

Home Security Using Image Processing and IOT

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Abstract – The concept door locking and unlocking system utilizes Internet of things to open and close the door. In addition to this the security will be provided using camera and IR sensor in case of any unauthorized access. The system automatically locks the door as soon as it receives predefined message from the user. The user should first enlist. His information will be stored in database. Whenever the message will be received from the registered user, the Raspberry pi will accordingly give instruction to door lock system. Then system will perform action on either door locking or unlocking. In case of unauthorized access, the sensor will detect the action and send the alert message to the registered user using Internet of things. This builds extraordinary security for homes and that too without human intervention.

Also, the project is aimed at developing the security of home against gas leakage & liquid petroleum gas (LPG) leakage. In any of the over three cases any one met when user is out of home then the device sends message to the registered user.

Index Terms – Raspberry pi, PIR sensor, Water leakage sensor, MQ-6 LPG gas detector sensor, camera, etc.

1. INTRODUCTION

We are developing a system which automatically locks and unlocks the door when it gets a predefined message from the authorized person. Home security is a process for enhancing the quality of resident's life by facilitating a flexible, comfortable and secure environment. Traditional techniques of alarm based security have gained much popularity in past decades. Nowadays, embedded system is designed to provide security due to tremendous improvement in microcontroller unit and widespread applications of GSM technology.

The system provide security at homes, offices and so forth. There are numerous systems which has been developed till now which were working on the technologies such as entering passwords, wireless networks and so on however the impediments appeared by them were not all that safe additionally it required physical presence. Here, we are developing a system which is more secure and cost efficient.

2. RELATED WORK

The existing system detects the motion of the user will be captured from the camera and the user will be detected and then only he will be given a key to lock or unlock. A digital door lock system is an equipment that uses the digital information as smart card, and finger prints as the process for authentication as a substitute of the legacy key system. A Bluetooth module is set in digital door lock and the door lock acts as a central main controller of the overall system. The group of sensor nodes and actuators with digital door lock as base station. A door lock system proposed at this point consists of Bluetooth module and smart phone for user verification, motor module for opening and closing of the door, sensor modules, communication module, and control module for controlling other modules.

But the drawback with this systems Bluetooth component is that, if the phones have different interfaces, the application need to be specifically adjusted to each interface and that would mean the integration with the system would have different requirements than what is stated in this specification.

This problem can be resolved by using proposed system.

Also, leak detection in water pipelines, the pressure into the pipe using on force sensitive resistors (FSR) generated from a leak is detected, it will be indicated by an increase in the LED meter and a rushing sound will be heard in the headset. Due to which system becomes complex and so we are using simple conductivity principle to detect water leakage.

3. PROPOSED MODELLING

The main concept behind the system is unlock the door by matching the image of person by using face recognition process, visiting our home with the stored database.

For face recognition process we are using Eigen-face facial recognition algorithm. For that purpose we need to first install OpenCV and then to train the system. At the time of training

user gives the database of persons who visits frequently to home and also of family members.

