# Dorito Finger Cleaner

ECE411 Fall 2025 - Team 16

## Executive Summary and Concept of Operations

Instead of wasting paper towels all the time, this device cleans snack dust from your fingers in just a few seconds. By just inserting your hand in the box, it will sense your hand and will activate the cleaning brushes. Wait a few seconds, remove your hand, and the brushes will stop. Highly convenient for those who like to snack at their desks throughout the day.

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## Market Analysis

Intended Users

Intended users are people that sit at a desk, use their hands, and have dirty fingers. The specific audience is gamers, office workers, and students but this can extend to other fields.

Customer Base

Customers other than the intended users could be parents, internet cafe managers, office suppliers, nail salon proprietors, janitorial contractors, or assembly technicians. These customers would have unexpected use cases of the device, but there are several reasons for needing clean hands at a workstation, whether it's from food debris or other contaminants.

Competition and Product Niche

There is little to no competition in this product segment. Simple, inferior solutions include wet wipes, finger cots, utensils, washcloths, napkins, and pant legs. There was a brief promotional product made by Lays, the "Finger Washing Machine". However it was a limited run and is not an active market contender. Our product offers convenience and luxury in an unintrusive fashion, unlike the simpler solutions listed above.

Pricing

Depending on featureset, this product could sell between the $20 to $40 range. At its least complex, an automated brush driver, the use case is clear and the price for an automated appliance is forgivable. At the most, it could be customizable with sounds and lights while having fast cleaning ability. This would market primarily to gamers, a customer base which prioritizes stylized workstation.

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## Requirements

- Shall start when a hand is entered in the device.
- Shall remove dust from fingers.

- Should require cleaning at or less than once a month.
- Should remove oil from fingers.
- Should not leave hand sopping.

- May play a tone during cleaning.
- May be portable.
- May be wirelessly chargeable.
- May have a light on when cleaning.

