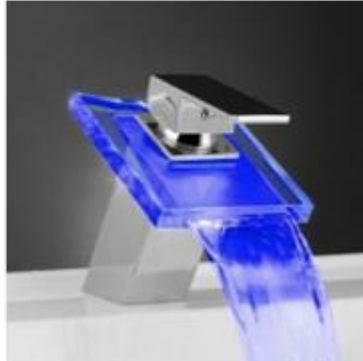


Orchestrate

Competing Products



Theirs:
No touchless temperature/pressure control
No realtime temperature display



Ours:
Completely touchless operation
Maintains manual operation

Highlights from previous survey...

Which option(s) do you prefer to be available for use when adjusting the temperature and pressure of your kitchen sink water?

	Traditional Handles	Touch-Free Sensors Only	Both
Temperature	41.82% (69 votes)	10.30% (17)	47.88% (79)
Pressure	40.49% (66)	10.43% (17)	49.08% (80)

Market Identification

Residential - Home Use

~ 75 million homeowners

Potential Demand

~ 187,500 units/yr

Assumptions:

5 % of kitchens remodeled each
year → 3.75 M

5 % of remodeled kitchens choose
our product → 187,500

Life Cycle Requirements

Shelf Life: Decades

Service Life: ~ 10 years

Cost of Installation: ~ \$50-100 (~ 1hr labor)

Cost of Operation: ~ \$10 per year in energy

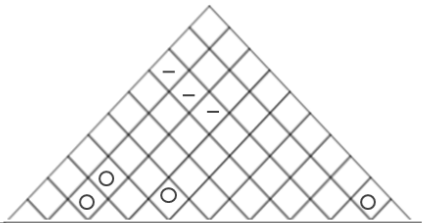
Maintenance: None

Mean Time to Failure > 10 years (ideally)

Key:

- L- Length
- Q- Quality
- Temp- Temperature
- Press- Pressure
- Trad.- Traditional

Orchestrate



Customer Requirements:		Engineering Characteristics:															
		Customer Priority (1-5)	Reach L to sensors	Reach L to on/off	L between sensors	On/off toggle time	No. Readings/sec	Sensor H2O resistance	Trad. handle Q.	Radius of Sensitivity	LED Display Geometry	No. LED lights					
Customer Requirements	Usability	Easy to toggle on	5	●		●●	○		○	□			5	4	4	4	
		Easy to change temp/press	5	●		□		●●	○	●●				5	3	3	3
		Easy to gauge temp/press	3			□		●			□	●●		4	1	1	1
		Accessible sensors	4	●	●	○				●				4	2	2	2
		Convertible trad. handle	3						□					3	3	3	3
	Performance	Price	2				□		●	□		○		3	2	3	2
		Safety	4					●●		○				4	4	4	4
		Attractiveness	4								●	○		4	4	4	4
														125	91	93	91
Importance Rating:			63	63	32	50	84	40	36	110	40	36					
%			11	11	6	9	15	7	6	20	7	6					

Correlations:

- +9 ● Strong Pos.
- +3 ○ Positive
- 3 - Negative
- 9 × Strong Neg.

Relationships:

- 10 ●● Strongest
- 7 ● Strong
- 4 □ Fair
- 1 ○ Weak

Technical Assessment

Financial Requirements

Target Manufacturing Cost: \$100

Distributor Price: \$300

Target Retail Price: \$500

$\$200 \times 187,500 \text{ units/yr} = \$37.5 \text{ million/yr in sales}$

Primary Level Electronics

How the water will be delivered

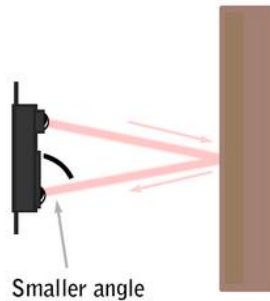
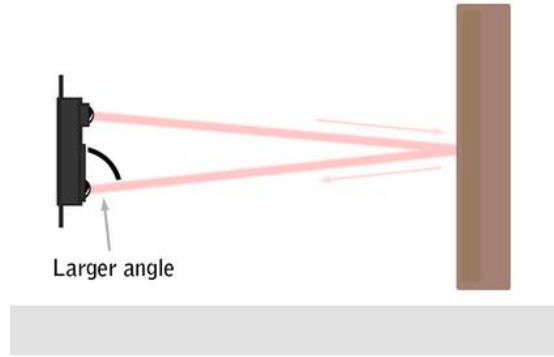
Electronic Only

