

## **Ground-Breaking Next-Gen Smart Pet Door**

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### **Problem Statement**

Have you ever had to leave work or school to let your dog outside? Have you ever needed to pay dog-sitters and give them access to your home? Introducing the ground-breaking Next-Gen Smart Pet Door, which is designed to convenience both pets and their owners when it comes to technology and pet care. This project specifically aims to create a pet door which opens and closes based on motion-detection through real-time camera monitoring viewed through our own smartphone app. Pet owners have full access in giving their loved ones the ability to roam freely remotely. The app includes full functionality of the door, which gives users the ability to open and close the door based on the display of the camera.

### **Solution**

As described in our problem statement, it will provide customers with a pet door that allows the users to open it remotely. At a high level, our design will revolve around modifying an existing door to fit our dog door. This dog door is controlled by the user through a phone app. Subsystems of this design include the app, the door, the sensors, the power system, and the camera. Motion detectors will be used to alert the customer when the pet is near the door and needs to enter. A camera will also be used to prevent unwanted visitors or other animals from entering. The door will close after some time has passed to prevent the door from being always open. In addition, the app can also be used to manually cancel the door open and close it immediately. This system will be on both sides of the door, so the pet can get in and out and not be trapped outside.

### **Solution Components**

#### **1. Sensor**

This subsystem is the part of our design that senses movement and feeds live video. Once the sensors get triggered, a notification will be sent to the app and the cameras will start sending live feed as well. We will need sensors for motion detection, cameras for live feed, and a wireless transmitter to feed video to the app for the owner to see.

## **2. Door**

This subsystem will be the mechanical side of our project. It will involve a stepper motor connected to a simple rolling pulley system that we will design. It will be a small version of the actual product and will be bolted onto a piece of plywood to demonstrate its functionality. It will have an opening and closing function.

## **3. User App**

This subsystem contains the controls for the door. It will receive the video feed from the cameras as well as send out controls to the door to open and close when necessary. This part of the project will be entirely software based and will go off of the wireless transmitter on the other subsystems to send and receive the required signals.

## **4. Camera**

The camera will be activated from the microcontroller to send a live feed locally to a laptop which will in turn upload to our application. This allows us to workaround the limitations of cheap pcb scale cameras.

## **5. Power Supply**

Our power supply system will include a high-quality 12V battery specifically for its capacity and stability for power. To meet the demands of other subsystems, we will need to incorporate voltage regulation techniques to control and stabilize the output voltage based on load conditions. Our design will use step-down voltage regulators for our microcontroller to minimize power flowing through to avoid damage.

## **Criterion For Success**

For the end of our project, we expect the project to be fully functional. We need to make sure the sensor can accurately detect motion and alert the camera to turn it on. This alert must also be able to send a signal to our app and feed the camera feed to the app. The app from here must be able to work properly (buttons and camera). The button when pressed should be able to successfully send a signal to the door and cause it to open. The door should be able to close after a certain amount of time has passed on its own and stop the camera feed from being sent to the app. This same criteria should be applied to the other side of the door as well. Once all these functions are working properly, then we can determine the project is effective.