SMART DOOR WITH FACE RECOGNITION

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Abstract. *The aim of this paper is represented by the importance of facial recognition process related to smart door accessibility. Therefore, the main goal is the implementation of a special and distinguished system that ensure security and surveillance. Clearly, all of these can be performed using Raspberry Pi and GSM module to ensure regular communication and connection.*

Keywords: *Raspberry Pi, facial recognition door, home security, IoT.*

Introduction

Nowadays, in our society is growing up the necessity of new technology, so, now all of us are focused on creating and developing only secured technological innovations. Therefore, each technological branch has been developing separately very fast, so appear the necessity to gather all these devices (computing devices, mechanical and digital machines). Thus, come out a new term named IoT (Internet of Things), which makes possible connection between objects exchanging, collecting data and sending it to the internet.

Generally speaking, one of relatively new technology represents face recognition that is based on face descriptors. Consequently, the main goal of face recognition is represented by the way of working with camera checking continuously the gallery until the face is matched. Due to it, the entire process can be split in small pieces that perform each of the most well-known operations: first part it captures the person's face; the next part is represented by set of transformations from analog to digital data taken from the capture and the last part is the comparison of the image already stored with the image taken recently.

Hence, the importance of face recognition is so great, because of that it was necessary to focus on improving the domain of security by including face recognition process in current project. The meaning of this choice is because face recognition has a widely usage for securing different type of innovations. The biggest problem people face with is related to securing some places or things they found important. The main idea of the face recognition project is to create a system, a "safe" place, la door into a secret room that cannot be unlocked by any stranger. The major drawbacks of a simply, common door is that it can be opened by anyone who can steal the keys or in other cases close friends or some distant relatives cannot enter in the house without a keys and without the owner of the house. As a consequence of all the points of view about the importance of smart door working with face recognition process, it is so simple to make the change from normal door lock to a smart one giving the possibility to open it only for trusted face included in gallery.

Related literature and existing models

Before started to create the project, we analyzed some projects that were done and their implementation, devices which they used, but the most important the algorithms of face detecting and their accuracy.

For example, S. Jogdand.et.al [1] came up with a work on Implementation of Automated Door Accessing System with Face Design and Recognition where he used Viola Jones method for face detection and PCA (Principal Component Analysis) for comparison with existing faces from database. The disadvantage of this project is that it has a lower accuracy at the beginning.

Another example, M. Carikci et al. [2] proposed a project on A Face Recognition System based on Eigen face method, this method is for face detecting and Euclidean distance method for comparing detected face with those from database. In contrast to the example above, it was more efficient, faster and gave a high accuracy.

The objectives of all proposed work that we found, in the end was to implement a working model of smart door with face recognition that would give solutions to the problems that people face day by day, for example losing the key, but besides that to send a notification to the owner that someone is trying to open the door.

Proposed system

That's why we propose a Smart Door Lock System to increase security and overcome some obstacles that are present in door locks, a system that replaces the traditional door locks which are using simple keys or RFID cards. These two ways can bring to some problems, for example if the keys or cards are misplaced. In order to avoid this type of incidents, we want to create a system which will give access of the house/door to the right person and this process of choosing the right person will be made by face recognition technology. In this world, each person has a unique face and the fact that there exists a small chance for a twin to open the door is very less. As a feature, we think about to implement intrusion detection, if someone else besides the trusted faces tries to enter the door, owner will be notified and for the twin factor, we thought about to add an extra factor, after owner pass the face door technology he must introduce the pin code lock.

Methodology and working of the proposed system

The hardware components that we need in this project are as mentioned below.
- Raspberry PI
- GSM module
- Camera module
- WIFI Connection

The system will work in the next way:
- Camera captures live face images.
- Create a database of authorized persons.
- Save captured image in database and compare with the existing images, we save the actual picture because in this way we can detect impostors.
- Through the GSM module will be send an alert to owner while unlocking the door.

The system is composed from two parts. The first part will capture and create database by storing the images, but the second one will compare the captured image with those that are stored in database. For feature extraction, we will use Eigen face methodology and Euclidian distances because it is fast and give a high accuracy.

Camera module – will capture images and send them to the raspberry pi module.
Raspberry Pi – will take the captured images and then compare with those from database, depending on the output, it will give send a command to GSM module.
GSM module - used to send a message to the authorized people based on the output. If the output is positive "Access granted" message will be sent to the authorized people, otherwise in case of unauthorized access it will send an "Access denied" message.
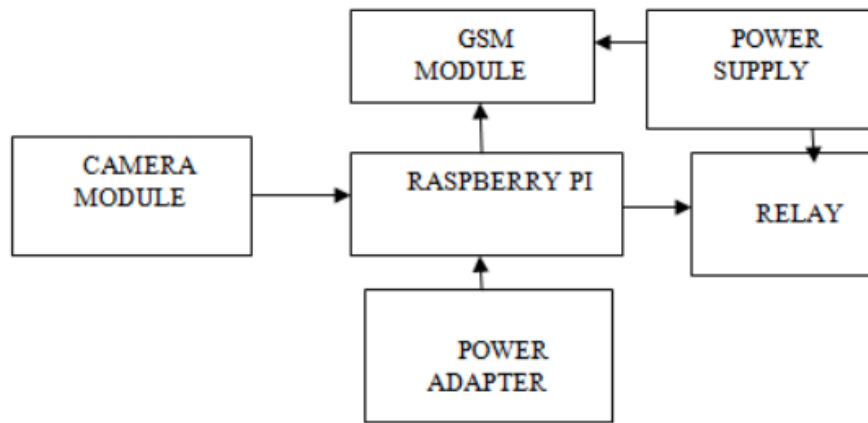
Figure 1. Block diagram Face recognition system for door unlocking based on Raspberry Pi

Based on that, the flow works as following:
- Persons stands in front of camera.
- Camera module captures images.
- Then captured images will be compared with database.
- No matter of the answer, raspberry pi will send a command to GSM module.

Conclusion

The intention of this project was to show how the Internet of Things can help people in creating a secure closed door that can be opened just with face recognition that was already registered in the memory. For this project was created a system, the safe place, using GSM module for communicating with Raspberry. For detecting and locating human faces within an image and verifying if the input face is compatible with the stored one was used Microsoft Face API. This project has a great future, because developing a complex user interface where the owner could establish which image can be added or removed from trusted faces list that will be created in the memory will offer him a great influence and a better security in his company. Also for better security could be added one more option except face recognition which will be processed with the face, such as a password or name of the user for the reason that the system might detect faces from pictures.

References
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