CPR For Dummies

Bathtub Drowning Prevention

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Introduction

- Bathtub drowning is the 2nd leading cause of death in toddlers.
- Many of these are due to water left in the tub unattended.
- Our project will minimize this risk by automatically draining the tub when not in use.

Project Goal

- Design and build small device to automatically drain bathtub when:
  - Not being used.
  - Water too hot.
  - Detects struggle.
- This will minimize the time window of an accidental drowning/burning.

Functional Description

- User will attach small box to the outside of the tub.
- A single 9V battery or 4 AA batteries will be used to power the system.
- Waterproof wiring will be ran to a draining unit in the drain of the bathtub if tub already installed. Otherwise wiring will be on inside.
- The draining unit will automatically drain the bathtub.

Design Description

- A PZM (Pressure Zone Microphone) will capture the sound coming from the bathtub through vibrations in the tub wall.
- The thermistor in the draining unit will capture the water temperature in the bathtub.
- The two signals will pass through some electrical circuitry to filter noise prior to going through a analog to digital converter (ADC).

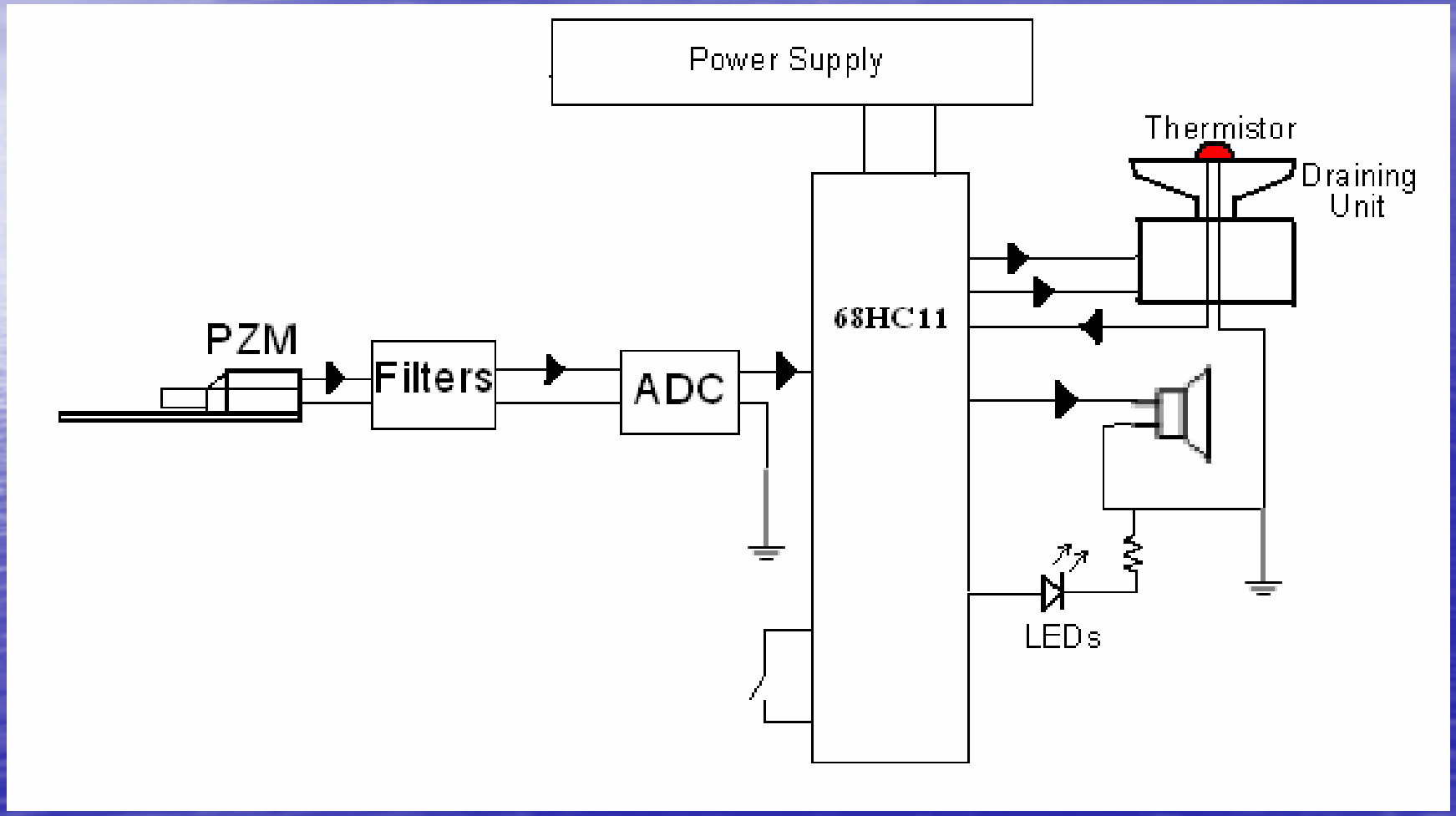
Design Description

- The signals will then be processed by a microcontroller.
- If microcontroller finds it hasn’t seen any bathtub waveforms for a given time period, or that the water is too hot, it will automatically drain tub.

