

Title: Windows IoT: Facial Recognition Door

I. Objective

The purpose of this project is to build an automated door that can be unlocked using facial recognition.

II. Summary

The project is to build an automated door that unlocks itself using facial recognition. The project will require knowledge about image processing and basic circuit design. Also, this project is related to the internet of thing (IoT) devices that are emerging throughout the world. This will be completed by using the Raspberry Pi. The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse. The device can be programmed to complete specific tasks. This makes the facial recognition possible on a mobile stage without using a regular computer.

III. Related to Industry Summary

This project is related to industry by many companies are implanting the internet of things into many products. These products are seen in everyday lives products, such as, televisions, refrigerators, smart speakers and more. Therefore, it is important for student to become familiar with IoT devices and the construction of them. The IoT devices will be the future of many engineering design projects. This project will develop the students programming skills and circuit design for real world application of a product.

IV. Description of project

a. Parts

- i.** Raspberry Pi 2 Model B
- ii.** MinnowBoard MAX
- iii.** Perma-Proto Breadboard Half Size
- iv.** Leviton 12-Volt DC Electric Door Strike
- v.** SainSmart 2-Channel 5V Relay Module
- vi.** Adafruit Female DC Power Adapter
- vii.** Adafruit 12V 5A Switching Power Supply
- viii.** Microsoft Lifecam 3000
- ix.** Generic Keyboard and Mouse
- x.** Generic Speakers
- xi.** Power Supply

b. Software apps and online services

- i.** Visual Studio 2015
- ii.** Microsoft Visual Studio 2015
- iii.** Microsoft Azure
 - Facial Recognition is done through Microsoft Face APIs within Project Oxford, hosted by Azure.
- iv.** Microsoft Windows 10 IoT Core

c. Procedure

- i.** Set up the Raspberry Pie as shown in Figure 1.
- ii.** Wire the Doorbell as shown in Figure 2.

- iii. Wire the same power relay to the lock, or electric door strike as shown in Figure 3.

iv. **Software Setup**

1. Use Command Prompt to navigate to the folder where you want the project: `cd <your folder path>`
2. Run the git clone command to download the project:
`git clone https://github.com/ms-iot/Facial-Recognition-Door.git`
3. Open the FacialRecognitionDoor.sln solution file, in the FacialRecognitionDoor folder you just downloaded, using Visual Studio 2015.
4. On the right panel, under the "FacialRecognitionDoor" project, navigate to the Constants.cs file. You should see a section at the top entitled "General"
5. Constants". The first thing you need to do here is enter your Oxford API key. Follow the instructions here to acquire your key.
6. Replace OXFORD_KEY_HERE with your new key:
7. ONLY FOR MINNOWBOARD MAX: Switch the DisableLiveCameraFeed variable from true to false
8. On the top menu of Visual Studio, select Debug and ARM if you are using a Raspberry Pi. If you're using an MBM, select Debug and x86.

9. Press Remote Machine. In the "Remote Connections" dialog you will have to enter your Remote Machine IP address and use "Universal (Unencrypted Protocol)" for Authentication Mode.
10. Use WindowsIoTCoreWatcher to find your IP address.
11. You can now run the code! Press the Remote Machine button with the green "play" arrow.

v. Software use

1. When you first run the project, this is the screen you should see.
On an MBM you would have set the DisableLiveCameraFeed variable to false in step 6 of Software Setup and instead of seeing the camera icon, you would see a live feed of what the camera is seeing.
2. There are three buttons located on the bottom app bar. The first is a "plus" icon. This is used to add a new user to your "whitelist." Any user on the whitelist is essentially marked as a "friend" and allowed to unlock the door using their face. Try pressing the "plus" button now. You should see this screen:
3. Position yourself or a friend in front of the webcam and press the Capture ID Photo button. You should see this screen with your newly captured selfie:
4. Enter the name of the person in the photo and press Confirm. If not, just press Cancel and take another photo.
5. After pressing Confirm, you will be sent back to the main page, but you will now see a user under the Whitelisted Visitors section.