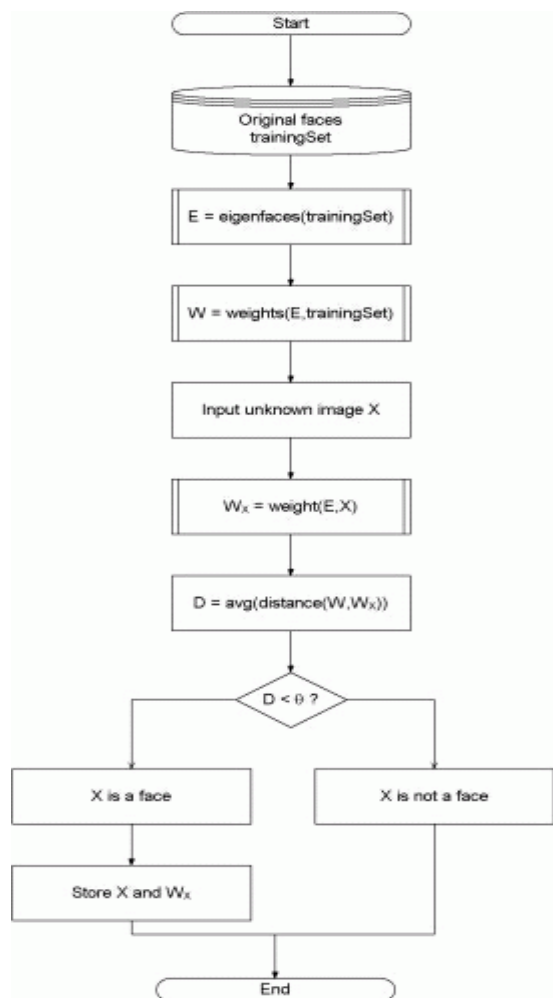


Fig 1 Principle of the eigenface-based facial recognition algorithm

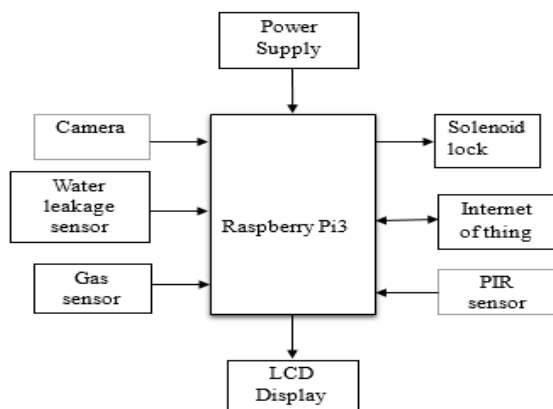


Fig 2. Block diagram of system

When PIR sensor detects the motion then camera captures the image and compares it with database. If the input image from camera matches with the stored image then it unlocks the door otherwise send alert notification to user.

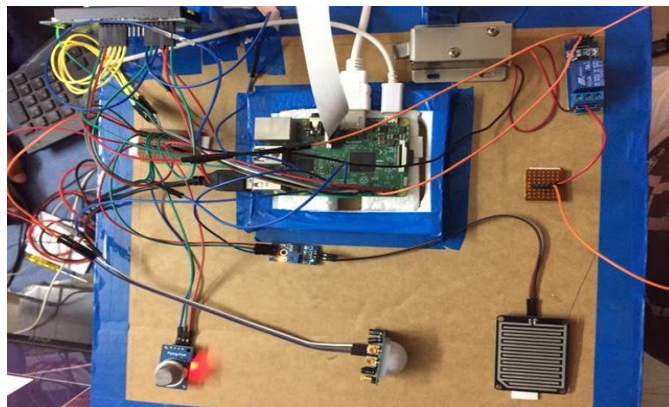


Fig 3. Home security system

Also, system checks for the water leakage and gas leakage and notify the user.

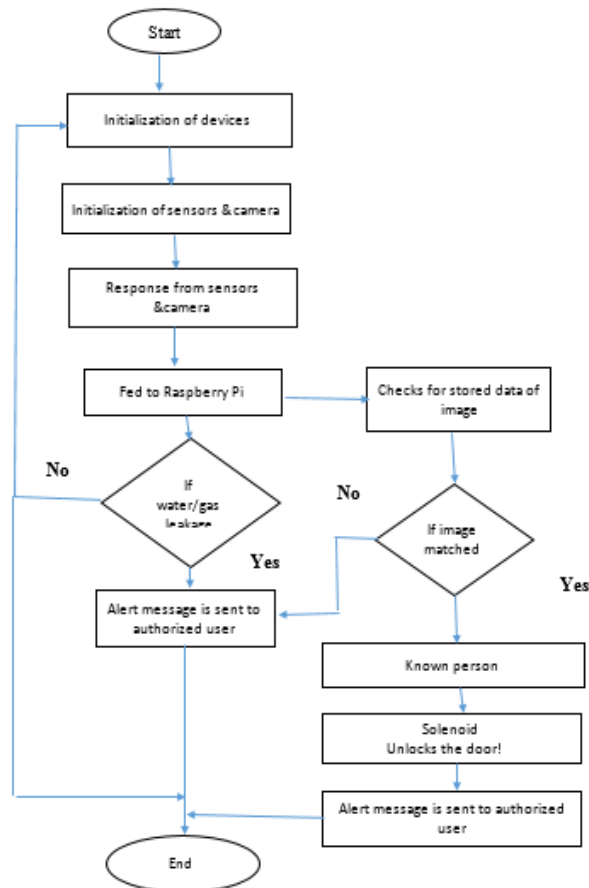
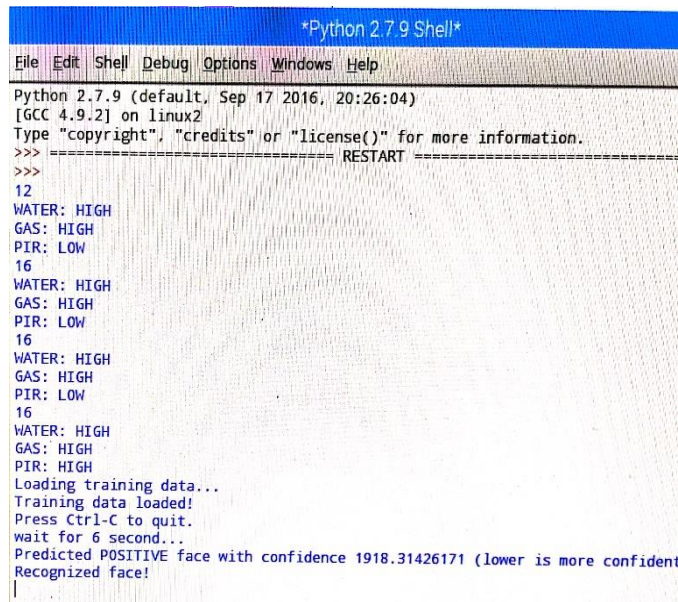


