

Building a Raspberry Pi-Based Guitar Environmental Monitor

Grant Alphenaar

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Roadmap

Introduction & Overview

A Bit More Detail...

Timeline

Use Case Description, Activity Diagram, and Requirements

Mockups

Introduction & Overview

Project Overview

Goal: build a system that can...

- ▶ ... be run off a Raspberry Pi.
- ▶ ... monitor temp and humidity for guitars.
- ▶ ... allow user monitoring and (some) control.



source: <https://www.espressoandcream.com/2011/07/wedding-pie-1-cran-raspberry-pie.html> – bonus:

this website also appears to have a pretty good recipe for *actual* raspberry pie

Introduction & Overview

What?



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A Bit More Detail...

Why?

- ▶ Guitars are (mostly) made out of wood, and...
- ▶ ... wood is sensitive to temperature and humidity...
- ▶ ... especially swings to either extreme...
- ▶ ... which Michigan has a lot of.

A Bit More Detail...

Components

Sensor Unit:



Battery Board:



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Timeline

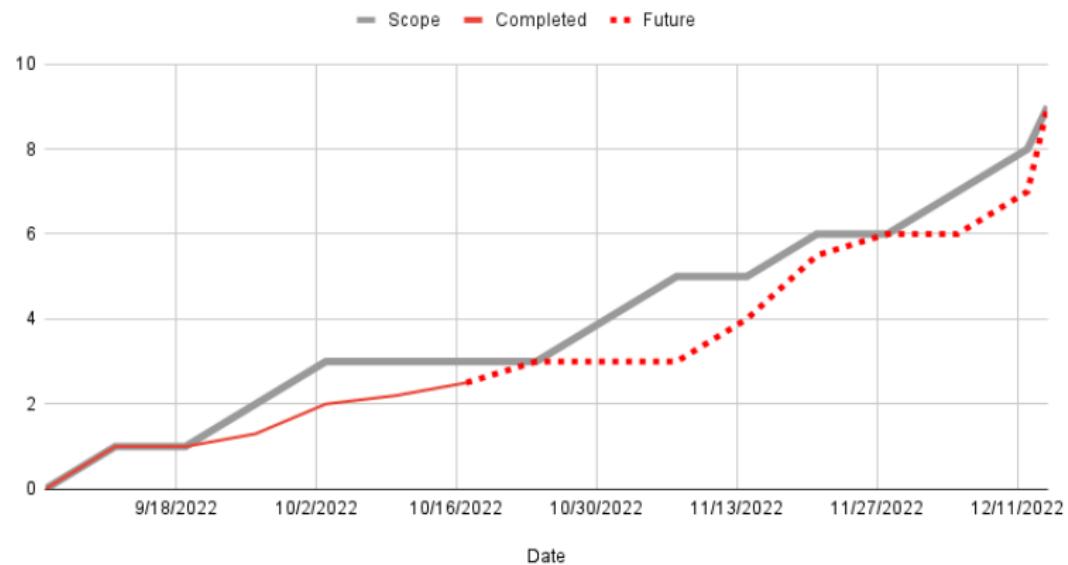


source: <https://fr.audiofanzine.com/delay-guitare/strymon/timeline/>

Timeline

Burn-Up

Burn-Up Timeline



Timeline

Key Points

- ▶ Early October – End of October: sensor prototyping and finalize code for sensor ($\approx 1 – 2$ more weeks)
- ▶ Early November: Build backend and analysis capabilities ($\approx 1 – 2$ weeks)
- ▶ Late November: Build frontend – user interface ($\approx 2 – 3$ weeks)
- ▶ Early December: Bring everything together + final touches (≈ 1 week)

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Use Case Description, Activity Diagram, and Requirements

Use Case Description

Use Case Name: Monitor Environment

Importance Level: Critical

Primary Actor: Sensor

Use Case Type: Essential Overview

Brief Description: This use case describes the process of a Sensor taking environmental readings, logging them, and sending them to the Base Unit to be included in the web dashboard.

