to stand maximum 1 meter far away from the camera as stationary, otherwise the camera cannot detect the his/her face and iris correctly, so authorized person should inform every employee who needs to use recognition system or we need to robust algorithm for distance measurement.

Our solution

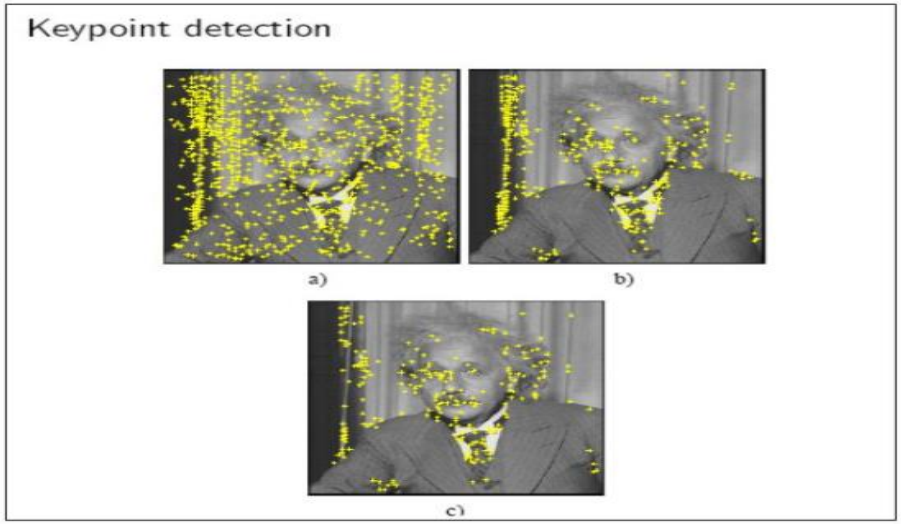
- We are using Scale-invariant feature transform (SIFT) which is the fastest and reliable algorithm for working security system process. It is also more accurate than any other descriptors and it is independent of rotation, luminance, and scale, so its acceptable level is higher than other algorithms. Also, the acceptable level of Face and Iris recognition system can be adjustable according to company's request.



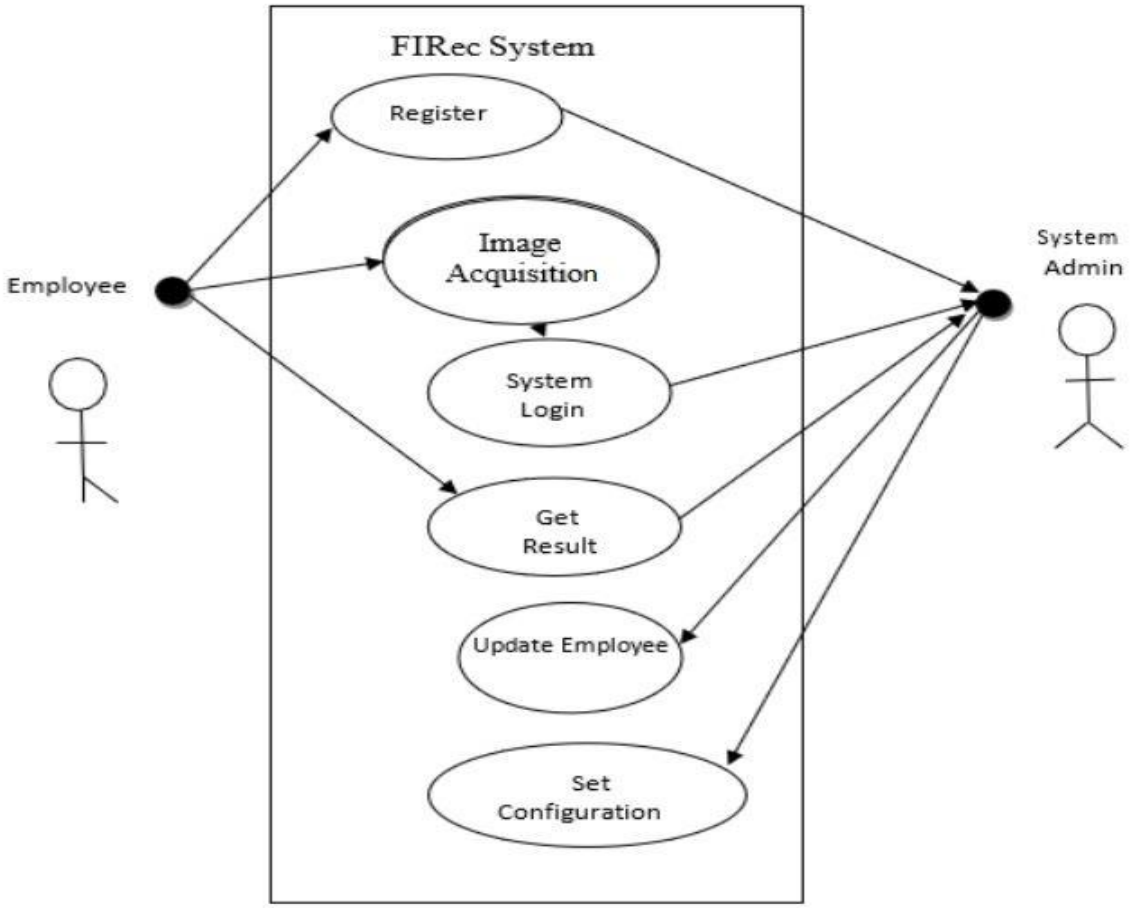
• Find Local Extrema of DoG in Scale Space.

