Spider Lock

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Purpose and Scope

What is it and what does it do?

Spider Lock is a facial recognition system that provides a fast and easy way to identify or verify a person from a digital image.
First, the end user inserts his credentials (username and password); then, he takes a picture of his face. If he is recognised and obtains the authorisation, a signal that points out the success of the operations is shown; otherwise, he has three attempts to insert a one-time password (nonce code). If he fails, a signal that states that the end user has not be authorised is displayed.
The system consists of:

- a touch screen that allows the final user to insert his credentials and the one-time password sent by the system via SMS;
- a camera that takes the picture of the user face;
- a LED that indicates, using an intuitive color system, whether the user has been authorised or not (e.g. green: success; red: failure).

Who is it for?

Spider Lock will be very helpful to any organisation that aims to manage a security system with an authorised access.
How many companies require all employees to follow an authentication procedure to access locations storing classified information?
How many owners of a building desire to have a reliable and safe system that allows to grant access only to registered people?
Spider Lock can be the solution to all these problems! The admin of the system should only register authorised users, link them with a password, an image and a cellphone number, and let Spider Lock perform all the operations. Whenever a registered user needs to access a restricted area, he only has to insert his credentials, take a picture and be recognised.
If the system is not able to identify a certain user, an SMS with a nonce code is sent to the cellphone of the person who is trying to access a specific location.
Now imagine how fast and cheap would it be for the owner of Spider Lock to use this ergonomic face recognition system.

Requirements document

Actors

- Admin
- User
- SMS gateway
- Email gateway
- Microsoft Project Oxford gateway for Face-API (v1.0)

Functional Requirements

1. The admin of the system must be able to use the Spier Lock web application developed for the admin only in order to handle the users database.
2. The admin of the system must be able to create, read, update, delete users.
3. The admin of the system must be able to modify his password.
4. The admin of the system must be able to specify, for each user, an username, a password, a path that represents the stored image of the user face, a cellphone number.
5. The admin of the system must be able to receive an email with the current log file.
6. The user of the system must be able to insert his credentials.
7. The user of the system must be able to take a picture of his face with the camera of the system, in order to be recognised.
8. If the recognition procedure fails, the user of the system must be able to insert a nonce, sent to his personal cellphone via SMS, for at most three attempts, in order to be recognised.
9. If the recognition procedure succeeds, the LED of the system must be turned on and must be set to green.
10. If the recognition procedure fails, the LED of the system must be turned on and must be set to red.
11. The system must be able to keep track in a log file of all the events occurring while the system is running.

Non Functional Requirements

• Product requirement

1. The system must be powered at all times.
2. The system must not lose the collected data in case of lack of power.
3. The system must support English language.
4. The system must have a response time of less than 1 minute.
5. The system must be reliable.
6. The software must run on a FEZ Spider II board.
7. The image that stores a user face must have one of the following extensions: ".jpg", ".jpeg", ".bmp", ".gif".
8. The admin web application must support the following browsers: Google Chrome, Internet Explorer, Mozilla Firefox.
9. The first time he uses the web application, the admin must insert the following credentials:
   9.1. Username: Admin
   9.2. Password: admin

