1 System Overview

The Doorgy Project is a smart pet door that allows the user to lock and unlock the door with nothing but an app. The Doorgy Project is split into three major parts, the Doorgy Service which handles the physical operations, the Doorgy App which allows the user to control the service, and the Doorgy Server which serves as a relay and an authentication service between the Doorgy Service and the Doorgy App.
2 Electrical Specifications

2.1 Block Diagram

![System Block Diagram]

Figure 1: System Block Diagram

2.2 Interface Definition

<table>
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<th>Name</th>
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<th>Definition</th>
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<td>• Voltage 5.1 V&lt;br&gt;• Current 1.2 A</td>
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<td>• Voltage 5.1 V&lt;br&gt;• Current 1.2 A</td>
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<td>Analog Signal</td>
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<td>USR_IN</td>
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3 User Guide

3.1 Prerequisite

This project requires the Doorgy Installation Package that comes with the specific components require for the installation. Schematics of these components are available should you choose to create your own. You will not be able to proceed without these components.

Doorgy is part of the Doorgy Project, all parts of Doorgy Project are required to operate.
3.2 Doorgy Installation Package

- 1x Doorgy Printed Circuit Board
- 1x Raspberry Pi Zero WH
- 1x 16GB Doorgy Service Micro SD Card
- 2x HC-SR501
- 1x Doorgy LED Assembly
- 2x Servo Motors with Extended Arms
- 1x Battery Pack
- 1x Micro USB Power Supply
- 1x Doorgy Exterial Frame (Top/Bottom/Left/Right)
- 1x Doorgy Interial Frame (Top/Bottom/Left/Right) with Circuit Housing
- 1x Doorgy Door
- 1x Doorgy Door Connector
- 1x Doorgy Servo Connector
- 4x Doorgy M10 Nuts
- 2x Doorgy M10 Screws
- 4x Doorgy M2 IR Screws
- 4x Doorgy M2.5 Raspi Screws
- 4x Doorgy M2 PCB Screws
- 4x Doorgy M3 Battery Screws
- 4x Doorgy M2.5 Servo Screws

3.3 Required Software

If you have the Doorgy Service Micro SD Card, these has already been installed and configured.

If you do not have a Doorgy Service Micro SD Card, you will need a Micro SD Card with Raspbian Lite installed, more information available on [https://www.raspberrypi.org/documentation/installation/installing-images/](https://www.raspberrypi.org/documentation/installation/installing-images/). Once you have a Micro SD Card with Raspbian Lite installed, you can use the doorgy-init.sh located in resources folder of this repo to install the require softwares.

- UFW
- Fail2ban
- Git
- Node.js
- NPM
- Express.js
- mongoDB
- bluetooth
Note: You should always secure your Raspberry Pi, Doorgy Service Micro SD Card will have security enabled by default. If you are using `doorgy-init.sh`, only firewall will be enabled. You will need to setup your Raspbian user and configure Fail2ban manually, more information available on https://www.raspberrypi.org/documentation/configuration/security.md.

3.4 Configuring Doorgy Service

If you have the Doorgy Service Micro SD Card, these has already been installed and configured.

3.4.1 From GitHub

```bash
git clone https://github.com/Anthonykung/Doorgy.git
sudo npm run config
sudo npm install
sudo systemctl enable doorgy
```

If the installation fail, you can use `sudo npm run install` to try again. Sudo is required for all operations.

Note: The service will ask for a username and password, it is suggested that you create an account on the app beforehand.

Once the service has been successfully configured, you can either start or reboot to start the service.

3.4.2 From NPM

```bash
mkdir ~/Doorgy
cd ~/Doorgy
sudo npm install doorgy
sudo npm run config
sudo npm run install
sudo systemctl enable doorgy
```

If the installation fail, you can use `sudo npm run install` to try again. Sudo is required for all operations.

Note: The service will ask for a username and password, it is suggested that you create an account on the app beforehand.

Once the service has been successfully configured, you can either start or reboot to start the service.

3.5 Install

This assume you have the Doorgy Installation Package and met all the prerequisites, if not please check that you have met the prerequisites before continuing.

