METERED DOSE INHALER DRUG DELIVERY SYSTEM FOR RATS

UW BME Design

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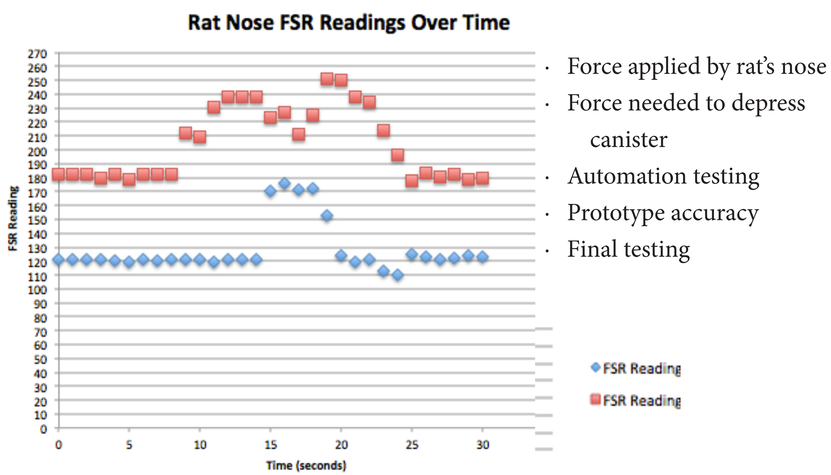
ABSTRACT

The goal of this project was to modify the mouthpiece of a metered dose inhaler (MDI) to allow for use by rats in a laboratory setting and integrate an automated system to dispense the medicine. A nozzle was 3D printed of ABS plastic in dimensions that a rat can use. When the rat's mouth is placed over the nozzle, an FSR activates motors through an Arduino system, and medicine from the inhaler is dispensed.

BACKGROUND

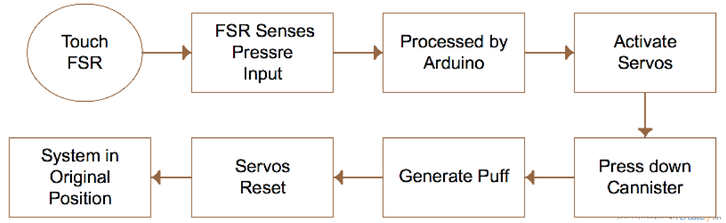
- Metered Dose Inhaler (MDI) deliver a set amount of medicine as an aerosol
- Dr. Teodorescu's Laboratory Research:
  - Side effects of corticosteroid medication delivered through MDIs
  - Correlation with weakening of musculature of tongue and upper airway
    - Sleep Apnea is a direct cause of weak airway muscles
- The Subject for Testing: Rats
  - Breathe through nose
  - Bite and Gnaw to Eat
  - Must Voluntarily use MDI

TESTING



- Force applied by rat's nose
- Force needed to depress canister
- Automation testing
- Prototype accuracy
- Final testing

BLOCK DIAGRAM



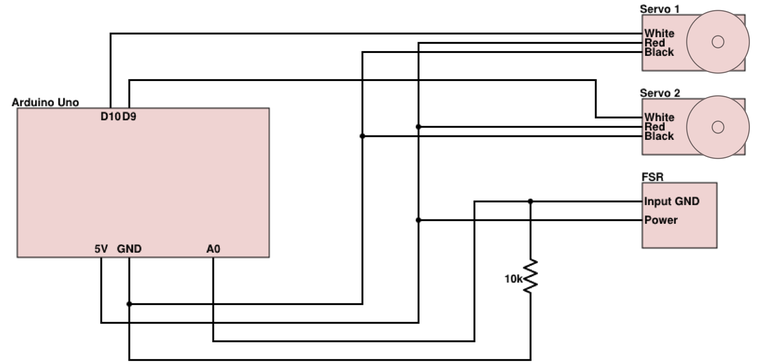
Servo and Arduino System

Inhaler fitted with modified nozzle

DESIGN FEATURES

- Force Sensitive Resistor (FSR)
- Arduino Microprocessor
- Two servo motors connected with fishing wire, threaded through a plastic top
- Modified nozzle of ABS plastic fits on end of MDI

CIRCUIT SCHEMATIC



FUTURE WORK

- Modifications based on experiment needs:
  - FSR threshold
  - FSR size and shape (square, round, etc.)
  - Housing of the system
- Different nozzle sizes and shapes based on different rats (age, size, etc.)
- Other potential medical applications that may require an automated dispensing system

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