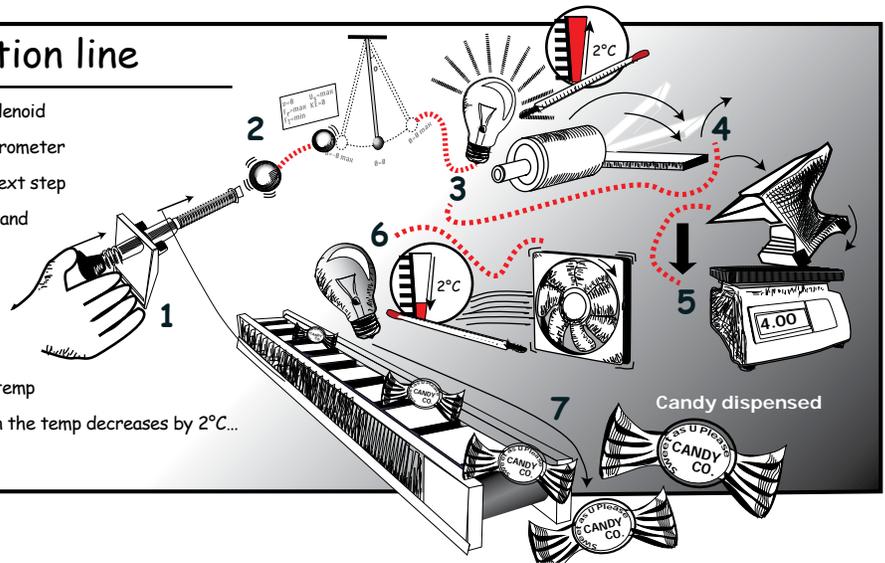


Precision Analog Rube Goldberg Candy Dispenser

Dispensing candy on a production line

1. Pull back pinball plunger to release pinball.
 2. Pinball causes solenoid to fire and knock off pendulum to start accelerometer
 3. Accelerometer turns on light bulb. Temp sensor reads temp of bulb. Moves onto next step when temp increases 2°C.
 4. Motor with arm spins with rubber band applying increasing torque in opposite direction. Current measured that is supplied to motor. Moves onto next step after current exceeds threshold.
 5. Weight falls onto weigh scale.
- After weight exceeds set threshold, the system will move onto the next step.
6. Light bulb is turned off, fans turn on, and temp sensor reads temp of bulb. The system moves onto next step when the temp decreases by 2°C...
 7. Conveyor belt turns on, and dispenses candy.



The concept of Rube Goldberg

This is a deliberately over-engineered contraption that performs a very simple task in a very complex fashion including a chain reaction — *Our very simple task:* Dispensing a piece of candy

TMP006: Integrated thermopile with analog front end

Temperature measurement of lightbulb

- IR spectrum sensitivity: 4 μm – 8 μm
- 6-bit ADC with I²C SMBus interface
- Integrated local temp. and voltage ref.
- Measurement range:
 - Local: -40 to 125 C (± 1 C)
 - IR object: -40 to 125 C (± 3 C)
- Ultra-small package: 1.6 mm x 1.6 mm
- Low power
 - Quiescent power : 240 μA
 - Shutdown power: 1 μA
 - Supply: 2.4 V to 5.5 V

Get more information at:
www.ti.com/product/tmp006

INA226: High-side measurement, current/power monitor

Monitors current through a motor that drives the arm connected to a rubber band in blue module

- High accuracy:
 - 10 μV offset (max)
 - 0.1% gain error (max)
 - 0.1 $\mu\text{V}/^\circ\text{C}$ offset drift (max)
- Wide dynamic range
 - Common-mode range: 0 V to 36 V
 - Supply range: 2.7 V to 5.5 V
- Application configurable
 - Reports current, voltage and power
 - Programmable sample averaging
 - Independent programmable Conversion times

Get more information at:
www.ti.com/product/ina226

ADS1118: Fully integrated 16-bit ADC

Signal conditioning for pendulum accelerometer measurement

- Complete set of integrated functions:
 - Four multiplexed analog inputs
 - Four digital I/O
 - PGA with multiple gain options
 - 8 to 860 SPS
- Internal temperature sensor (0.5°C max)
- Small QFN package (2.05 mm x 1.55 mm x 0.4 mm)
- Versatile supply range and low power consumption
 - Low supply current: 150 μA typ
 - Supply 2.0V – 5.5V

Get more information at:
www.ti.com/product/ads1118

PGA308: Programmable analog sensor signal conditioner

Weighscale signal conditioning

- Auto zero - drift: 0.2 $\mu\text{V}/^\circ\text{C}$; offset: 50 μV (max)
- Digital offset and gain adjustment
 - Offset adj: coarse (± 100 mV) & fine ($\pm \text{VREF}/2$)
 - Gain adj: PGIA (4 -1600), output (2-6), fine (0.33-1)
- One-wire programming interface
- Integrated system monitoring:
 - Fault detection
 - Programmable over & under limits

Get more information at:
www.ti.com/product/pga308

SN754410: Quadruple Half-H drivers

Drives the motors forwards and backwards

- 1 A output-current capability per driver
- Supports half and Full-H solenoid and motor drivers
- Designed for positive-supply applications

Get more information at:
www.ti.com/product/sn754410

MSP430 and TUSB3210 Microcontrollers

- Communicate with ADCs & DACs, controls motors, solenoids, LEDs and other features



Get more info at:
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