The Smart Spice Dispenser

By Akim Faisal
Andrew Cave
Sam Sangankar
Introduction

- Smart Sensors have been around as early as the 1920’s
- Toaster -> 1920s
- Washing Machine -> 1930s
- Microwaves -> 1955
- More Advanced technology with years
Motivation

- Last week you experimented and made your favorite chili…
- Forgot the ingredients….No Problem!
- Less time looking for spices
- Easier to control desired amount of spice
- Target audience: novice cooks
- Remembering the amount of ingredients used
- Easy to use
- Not in the market yet \(\rightarrow\) (current market: mechanical grinders)
Integrated Project

- Smart home appliance
- Device that incorporates sensors and actuators
- Basic user interface
- Safe operation
- Sensory feedback
Dispenser Components

- Wooden frame
  - Wooden slab
  - Thin plywood
- Spice Containers
  - PVC plastic sheets
- Turn Wheel
  - Maker-Bot
- Gears, etc.
Components II

- Parallax BOE kit
- Actuators
  - 2 continuous servo
- Sensors
  - Bending beam load cell
- Op-amp
  - With feedback
- AD converter
- Push buttons
Goals

1. Device has a scale for each spice and read by BS
2. BS2 controls rotation of dispense wheels
3. Originally wanted to have 3 dispenser
4. Cost: Limited < $200
5. Simple user Interface
6. Store Recipe
Bending beam load cell

- Very popular
- Converts force (load) acting on it to an electrical output
- The conversion force to weight is achieved by measuring physical deformation within strain gages
Safety

- The device is relatively safe to operate
- Hardware was properly sized to prevent IC and Basic Stamp
- Prevent structural damage:
  - Small container
  - Low weight
- Unplug Power
Circuit Diagram 1

- BS2 and pins
Circuit Diagram II

- Parallax LCD and user interface
Circuit Diagram III

- Continuous servo

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+5V

PIN 13

PIN 12

PARALLAX CONTINUOUS SERVO

PARALLAX CONTINUOUS SERVO
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Circuit Diagram IV

- Dual Op-Amp
Circuit Diagram V

- AD Converter
Our Signal at the outset

- 0 – 1.1 mV range
- We need a boost: closer to 0-5 V
- Difference Op-Amp
  - Gain = 100
  - New signal = ~2.2 – 2.3 V
  - Difference = 100 X original range
Get the signal into the stamp

- Basic Stamp
- We need a boost: closer to 0-5 V

- Difference Op-Amp
  - Gain = 100
  - New signal = ~2.2 – 2.3 V
  - Difference = 100 X original range
**Cost**

- **Total Cost: $257**

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<tr>
<th>Material</th>
<th>Dimension</th>
<th>Quantity</th>
<th>Cost/Item</th>
<th>Cost</th>
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<td>Load Cell</td>
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<td>2</td>
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<td>55.98</td>
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<td>Ply wood</td>
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Conclusion

- Fell short of a few goals
  - Not able to incorporate all 3 containers
  - Recipe storage

- Accomplished most of our goals
  - Dispenses the desired amount of spice
  - Relatively short period of time
  - A product that we or others may use on a regular basis

- Successfully met requirements
  - Feedback
Future Recommendations

- Goals were partially met
- Additional Dispenser
- Recipes and storage in memory
- Larger capacity
- Effective design
  - Compact
  - Minimize volume / space