

Easy Kennel Opener



Danny's Dawgs

Renn Stein, Spencer Bell, Jackson Painter, and Lance Kenely

The Team

Renn Stein

Lance Keneley

Spencer Bell

Jackson Painter



Danny and Korey

- Board member of the Canine Companion and other disability organizations
- Wheelchair user with Cerebral Palsy
 - Limited upper body strength
 - Grip and vision impairments
 - Diminished hand dexterity
- Korey is Danny's service dog
 - Helps Danny throughout the day but sleeps in a crate at night



The Problem

- Ultimately a problem of personal autonomy
- Currently Danny needs help to open the crate
- Due to dexterity issues associated with CP, Danny cannot operate the latch mechanism
- There are more than 500,000 service dogs and there are very few accessible crates.



Interview with Danny

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 - Hard to see the latch
 - Hard to activate the latch with his hands
 - Specifically pinching
 - His wheelchair sometimes prohibits him from easily opening the gate



Interview with Danny

Preferred Solution

- Integrate electronics into the solution

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Preferred Solution

- Integrate electronics into the solution
- Large button that can easily be pressed
- Kennel can be plugged into the wall
- Danny loves to use Alexa for tasks and has one in every room



What Assistive Technology is Employed?

- Voice activation through Alexa



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- Voice activation through Alexa
- Electronic opener with accessible button



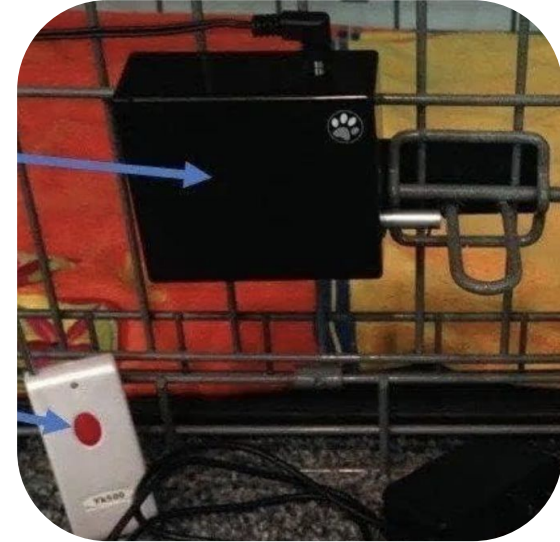
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 - Requires a separately purchased WiFi-enabled outlet
 - Only works for linear pull latches



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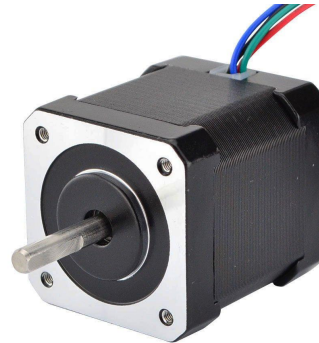
- Easy Out Deluxe:
 - Requires a separately purchased WiFi-enabled outlet
 - Only works for linear pull latches
- Escape Crate:
 - Only works for linear pull latches
 - Actuated by integrated button or WiFi control capability



Design Concepts - Electrical Actuators

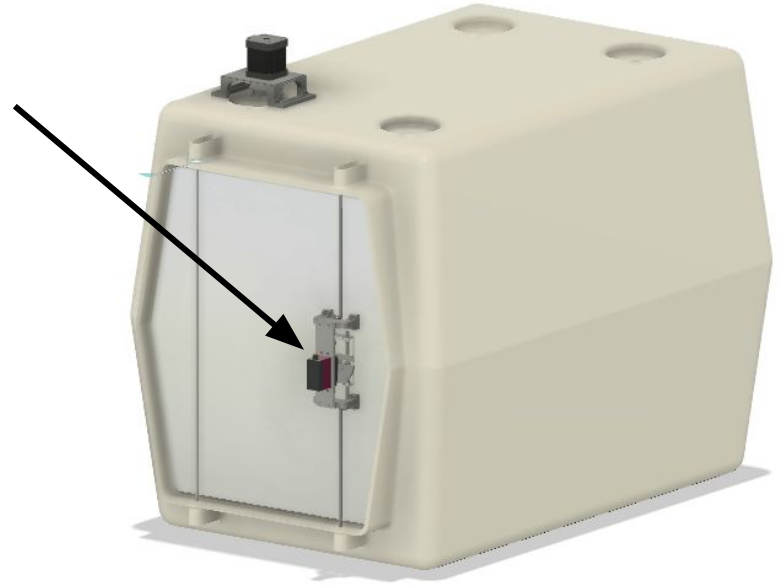
Lots of different ways to actuate the door and latch

- Latch:
 - Servo
 - Solenoid
- Door:
 - Linear actuator
 - Stepper motor
 - DC motor



Final Design

- Two electrical actuators
 - Servo to lock and unlock the door



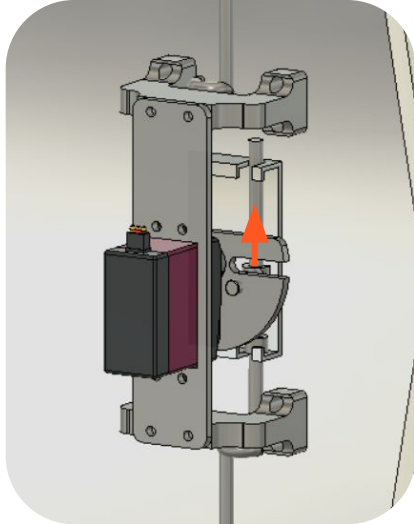
Final Design

- Two electrical actuators
 - Servo to lock and unlock the door
 - Stepper motor to open and close the door



