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 an 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 microphone 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

<table>
<thead>
<tr>
<th>Part</th>
<th>Price</th>
<th>Vendor</th>
<th>Availability</th>
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</thead>
<tbody>
<tr>
<td>IC Chip (M68HC11E02)</td>
<td>$20.00</td>
<td>Motorola</td>
<td>Have 2 already</td>
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<tr>
<td>PZM Microphone</td>
<td>$70.00</td>
<td>Crown</td>
<td>Widely available</td>
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<td>Filter Parts</td>
<td>$10.00</td>
<td>U of U</td>
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<td>ADC</td>
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<td>Limited</td>
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<tr>
<td>Draining Module (Servos)</td>
<td>?</td>
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<tr>
<td>Thermistor</td>
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<td>Tegam</td>
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<tr>
<td>Speaker</td>
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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

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<th>Finish Date</th>
<th>Task</th>
<th>Responsible Person</th>
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<tr>
<td>April 26, 2006</td>
<td>Finalize Design</td>
<td>Both</td>
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<tr>
<td>June 4, 2006</td>
<td>Receive Parts</td>
<td>Justin</td>
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<tr>
<td>July 24, 2006</td>
<td>Determine Waveforms</td>
<td>Justin</td>
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<tr>
<td>September 1, 2006</td>
<td>Interface Microphone</td>
<td>James</td>
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<td>September 21, 2006</td>
<td>Interface Thermistor</td>
<td>James</td>
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## Schedule

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<td>October 1, 2006</td>
<td>Interface Speaker</td>
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<tr>
<td>November 15, 2006</td>
<td>Draining Unit</td>
<td>James</td>
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<td>November 25</td>
<td>Debugging/Testing</td>
<td>Justin</td>
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<tr>
<td>December 5, 2006</td>
<td>Catch-up/Add-ons</td>
<td>Both</td>
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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