- Electronic Ball Valve

Both Electronic and Manual

- Servo actuated mechanical system

IR Sensor

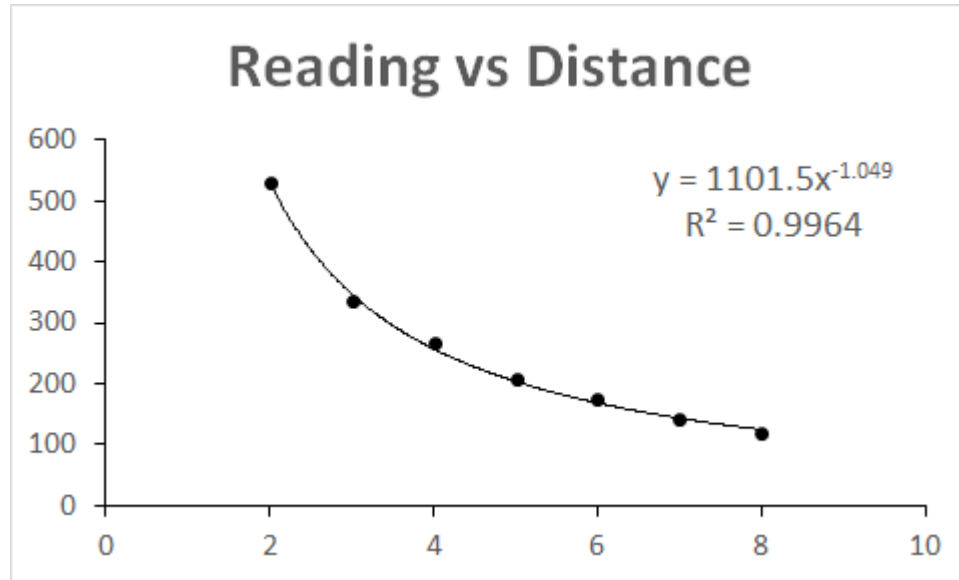


Price: > \$3

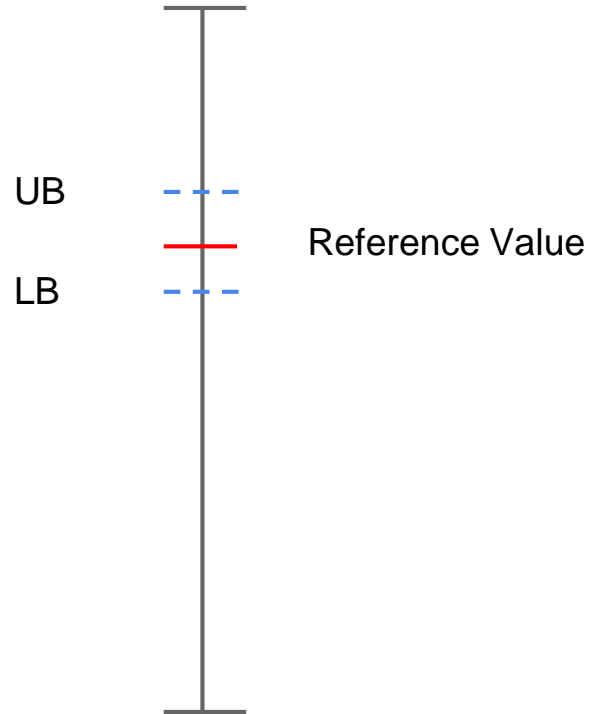
Benefits:

- Price
- Low energy
- Ease of use

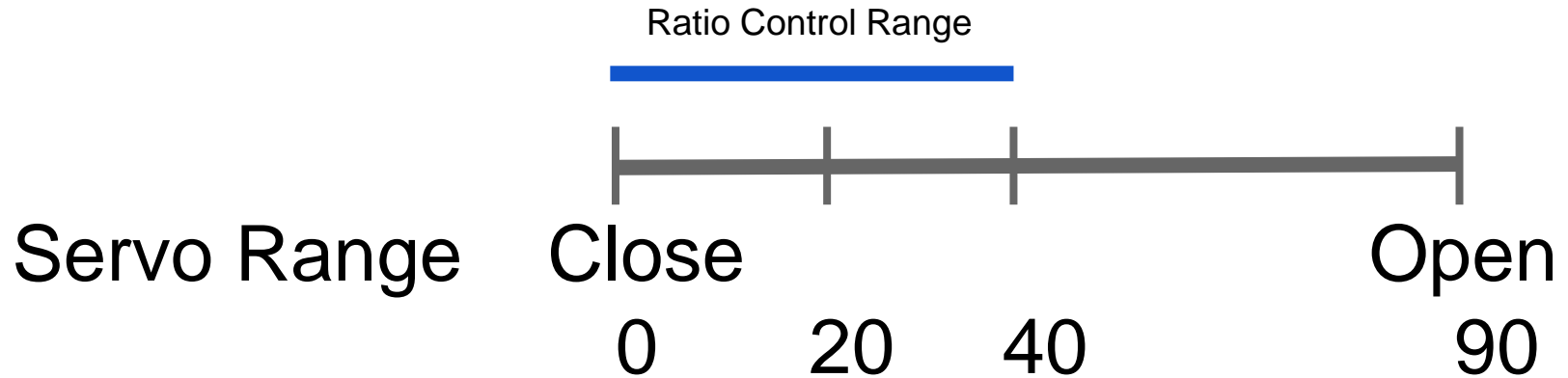
Normalizing Control



Scalar Adjustments



Control System Design



Example Control

Low Pressure Hot Servo

Low Pressure Cold Servo

High Pressure Hot Servo

High Pressure Cold Servo



Servo Range

Close

Open

0

20

90



Control System Design

Servo H: Flow = tGain * pGain

tGain: [0, 40] Default 20

pGain: [0,2.5] Default 1

Pugh Chart

Datum: Typical Sink



Current Touchless Sink

	Orchestrate	Current Touchless Sinks
Cost	S	-
Reliability	S	-
Cleanliness	+	+
Ease of Use	+	S
Aesthetics	+	S
Safety	-	-
Total	2	-2

TRIZ

Solve:

6 - Area of Stationary

- The wires and circuits need to be in small area for easy storage

Keep the same:

16 - Durability of non-moving objects

- The container holding the wires and circuits needs to stay durable

Solution:

2 - Taking Out

- Move the wires and circuits behind the sink to be kept in the wall or below the sink to protect from water damage

Potential Problems: Installation and safety issues with location

TRIZ 2

Solve:

6 - Difficulty of Detecting

- LED lights are blocked by the faucet

Keep the same:

16 - Illumination Intensity

- The LED still need to be bright

Solution:

2 - taking out

- Get rid of the part holding the LED's and place them directly on the faucet facing downwards.

DFA

- Screws = 0.5185
- Snapfits = 0.5710
- Friction Fits = 0.1480

Criterion	Mat. Cost	Mfg. Cost	Repar.	Dura.	Relia.	Time Prod.
Mat. Cost	1	1	0.2	0.2	0.14	0.2
Mfg. Cost	1	1	0.33	0.2	0.14	1
Reparability	5	3	1	1	1	3
Durability	5	5	1	1	0.33	3
Reliability	7	7	1	3	1	3
Time Prod.	5	1	0.33	0.33	0.33	1

aPriori Estimates

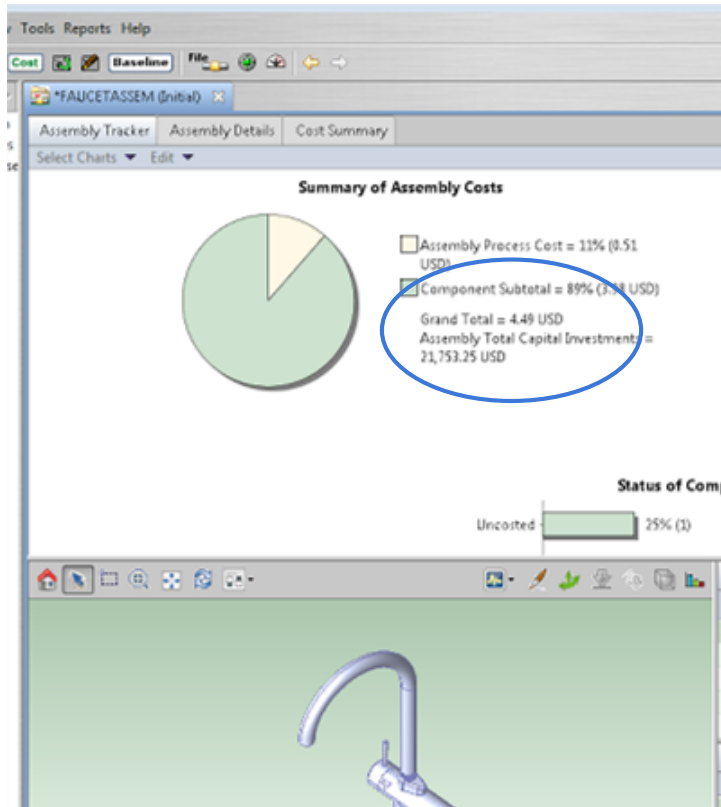


aPriori Production
Parameters:

187,500 units per year

10 year lifespan

aPriori



Components are primarily cast iron or sheet metal

aPriori USA: \$10.98

aPriori China: \$4.98

Pictures...



