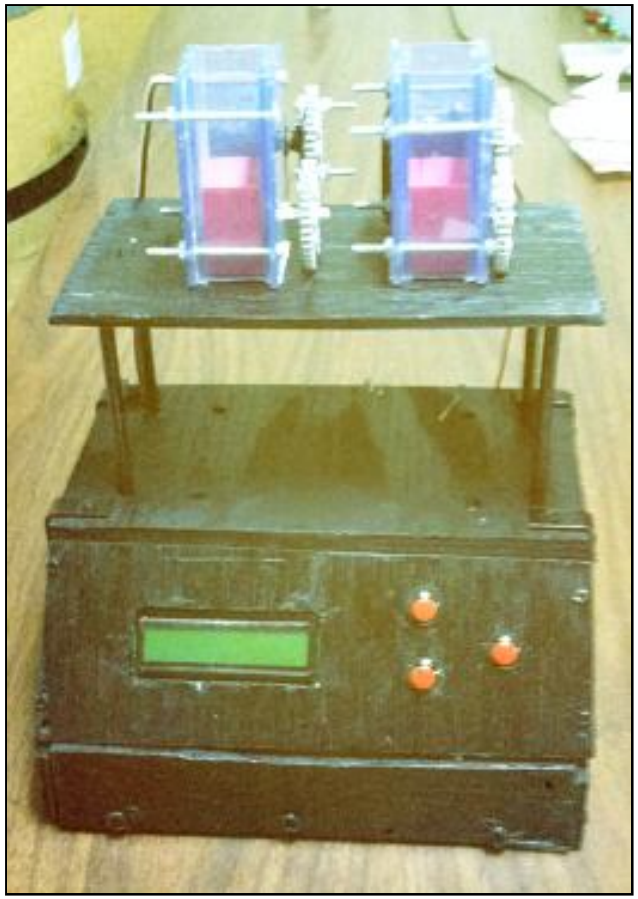
The Smart Spice Dispenser



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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 → (current market: mechanical grinders)

Integrated Project

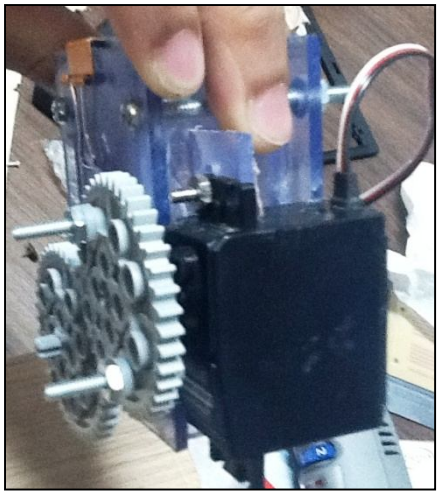
- Smart home appliance
- Device that incorporates sensors and actuators
- Basic user interface
- Safe operation
- Sensory feedback