Final Design

- Servo system mimics pinch based system of current crate allowing easy retrofitting
 - Allows the door to be locked unlocked manually if power is lost



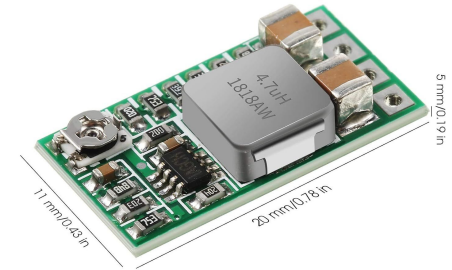
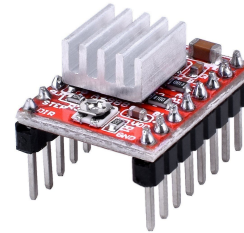
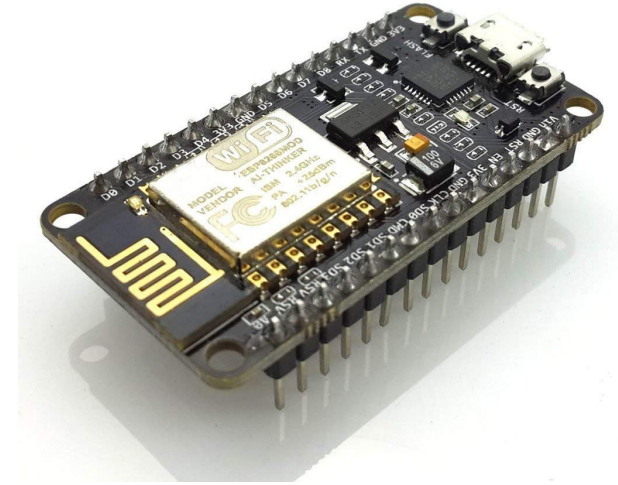
Final Design

- Stepper motor allows manual and automated operation
 - Allows the door to be open/closed manually if power is lost
 - During automated operation speed can be controlled to ensure safe movement



Final Design

- Can connect to Alexa and drive motors with three items and free software
- Used:
 - WiFi enabled microcontroller
 - ESP 8266
 - Stepper Driver
 - Buck converter
 - Arduino IDE



Final Design

- Can be actuated using either Alexa or a large button
 - Red button is easy for Danny to operate
 - Alexa is easiest and Danny can be further from kennel
 - will be integrated before delivery

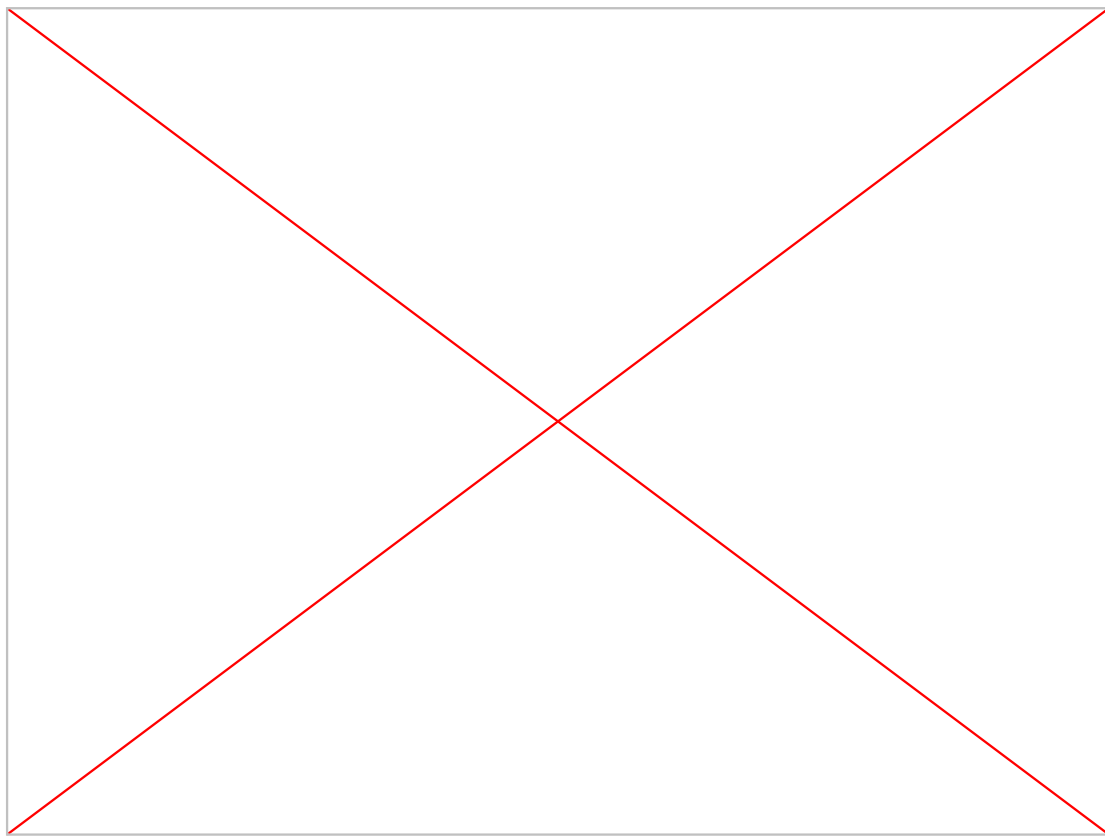


Final Product

FINAL COST: \$120



Demonstration



Future Work

Enable Alexa functionality before delivery

Higher torque stepper to add safety factor

Assemble second crate for Danny and Korey

Commercial cost ~\$400

Good market potential since alternatives do not provide the same functionality but expensive to bring to market