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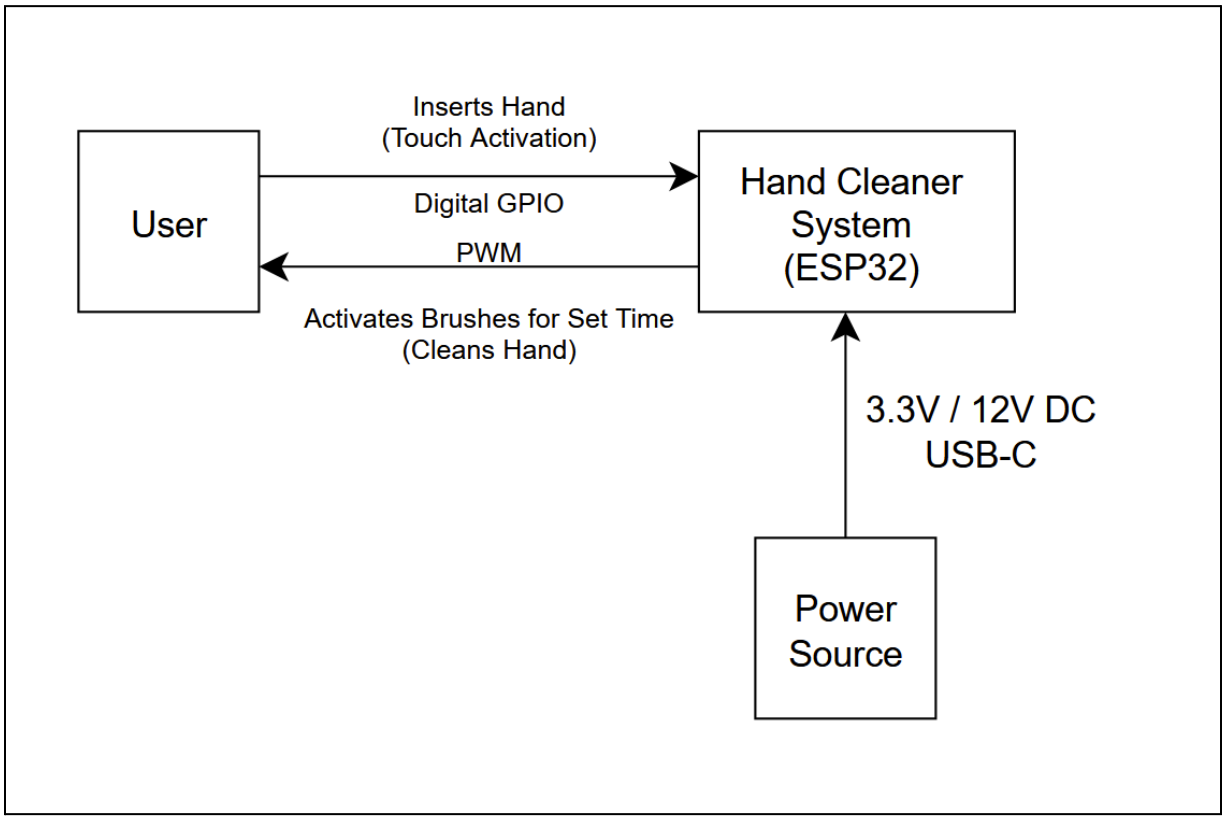
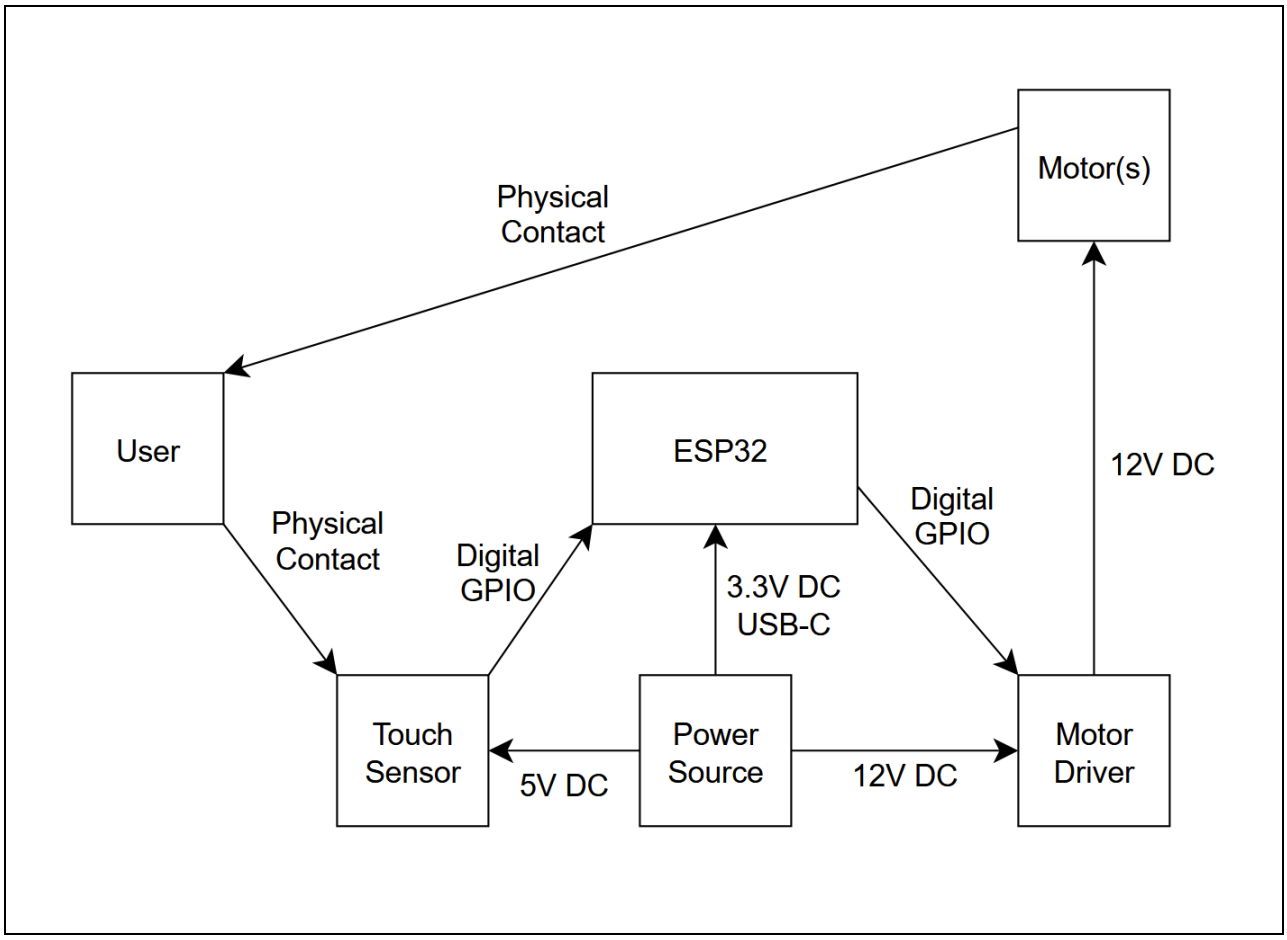
## Design Specifications

- Small DC motor to power finger cleaning.
  - Rotating motor that will have a brush mounted on the output shaft. Concerns are load rating and mounting of the motor, this is especially a challenge in our packaging constraints.
- Small Brushes
  - Rotary brushes.
- Motor Driving Circuitry
  - Constant on relay motor control - current controlled on/off
  - This will require a separate PCB.
- Power board to accept and distribute wall power from a wall power supply
  - Esp32 requires a 5V for power and it drives not more than 500 mA.
  - Motors may require anywhere between 3 volts to 12 volts depending on model and specification. This can be determined during component selection.
- Motion or heat sensing to detect a hand in the device.
  - Heat sense IR would only require one sensor. Signal detection and processing is more difficult and most likely more expensive than more basic solutions.
  - Laser/light sensing similar to a garage system would be very easy and binary to detect a hand in the enclosure.
- Huzzah32 package ESP32 SoC system.
  - Bare metal is very possible; it should be easy to make a simple program.
  - C++ Arduino programming is possible as a back up choice.
- Ergonomics
  - Need guides or contouring for hand shapes. The thumb surface is not flat to the bottom of the device. Further, left-handed people should be considered.

## System Architecture




**Level 0 Block Diagram**




**Level 1 Block Diagram**