• External requirements

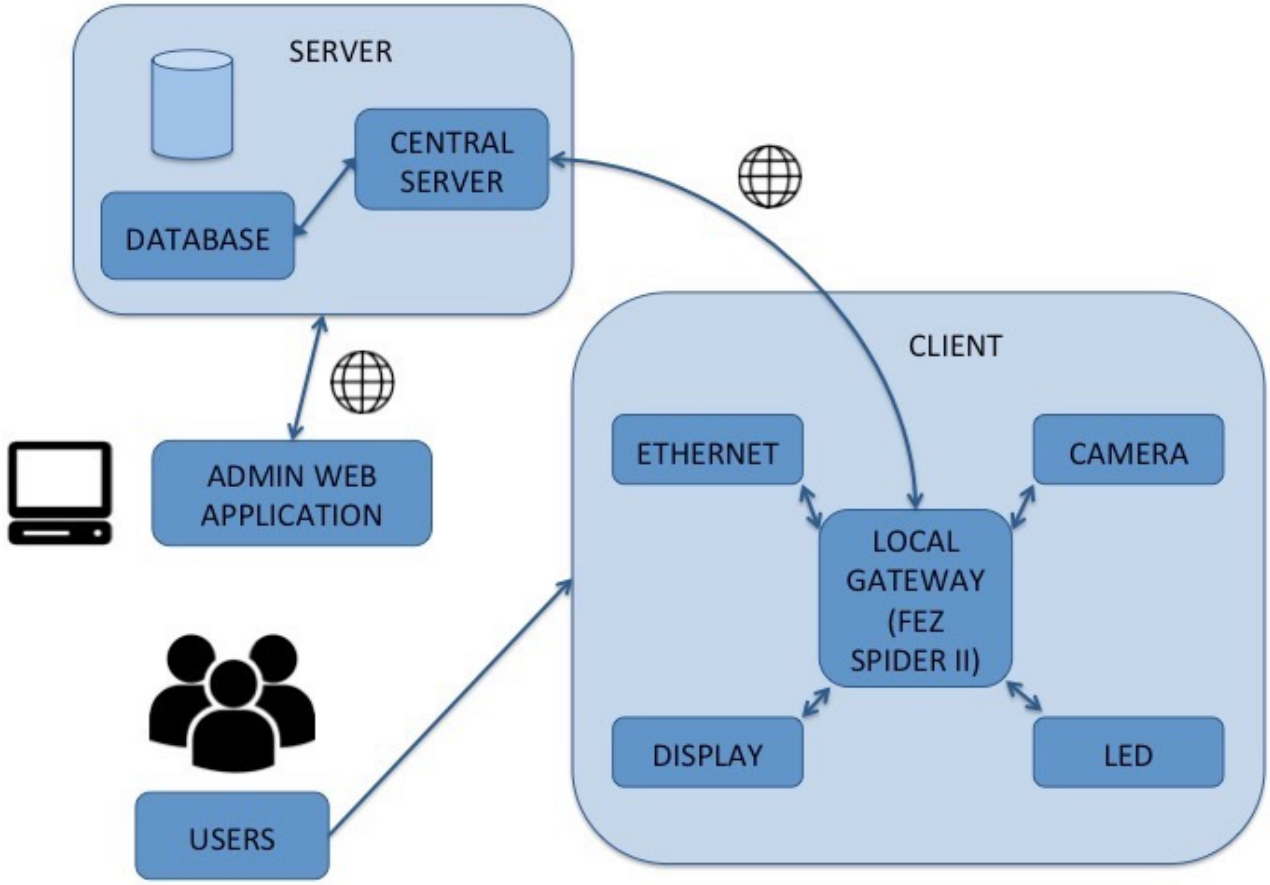
1. The system must be connected to the Internet to work properly.
2. The board must be connected to the server through an ethernet cable to work properly.
3. All the elements of the system must be on the same subnetwork.
4. The software has been implemented with Visual Studio 2013
5. The software has been written in C#, XML, HTML, CSS, JS

• Organisational requirements

1. The system must have a structure that allows future implementations.

Architecture

System Architecture



Hardware Architecture

- Central Server
  - Anywhere in the web, always-on system
  - Data elaboration
  - Data storage and manipulation (localhost database)
  - Intelligence

- Local Gateway (FEZ Spider II)
  - One for each facial recognition system
  - Data collection
  - Intelligence

- Camera
  - One for each facial recognition system
  - Picture acquisition

- Display
  - One for each facial recognition system
  - User inputs acquisition

Software Architecture

- Central Server
  - Has a world-accessible public IP address and communicates with the local gateway via socket
  - Has a world-accessible public IP address and communicates with the admin web application via HTTP
  - Elaborates data sent from the local gateway
  - Decides whether credentials are valid by querying the database
  - Decides whether the face matching operation succeeds by calling the Microsoft Face-API
  - Decides whether the one-time password inserted by the user matches the one-time password previously generated

- Local Gateway (FEZ Spider II)
  - Communicates with the central server via socket
  - Reacts to the user inputs
  - Sends data to the central server
  - Provides a transparent and a user friendly interface

- Admin web application
  - Communicates with the central server via HTTP
  - Is used by the administrator of the system in order to manage the users database

Hardware Component Selection

- Central Server: Laptop
- Local Gateway: Fez Spider II with Camera 1.1, Display TE35 1.0, USB Client EDP 1.1, Ethernet J11D 1.2, Multicolour LED 1.2
- Admin web application: Laptop

Software Component Selection

- Central Server: .NET Framework 4.5, MySQL, Microsoft ProjectOxford Face API 1.0, JSON, ViaNetSMS
- Local Gateway: .NET Framework 4.3, Microsoft .NET Gadgeteer Core, GHI Electronics NETMF SDK 2016 R1, Glide 1.0.7
- Admin web application: ASP.NET, MySQL