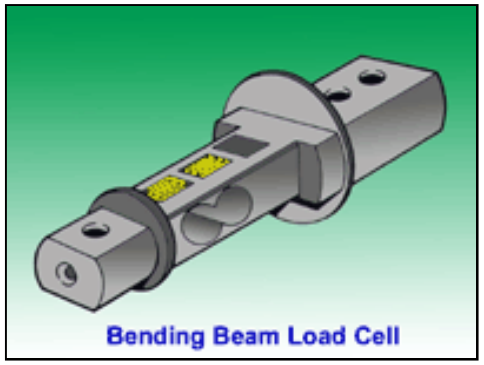
Dispenser Components

- 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

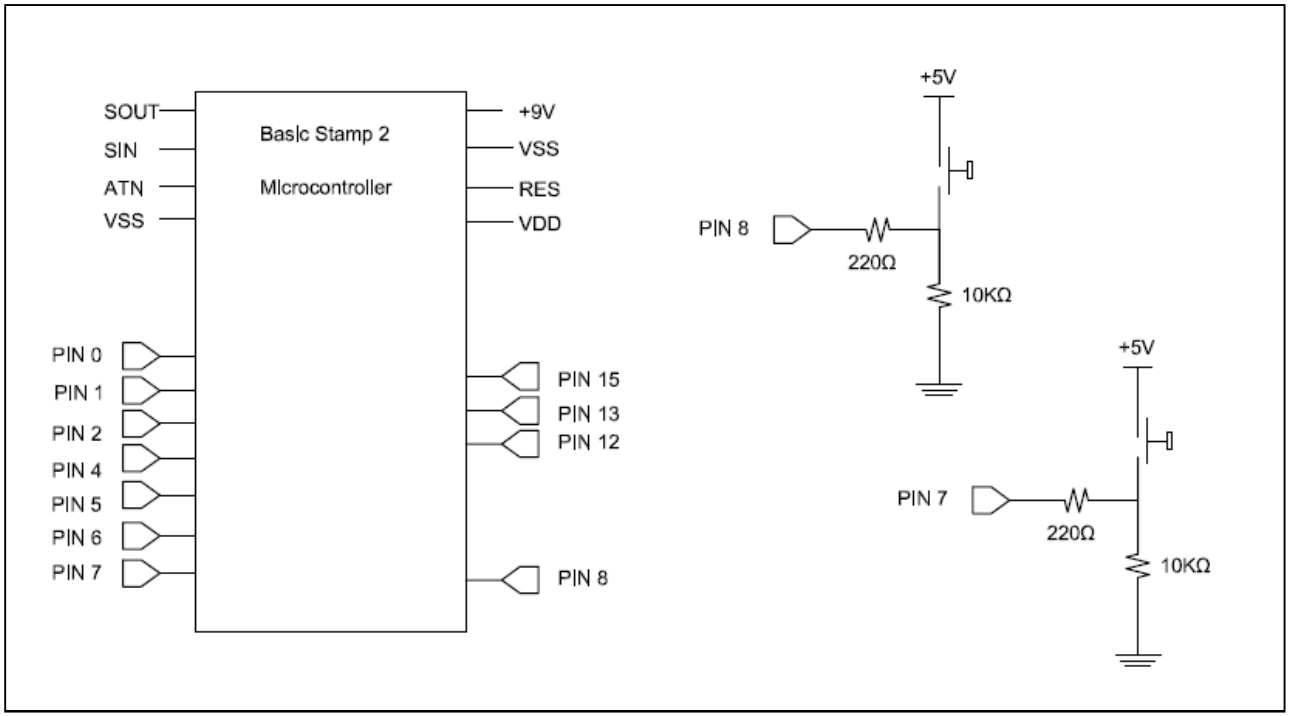
- Very popular
- Converts force (load) acting on it to an electrical output
- The conversion force to weight is achieved by measuring physical deformation within strain gages