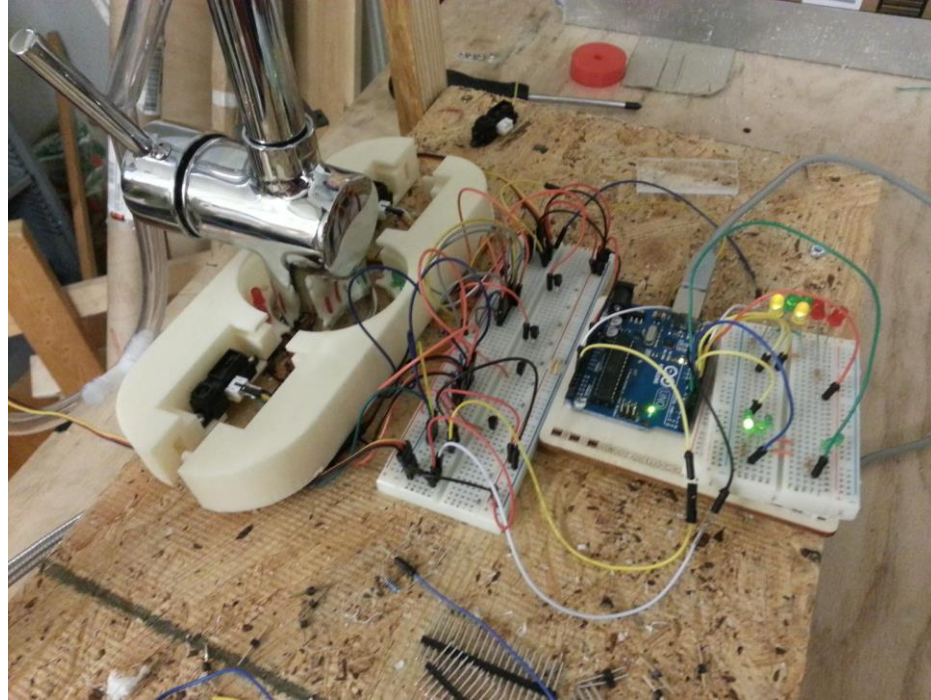
Pictures...



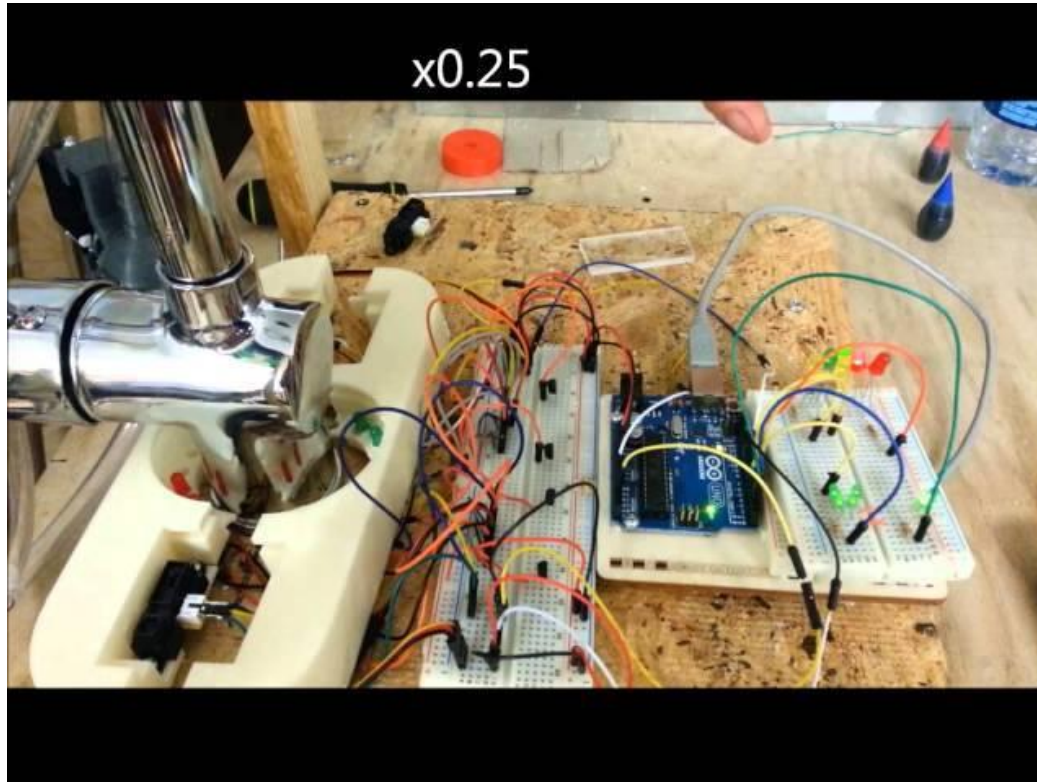
Pictures...



Pictures...



Video Demonstration



Valve