Remove

- Low Contrast Point
- Points on Edges.



Solution


FIRec System
Register
Image Acquisition
System Login
Get Result
Update Employee
Set Configuration
Employee
System Admin

Solution

Employee

Employee	
Element	**Details**
Description	An employee whose face and iris are recognized
Examples	An employee whose face and iris features are detected and recognized, then added to the database

Admin

System Admin	
Element	**Details**
Description	A system admin is a person who handles the application
Examples	System admin who logins in the system, register a new person and add to the database, delete and update a registered person, change accepting match rate.

Solution

Register

Register	
Element	**Details**
Actor	System Admin
Trigger	System Admin must enroll the image of face and iris of a person
Pre Conditions	The person is not registered and the system menu is displayed.
Post Conditions	The person is registered and has his/her face and iris features recognized
Normal course	1. The system admin collects data and image of a person 2. The system admin stores the data and features of image on database
Alternative courses	The person is already registered

Solution

Image Acquisition

Image Acquisition	
Element	**Details**
Actor	System Admin
Trigger	System Admin must take the image of face and eye of a person
Pre Conditions	1. The person is not registered i.e not yet enrolled and the system menu is displayed. 2. The person is registered i.e not yet recognized and the system menu is displayed.
Post Conditions	1. The person is registered and has his/her face and iris features recognized 2. The image is fed to Face and Iris Recognition System
Normal course	1. The System Admin collects personal data and image of a person 2. The System Admin takes the face and eye image of a person

Solution

System Login

System Login	
Element	**Details**
Actor	System Admin
Trigger	The System Admin wish to start using the system.
Pre Conditions	The System Admin is not logged into the system.
Post Conditions	The System Admin is logged into the system, and the system menu is displayed
Normal course	1. The System Admin click the link for the application and a login form appear on the screen. 2. The System Admin types his username and password into the form and press the login button. 3. The system confirms that the user is logged on

Solution

Get Result

Get Result	
Element	**Details**
Actor	System Admin, Person
Trigger	When the face and iris pattern is recognized by the application
Pre Conditions	Image is fed to the system and processed
Post Conditions	Information about either the face and iris patterns matches with that stored in the database or not and the details of the person is displayed in the screen