Fig 4. Flowchart of system

4. RESULTS AND DISCUSSIONS

We have successfully match the captured image with the stored database using Eigen-based face recognition algorithm and unlock the door also detect water leakage and gas leakage and sent the notification to authorized user using android application.

When guest's face get recognized then system will automatically open the door.

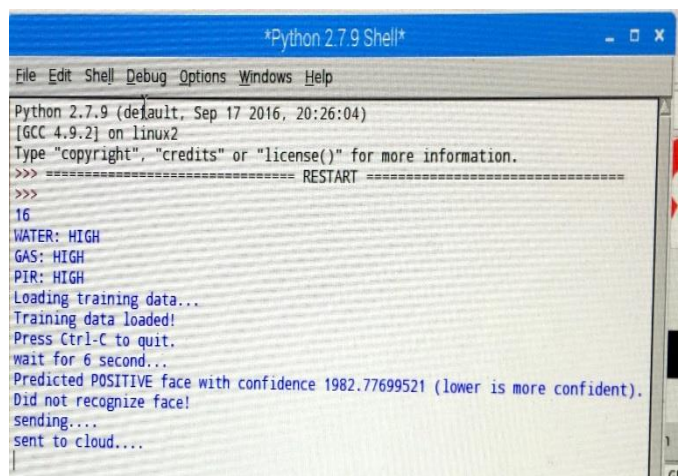


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*Python 2.7.9 Shell*
File Edit Shell Debug Options Windows Help
Python 2.7.9 (default, Sep 17 2016, 20:26:04)
[GCC 4.9.2] on linux2
Type "copyright", "credits" or "license()" for more information.
>>> ===== RESTART =====
>>>
12
WATER: HIGH
GAS: HIGH
PIR: LOW
16
WATER: HIGH
GAS: HIGH
PIR: LOW
16
WATER: HIGH
GAS: HIGH
PIR: LOW
16
WATER: HIGH
GAS: HIGH
PIR: HIGH
Loading training data...
Training data loaded!
Press Ctrl-C to quit.
wait for 6 second...
Predicted POSITIVE face with confidence 1918.31426171 (lower is more confident)
Recognized face!
  
```

Fig 5. Recognized face in python output window

When did not recognize guest's face get then system will send guest's image to authorized user. Then authorized user can open door using android application.



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File Edit Shell Debug Options Windows Help
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[GCC 4.9.2] on linux2
Type "copyright", "credits" or "license()" for more information.
>>> ===== RESTART =====
>>>
16
WATER: HIGH
GAS: HIGH
PIR: HIGH
Loading training data...
Training data loaded!
Press Ctrl-C to quit.
wait for 6 second...
Predicted POSITIVE face with confidence 1982.77699521 (lower is more confident).
Did not recognize face!
sending...
sent to cloud...
  
```

Fig 6. Did not recognize face in python output window

In case of no leakage it will show no water leakage and gas not detected.