6. Click on that user's image in the upper-left corner of the page to navigate to that user's profile page
7. On this page, you can use the plus icon to add more photos as we have done. This will improve the overall accuracy of the facial recognition door. You can also press the trashcan icon to delete this user. When you're finished, press the home icon.
8. You're now ready to unlock the door! Position the registered user in front of the webcam and press either the virtual door icon (located next to the previously used plus icon) or the physical "doorbell" button you wired up. You should hear audio feedback informing you that the door has been unlocked!
9. Now try pressing the doorbell button when an unregistered user is in front of the door. You should hear audio feedback informing you that the door has detected a stranger and will not unlock.

V. Photos and References

- a. **Code:** <https://github.com/microsoft/Windows-iotcore-samples/tree/master/Demos/Facial-Recognition-Door/CS>
- b. **Video:** <https://youtu.be/NNLwphK5MN4>
- c. **Reference:** <https://www.hackster.io/windows-iot/windows-iot-facial-recognition-door-e087ce>

Figure 1- The picture shows the circuit for the raspberry pi and the relay.

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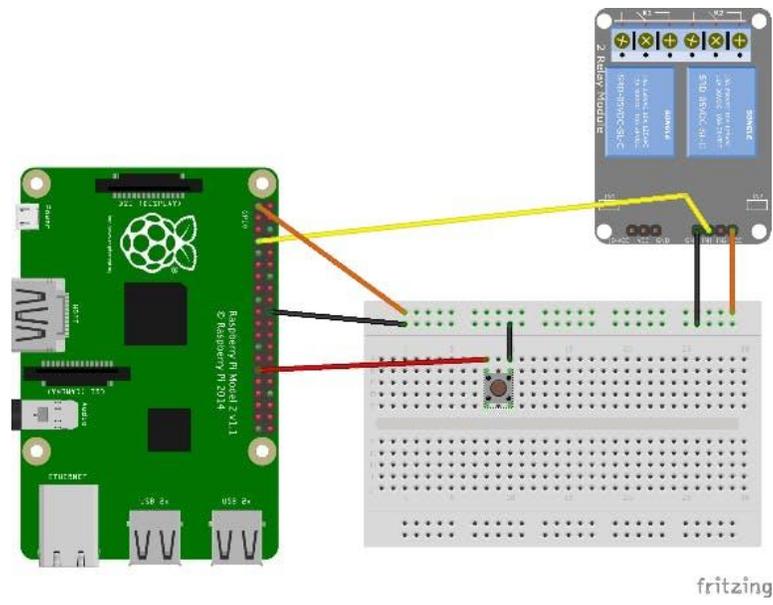


Figure 1- The picture shows the circuit for the raspberry pi and the relay.