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

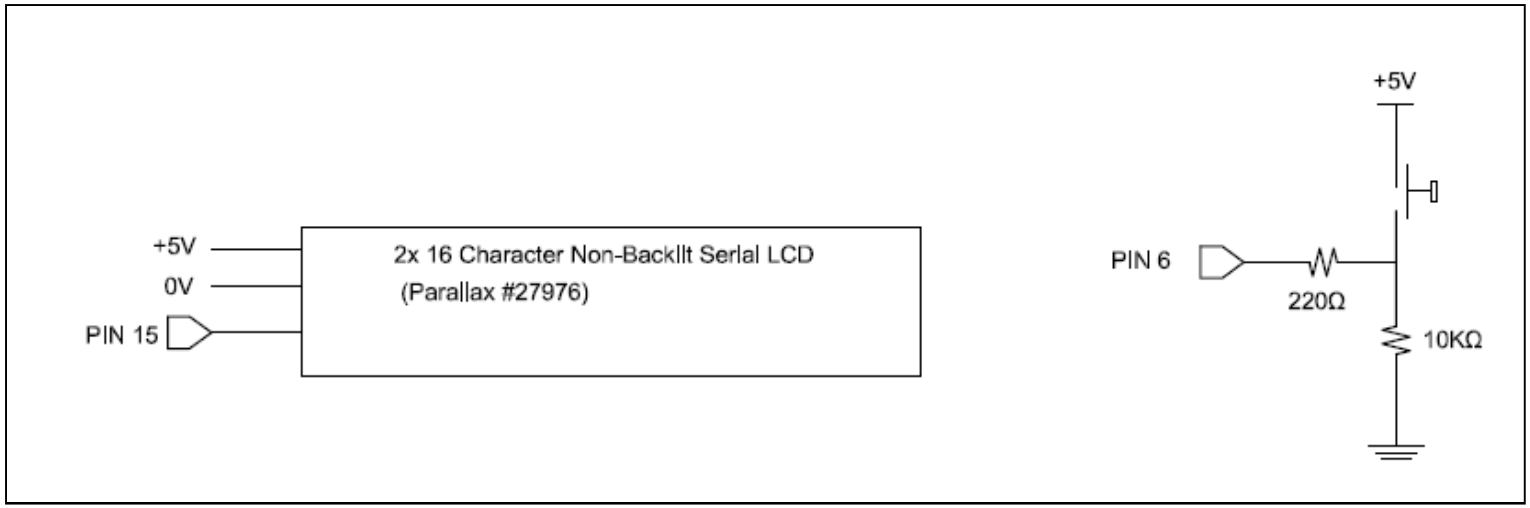
Circuit Diagram 1

- BS2 and pins



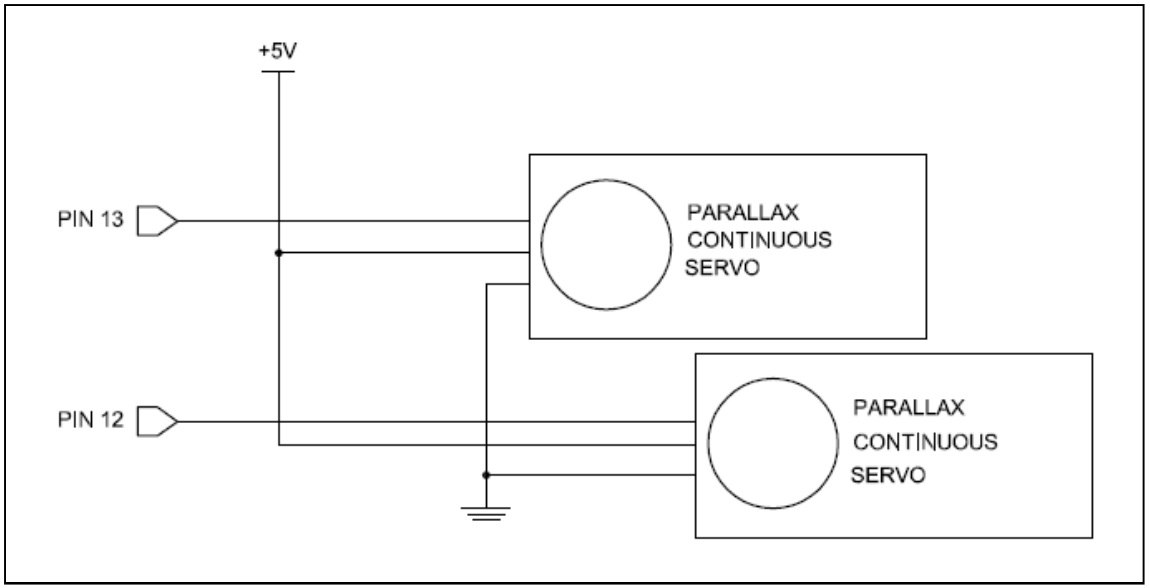
Circuit Diagram II

- Parallax LCD and user interface



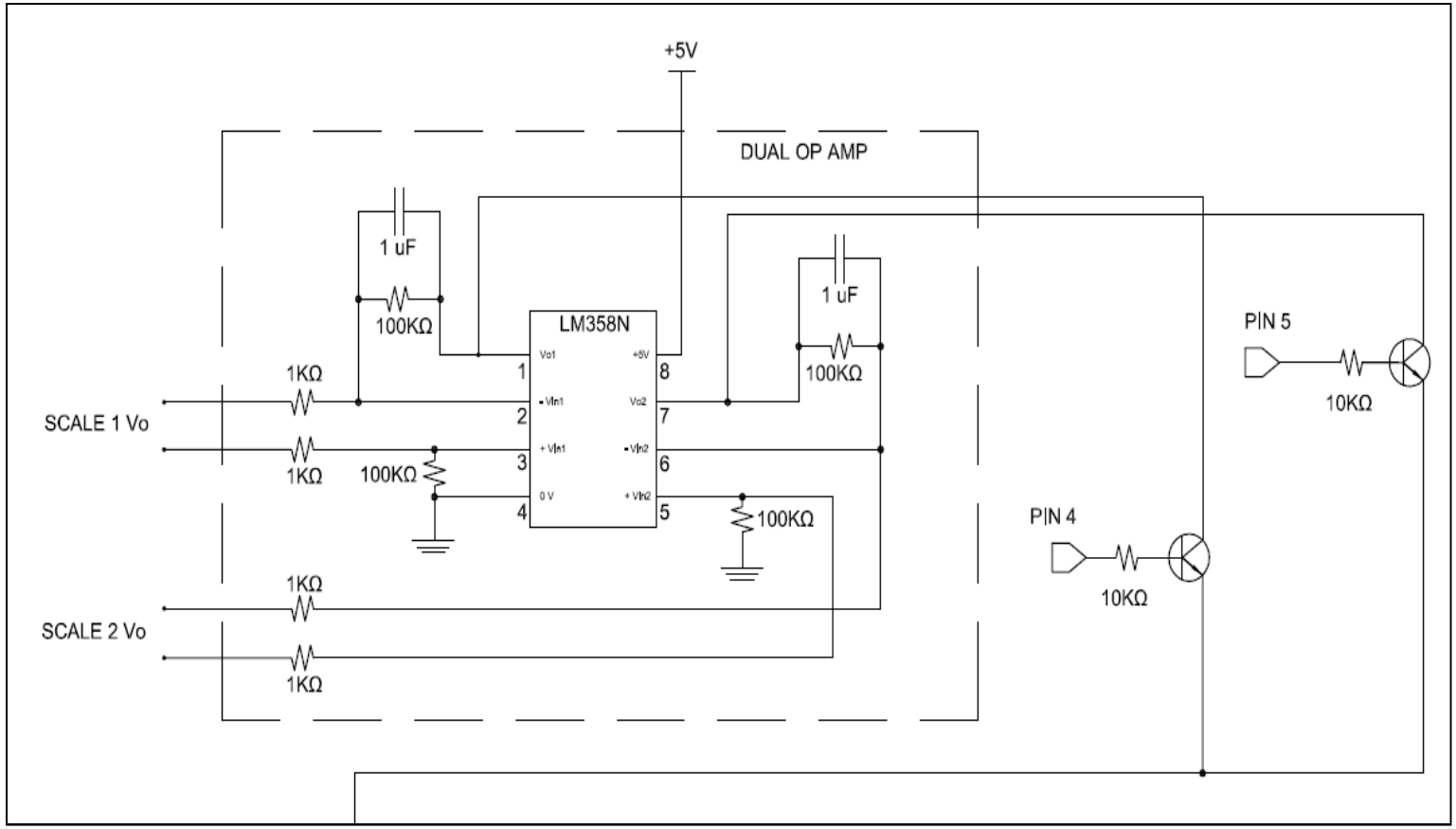
Circuit Diagram III

