The Smart Thermometer
Mock Design Review

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1. Block Diagram

2. Block Description

Sensors -

a. Water Temperature Sensor: DHT22 water humidity and temperature sensor is going to be used to measure water and environment temperature. Sensor will send digital signal to MSP430 via I2C protocol. It’s operational voltage is 1.8 to 3.6V which is compatible with our microcontroller. The limitation we have is it can measure only in range of 0°-50° celsius. This is not so problematic as we found out that tap water can only go as high as 48 degree. More importantly, the human body cannot tolerate more than 60 degrees celsius for extended periods of time, which works out well for us as this means this thermometer is in the optimum range.
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4. Calculation

Table represents accuracy calculations for our sensor.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>min</th>
<th>typ</th>
<th>max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution n</td>
<td></td>
<td>0.1</td>
<td>16</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
<td>± 0.5</td>
<td>± 1</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>-40</td>
<td></td>
<td>80</td>
<td>°C</td>
</tr>
<tr>
<td>Repeat</td>
<td></td>
<td>± 0.2</td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Exchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td>1/e(63%)</td>
<td>&lt;10</td>
<td></td>
<td></td>
<td>s</td>
</tr>
<tr>
<td>Drift</td>
<td></td>
<td>± 0.3</td>
<td></td>
<td></td>
<td>°C/yr</td>
</tr>
</tbody>
</table>
5. Requirements and Verification

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Verification</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHT 22 Humidity/Temperature Sensor</td>
<td>1. Using DHT22 libraries, obtain temperature data.</td>
<td>25</td>
</tr>
<tr>
<td>1) Functions for 3.0 V Vin 5.5 V</td>
<td>2. Measure current input and ensure that it is less than 2.5mA.</td>
<td></td>
</tr>
<tr>
<td>2) Analog Output Range 0-3.3 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Imax 5mA for Vin =3.3V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) 0.5 Hz sampling rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Detect correct humidity 2-5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Detect correct temperature +0.5C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) Pmax &lt;= 15mW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Safety

Lab safety instructions.

1. We will have to always work with partner in lab. (In case one of us will need help.)
2. We need to keep in mind that voltage and current should not exceed safe limit.
3. After finishing work we need to check if all the components are discharged.

7. Citation


c. Wolchover, By Natalie. "What Are the Limits of Human Survival?"