Design Description

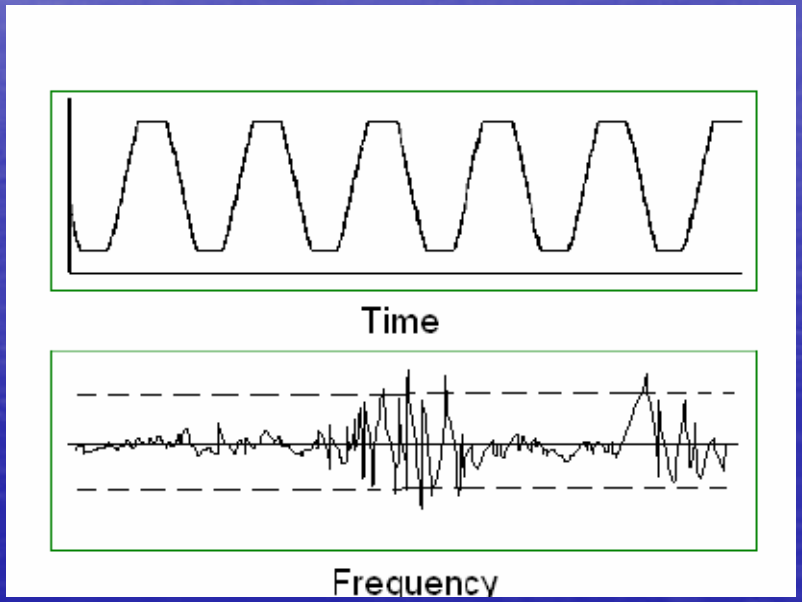
- Microcontroller will send a signal to a small speaker to sound a warning alarm.
- If no response after warning alarm, microcontroller will send a signal to the draining unit which will open the drain allowing tub to drain.
- After tub is drained the unit will power off allowing longer battery life.

Design Description – Block Diagram



Crown PZM-SG Pressure Zone Microphone

Sound Grabber II



Magnitude Detection

Crown PZM-SG Pressure Zone Microphone

- Frequency response (typical): 50 Hz to 16 kHz.
- Polar pattern: Hemispherical (half-omni) on a large surface.
- Impedance: 1600 ohms, unbalanced.
- Sensitivity: 20mV/Pa (-54 fBV/Pa).
- Power sensitivity: -42 dBm.
- Cable: 10 foot with mini phone plug, ¼” phone plug and micro phone plug adapters.
- Power: One 1.5v AAA alkaline battery.

TEGAM 8662 Thermistor Sensor Probe

- 5-ft long wire probe.
- Stranded 22AWG Teflon-insulated wire.
- Connected to a YSI series 400, 1/4” phone jack.
- Sheath: 304 SS.
- Range: -40ºC to +150ºC
- Time constant: 6 seconds
- Accuracy: +-0.2ºC from 0ºC to 70ºC

Bill Of Materials

Part	Price	Vendor	Availability
IC Chip (M68HC11E02)	$20.00	Motorola	Have 2 already
PZM Microphone	$70.00	Crown	Widely available
Filter Parts	$10.00	U of U	Widely available
ADC	Free	U of U	Limited
Draining Module (Servos)	?	Radio Shack	Widely available
Thermistor	$45.00	Tegam	Widely available
Speaker	Free		Widely available

Milestones

- PZM Microphone
  - Analyze analog signal (wave form patterns)
  - Build electrical circuitry
  - Mounting device
- Thermistor
  - Power supply
  - Analyze analog signal
  - Mounting device (waterproof)

Milestones

- Draining Unit
  - Build (servos)
  - Power supply
  - Mounting device (waterproof)
- Microcontroller
  - Power supply
  - Mounting device
  - Interface PZM microphone (ADC)
  - Interface thermistor (ADC)
  - Interface speaker
  - Interface draining unit

Schedule

Finish Date	Task	Responsible Person
April 26, 2006	Finalize Design	Both
June 4, 2006	Receive Parts	Justin
July 24, 2006	Determine Waveforms	Justin
September 1, 2006	Interface Micro-phone	James
September 21, 2006	Interface Thermistor	James

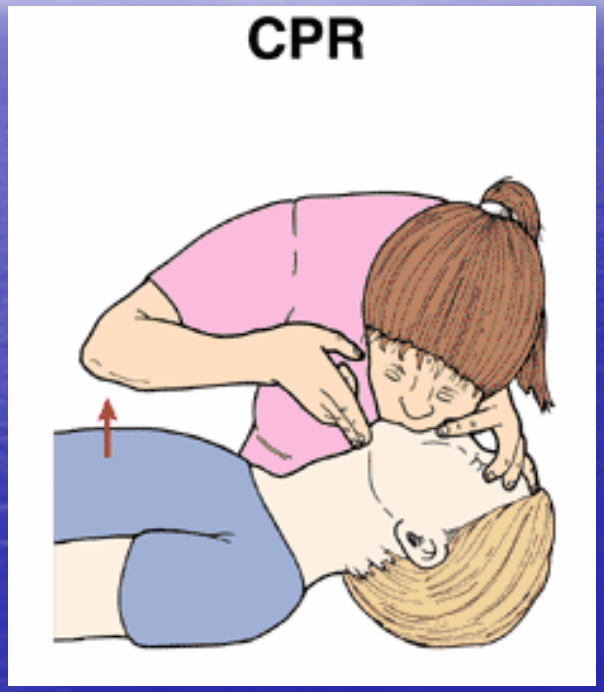
Schedule

Finish Date	Task	Responsible Person
October 1, 2006	Interface Speaker	Justin
November 15, 2006	Draining Unit	James
November 25	Debugging/Testing	Justin
December 5, 2006	Catch-up/Add-ons	Both

Project Extras

- Struggle detection
- Wired Phone Module
- Wireless Phone Module
- Relay Call (For Calling Used Line)

Conclusion



Looks Can Be Deceiving

Don’t let this happen to you.

Questions?

www.cs.utah.edu/~jyoung/CPRforDummies.html