Solution

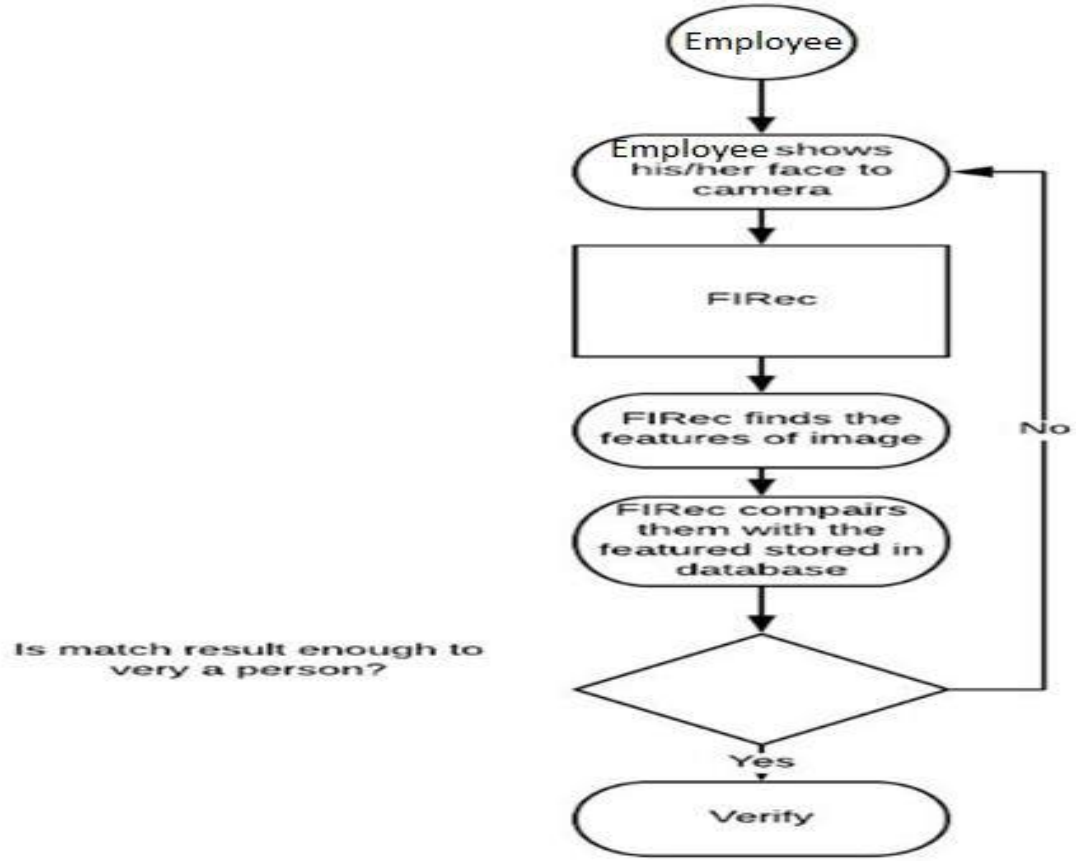
Update Person

Update Person	
Element	**Details**
Actor	System Admin
Trigger	When admin start using update system
Pre Conditions	The System Admin is logged into the system.
Post Conditions	The Person will be accepted with his/her new features

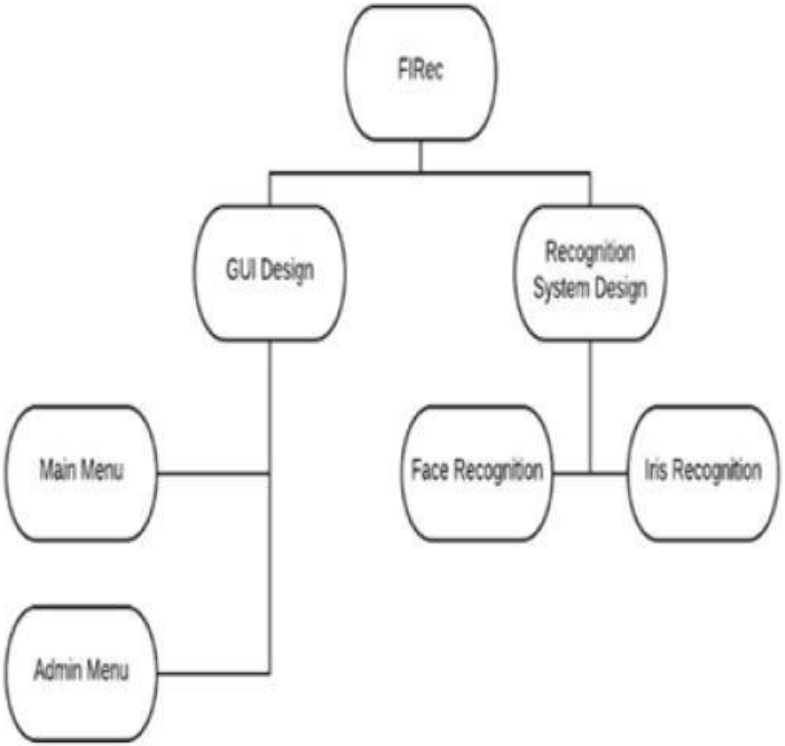
Set Configurations

Set Configurations	
Element	**Details**
Actor	System Admin
Trigger	When admin start using set configurations system
Pre Conditions	The System Admin is logged into the system.
Post Conditions	The Person will be compared with entered new accept match ratio

Solution


Employee
Employee shows his/her face to camera
FIRec
FIRec finds the features of image
FIRec compairs them with the featured stored in database
Is match result enough to very a person?
No
Yes
Verify

Solution



- The employee can register and verify his/her face and iris. Also, admin can login the system from the main menu.
- Responsibilities of recognition part belongs to recognition design.