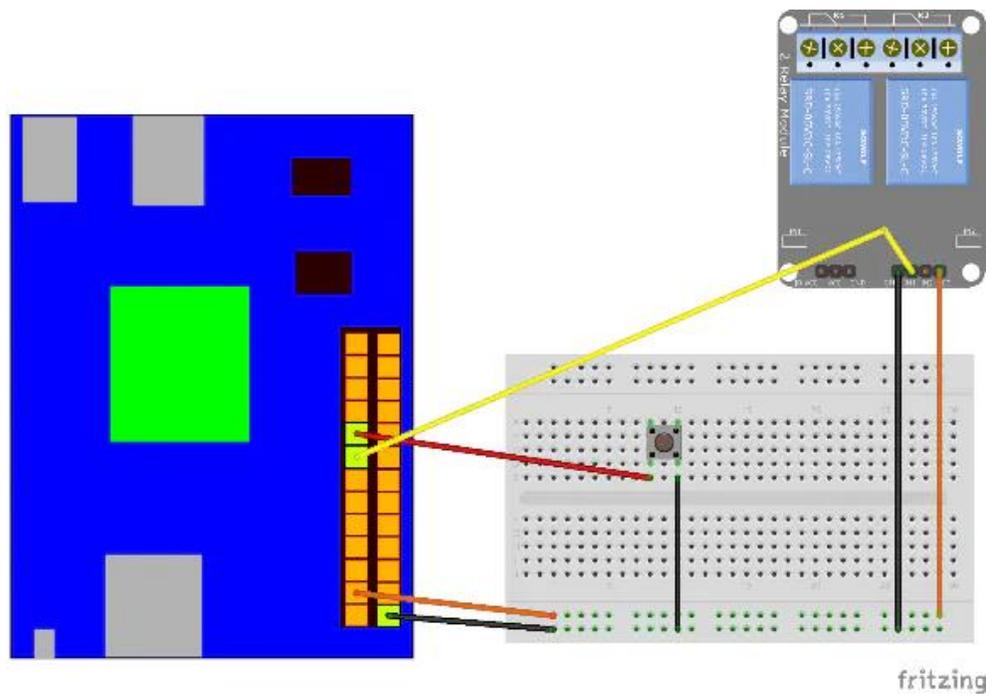


Figure 2- The photo shows the connection for the doorbell and the relay

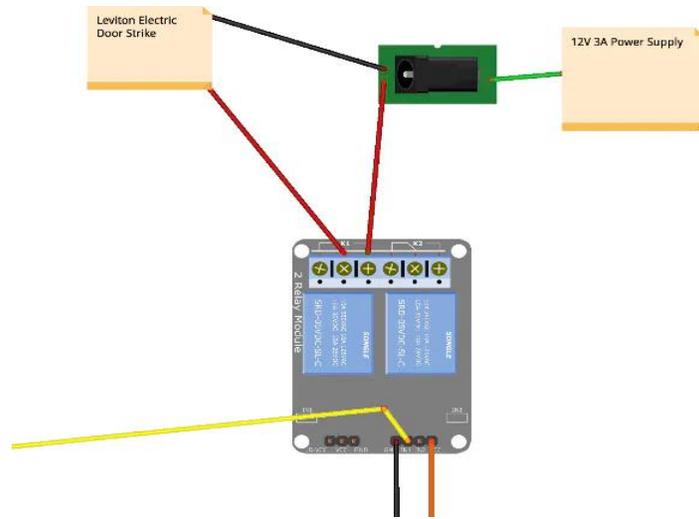


Figure 3- The picture shows the connection from the relay to the door strike and the power supply.

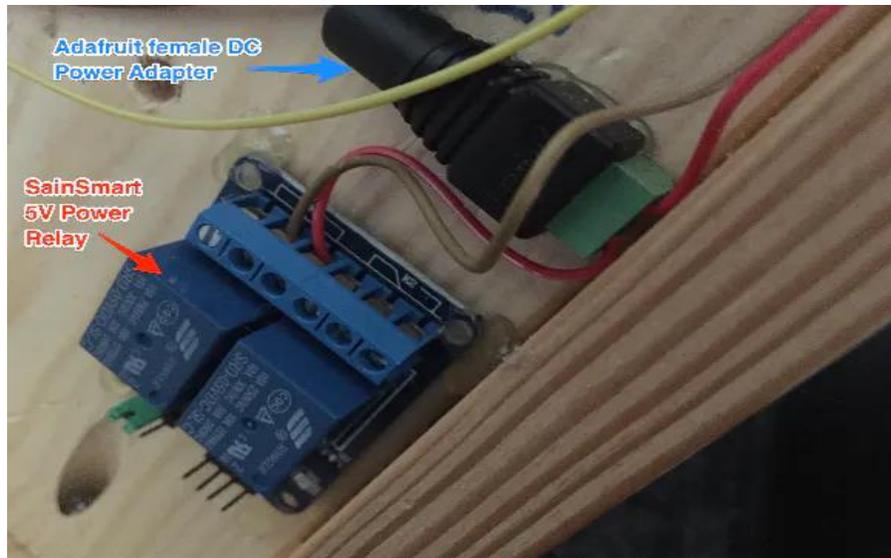


Figure 4- The picture shows the connection between the Relay and power adapter



Figure 5- The picture shows the door strike and wire connection from the relay.

```
/// <summary>
/// General constant variables
/// </summary>
public static class GeneralConstants
{
    // This variable should be set to false for devices, unlike the Raspberry Pi, that have GPU support
    public const bool DisableLiveCameraFeed = true;

    // Oxford Face API Primary should be entered here
    // You can obtain a subscription key for Face API by following the instructions here: https://www.projectoxford.ai/doc/
    public const string OxfordAPIKey = "OXFORD_KEY_HERE";

    // Name of the folder in which all Whitelist data is stored
    public const string WhitelistFolderName = "Facial Recognition Door Whitelist";
}
}
```

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    public const string OxfordAPIKey = "OXFORD_KEY_HERE";

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}

```