- Continuous servo



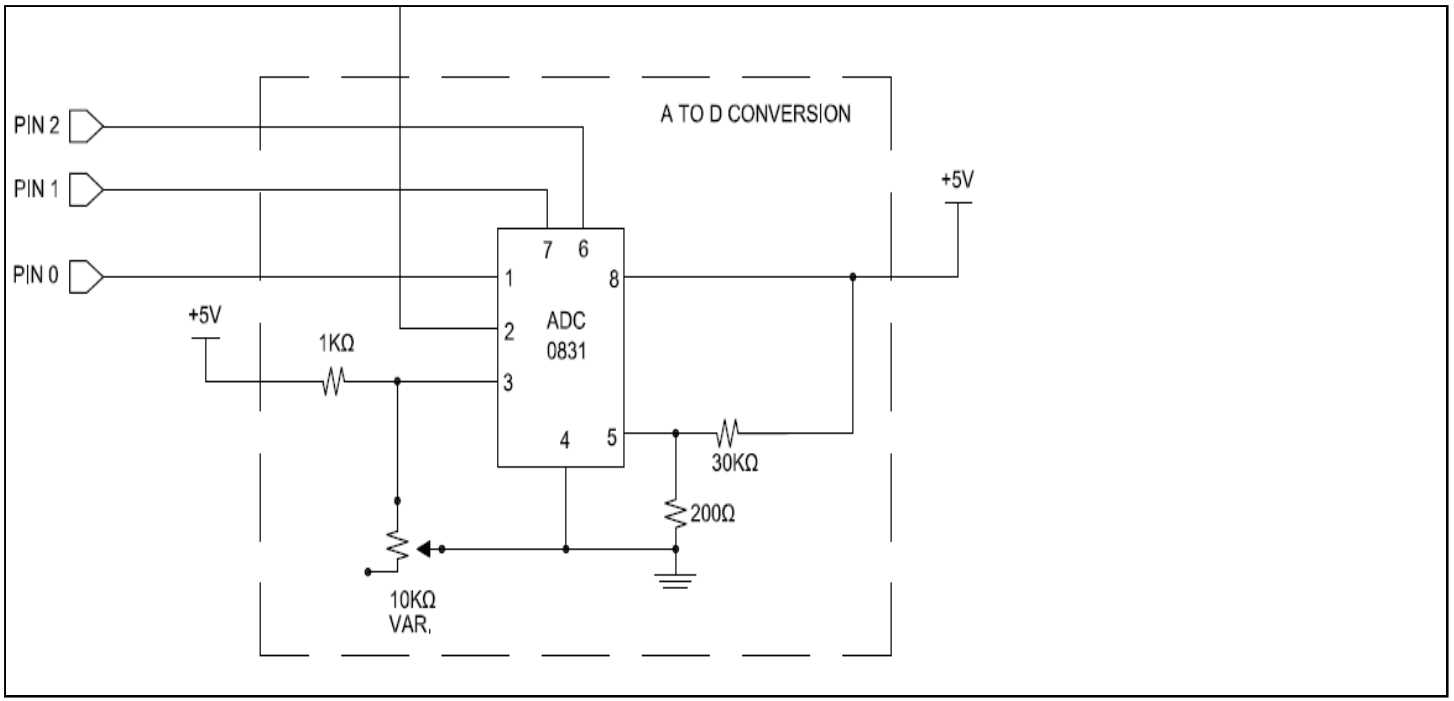
Circuit Diagram IV

- 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

Material	Dimension	Quantity	Cost/Item	Cost
Load Cell	N/A	2	27.99	55.98
Ply wood	24"x24"x3/8"	1	25.5	25.5
Wood Slab	12"x12"	1	7.56	7.56
PVC sheets	12" x 24" x 1/2"	1	13.15	13.15
Board of Education Development Board	N/A	1	69.99	69.99
Continuous Servos	N/A	2	15.00	30.00
Push Buttons	N/A	3	3.19	9.57
Parallax Parts Kits (Accessories)	N/A	1	45.99	45.99
			Total Cost (USD)	257.74

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