Solution

MATLAB will be used for the project because MATLAB has some advatages for image processing:

- A very large (and growing) database of built-in algorithms for image processing and computer vision applications.

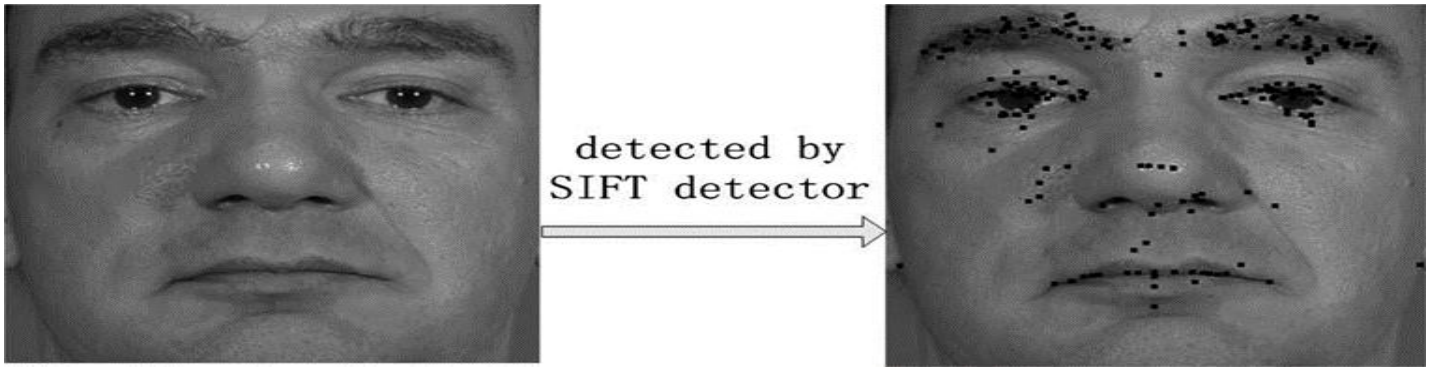
- The ability to call external libraries, such as OpenCV

Solution

- A large user community with lots of free code and knowledge sharing.
- The MATLAB Desktop environment, which allows you to work interactively with your data, helps you to keep track of files and variables, and simplifies common programming/debugging tasks.

Results

- We will using Scale-invariant feature transform (SIFT) which is the fastest and reliable algorithm for working security system process. It is also more accurate than any other descriptors and it is independent of rotation, luminance, and scale, so its acceptable level is higher than other algorithms. Also, the acceptable level of Face and Iris recognition system can be adjustable according to company's request.