Fig 7. No gas leakage on LCD display

In case of leakage it will show water leakage and gas detected on LCD display.

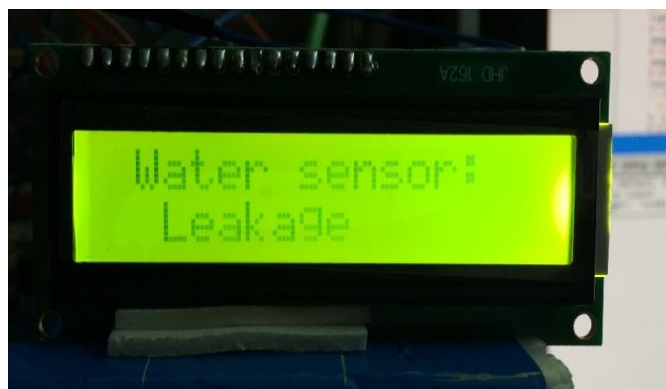
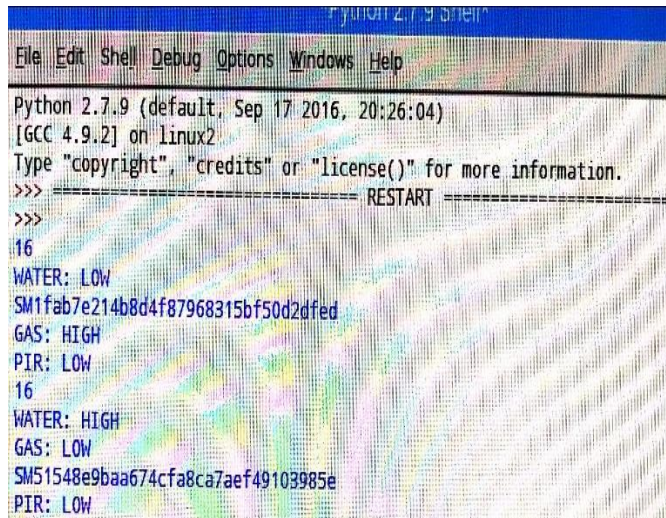


Fig 8. Water leakage on LCD display

Also, in case of leakage system will send alert message to authorized user using Twilio cloud communications platform and that will be displayed on python output window too.



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*Python 2.7.9 Shell*
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Python 2.7.9 (default, Sep 17 2016, 20:26:04)
[GCC 4.9.2] on linux2
Type "copyright", "credits" or "license()" for more information.
>>> ===== RESTART =====
>>>
16
WATER: LOW
SM1fab7e214b8d4f87968315bf50d2dfed
GAS: HIGH
PIR: LOW
16
WATER: HIGH
GAS: LOW
SM51548e9baa674cfa8ca7aef49103985e
PIR: LOW
  
```

Fig 9. Sensor result in python output window

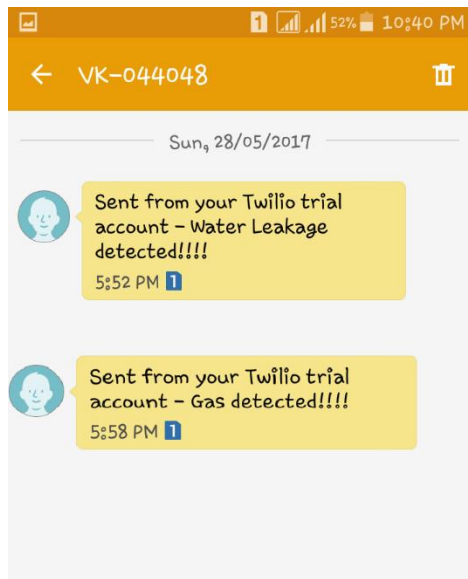


Fig 10. Screenshot of messages sent in case of any leakage

5. CONCLUSION

The end result of this project is ended up successfully with both unlock and lock capability of door by an android application and furthermore by a Raspberry pi Board. The application allows the user to get notification and interact with the module from longer range. The real preferred standpoint here is the

usage of a Raspberry pi Board which is in under research for future purpose by numerous scholars. Further the overall system is more attractive which allows us to interact with the environment. Also, the project gives security of home against gas leakage & liquid petroleum gas (LPG) leakage. Our project will prove to be boom for households and industries.

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