3.5.1 Physical Installation

1. Remove the door and place it on a table
2. Mark the cutting area of Width 274mm X Height 399mm on the door.

3. Leave at least 3 inches of space on each side and 4 inches on the bottom.

4. Cut the door on the marked location, this should give you a rectangular hole for the Doorgy Exterial Frame.

5. Assemble the Doorgy Interial and Exterial Frame, the sides should fit the holes on the top and bottom.

6. On the Interial Frame, push the Doorgy Door in place with the hook on the top facing inside.

7. Place the Doorgy Exterial Frame to the door (facing the outside), this should give you a tight fit.

8. Place the Doorgy Interial Frame on the other side overlapping the Doorgy Exterial Frame sliding the screw on the Exterial Frame to the hole of the Interial Frame.

9. Using the M10 Doorgy Nuts, tighten the Interial Frame with the Exterial Frame (the hole is located on the Interial Frame).

10. Using the M10 Doorgy Screws, secure the circuit housing to the door (you will need to drill a 1/2 inches hole on the door, do not penetrate the door).

11. Attach the IR sensors to the sensor housing and secure it with the M2 screws, connect the Interial IR to IR_INT and Exterial IR to IR_EXT.

12. Attach the servo motors to the servo housing and secure it with the M2.5 screws, match the connector with the number on the housing (note, you will need to connect it to the PCB and the PCB with the Raspberry Pi and power it up once, then adjust the servo arms to 3 O’clock position before proceeding, you may want to consider connecting your Raspberry Pi with the app and set the door to unlock position for SERVO2).

13. Attach the Doorgy PCB to the PCB housing and secure it with the M2 screws.

14. Attach the Battery Pack to the battery housing and secure it with the M3 screws.

15. Attach the Raspberry Pi to the Raspberry Pi housing and secure it with the M2.5 screws.

16. Attach the servo arm to the Servo Connector and connect the Servo Connector with the Door Connector, hook the Door Connector to the hook on top of the door, do not touch the servo arm on the left.

17. Plug in the Micro USB power cable or attach 4x AA batteries (not included) to the battery pack.

18. You are good to go! (Remember to tidy up the power cable so it doesn’t get pulled out!)

For a visual illustration of the frame installation, please check out this video: https://doorgy.anth.dev/videos/Doorgy%20Frame%20v39%20Animation.mp4.

3.5.2 System Configuration

1. Install the Doorgy app on your smartphone.

2. Open the Doorgy app and follow the display to create an account.

3. Enjoy your awesome new smart pet door!
4 Design Artifacts

4.1 Doorgy Block Diagram

The block diagram shows the interfaces of each block in our project. The blocks consist of the enclosure, power supply, external indicator, door/lock system, microcontroller design, app interface, web server, and IR sensors.

4.2 Doorgy Frame 3D Models

The Doorgy Frame 3D STL files can be found on the Doorgy Service GitHub repository. The Doorgy Frame Fusion 360 model can be found on https://a360.co/3bQ4yVy

4.3 Mechanical Drawings

Figure 3: Doorgy Frame Mechanical Drawing
The above 3d models show the 3d printed frame that is designed to fit into a 224mm by 347mm pet door. A basic design for the PCB and servos mounts is also presented. A similar model is used to secure the door at the top of the pet door. The IR sensors are encased on either side of the door and angled 45 degrees downward to limit unwanted detection. The box on the door is designed to catch a rhino attachment to a servo and lock the door.

5 PCB Information

The Doorgy Project comes with a PCB with a size of Width 100mm X Height 80mm and is composed of two layers.
5.0.1 PCB Layout

The PCB Layout shows the exact layout that was used to place the components onto the PCB, a separate placement file (can be found on GitHub) is used to provide the exact coordinates for placement.
The PCB schematics contains everything that the Doorgy Project uses, all electronic components has to go through the Doorgy PCB and therefore, is the overall schematics of the entire project. The red traces show the surface mount pad and the green represents the bottom layer of traces on the PCB. The grey text is information of handling the PCB as well as references to the project website.
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References

(1) Doorgy Website:
   https://doorgy.anth.dev

(2) Doorgy Service:
   https://github.com/Anthonykung/Doorgy

(3) Doorgy Service NPM Registry:
   https://www.npmjs.com/package/doorgy

(4) Doorgy Server:
   https://github.com/Anthonykung/Doorgy-Server

(5) Doorgy App:
   https://github.com/Anthonykung/Doorgy-App

(6) Doorgy App Expo Download:
   https://expo.io/@anthonykung/Doorgy