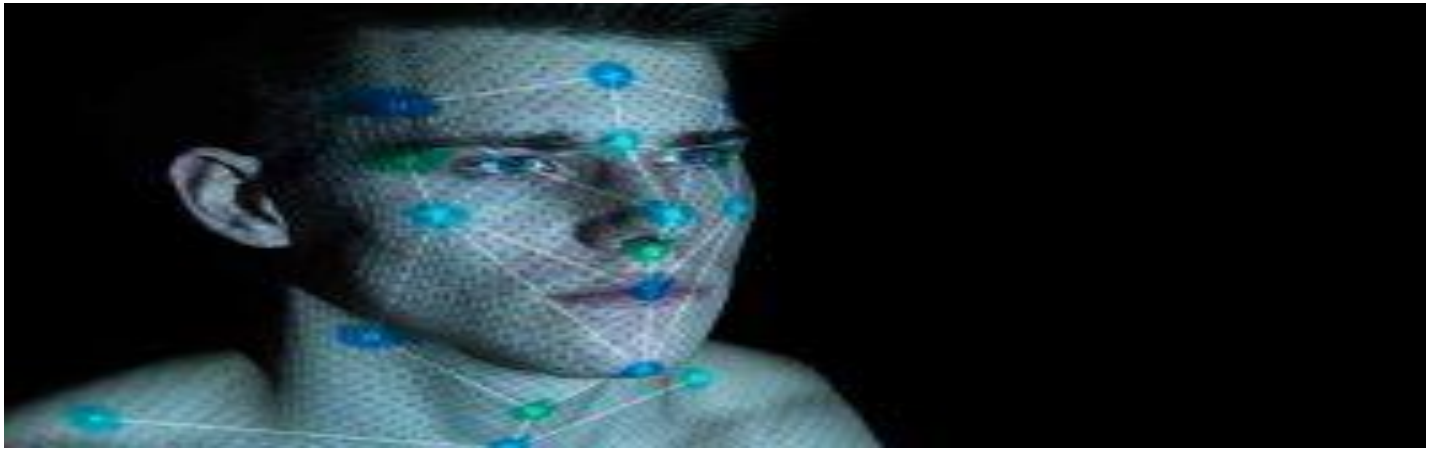


Advantages

- There are some advantages the FIRec project.
- Firstly, it is the safest and easiest to use according to other security products.
- It provides very high accuracy.
- It provide to improve customer experience.
- There is no known way to replicate an iris because it is unique at every person.

Disadvantages

- Except some advantages, the FIRec project has some disadvantages like illumination, external factors.
- Firstly, difference of illumination and pose and facial expression affect to face recognition in a bad way like lighting of ambient can change among indoor and outdoor environments and because of the 3D of human face shape, illumination angle makes shadow some points on the face.

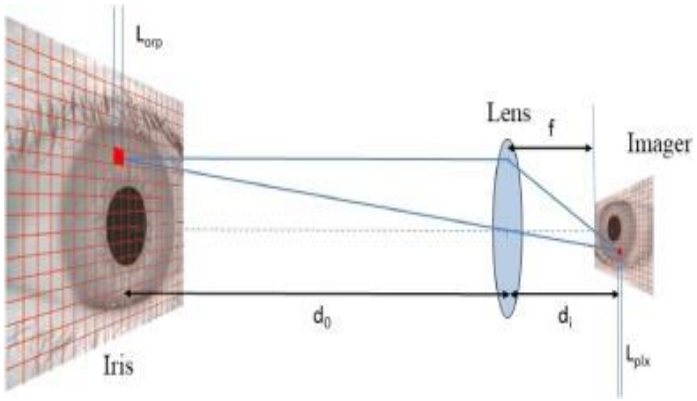


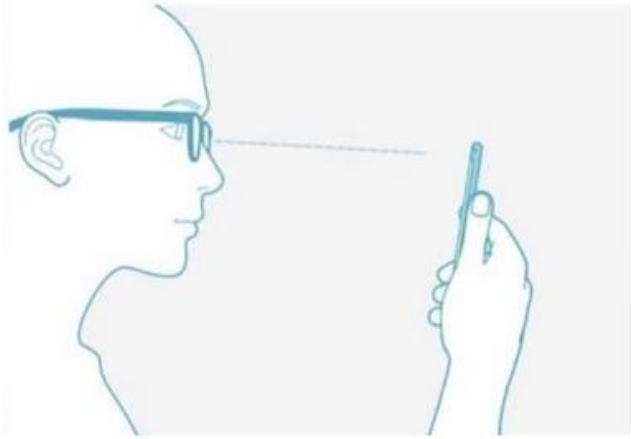
Disadvantages

- In addition, changing the pose and facial expression can cause loss of nodal points on the face because of changing the measure of existent parts at a human face like lip, nose so, recognition fail rate can increase than before.
- Also, researchers encounter with the rate of rejection of poor quality images, so they need to reduce delays the enrollment and verification because it can annoy the users while that all things happen consistently.

Disadvantages

- Iris Recognition devices can be fooled by an HD image and lighting effect to an accuracy of scanners in a bad way. Iris Recognition's cost is more expensive than other recognition systems.
- Furthermore, If the person who does not know about the FIRec project, s/he may have some trouble because the employee needs to stand maximum 1 meter far away from the camera as stationary.





Conclusion

- In conclusion, our team will develop FIRec project which is to design to provide a security system which holds a personal information keep in safe and decrease the rate of information theft against who want to steal your private information. This project involves developing an iris detection system in order to verify the uniqueness of the human iris and face by detecting the iris pattern from the image.

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