Use Case Description, Activity Diagram, and Requirements

Use Case Description

Trigger:

- ▶ Event: Base Unit triggers Sensor
- ▶ Type: Internal

Relationships:

- ▶ Actors:
 - ▶ Base Unit
 - ▶ Sensor
- ▶ Include:
 - ▶ *Monitor Environment* includes *Monitor Temperature* and *Monitor Humidity*

Use Case Description, Activity Diagram, and Requirements

Use Case Description

Normal Flow of Events

1. Sensor is triggered
2. Sensor takes environmental reading
3. Sensor sends data to Base Station
4. Base Station analyzes data and adds to database
5. Web server reads from database and updates dashboard
6. If...
 - ▶ ... reading is above safe range: alert user
 - ▶ ... reading is below safe range: alert user
 - ▶ ... continue on
7. (Loop begins again)

Use Case Description, Activity Diagram, and Requirements

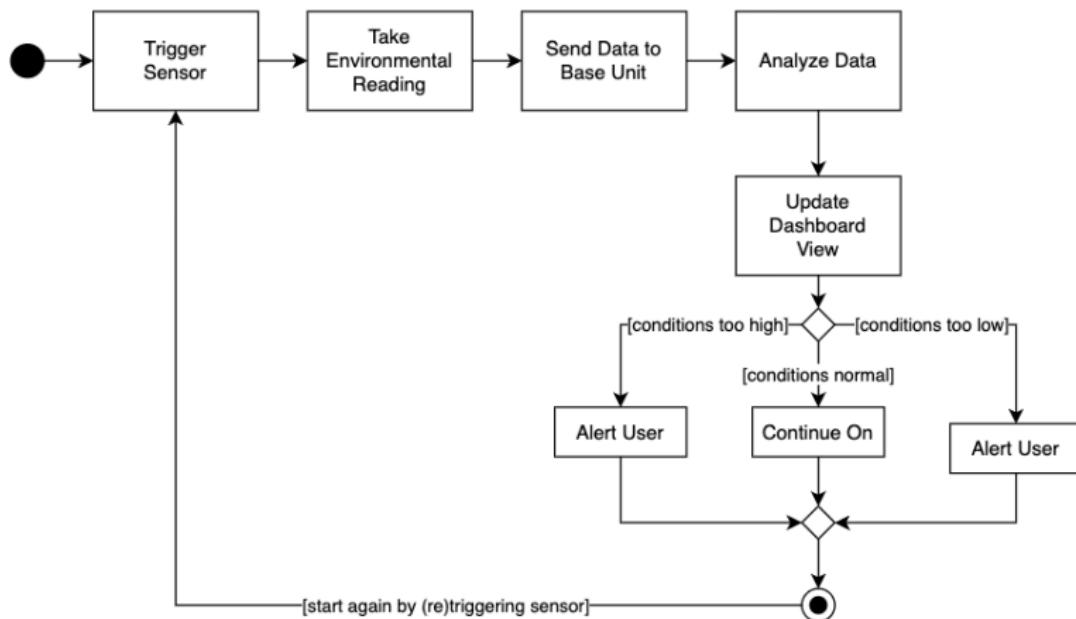
Use Case Description

Alternate and/or Exceptional Flows

1. Server crashes: user gets default browser error message
2. Other server faults: user gets message with resolution suggestions
3. Sensor is offline: user gets alert if sensor cannot be triggered three times in a row

Use Case Description, Activity Diagram, and Requirements

Activity Diagram



Use Case Description, Activity Diagram, and Requirements

Requirements – Abbreviated

Sensor:

- ▶ Sensor(s) shall be capable of taking and recording temperature and humidity readings.
- ▶ Sensor(s) shall transmit readings back to the base unit in a usable data form.

Base Unit:

- ▶ The base unit shall host the server for the web interface.
- ▶ The base unit shall possess data analysis capabilities.

Web Interface:

- ▶ Users shall be able to set upper and lower bounds for acceptable temperatures and humidity ranges.
- ▶ The web interface shall send a notification if either temperature or humidity drift out of the established acceptable range.

Roadmap

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A Bit More Detail...

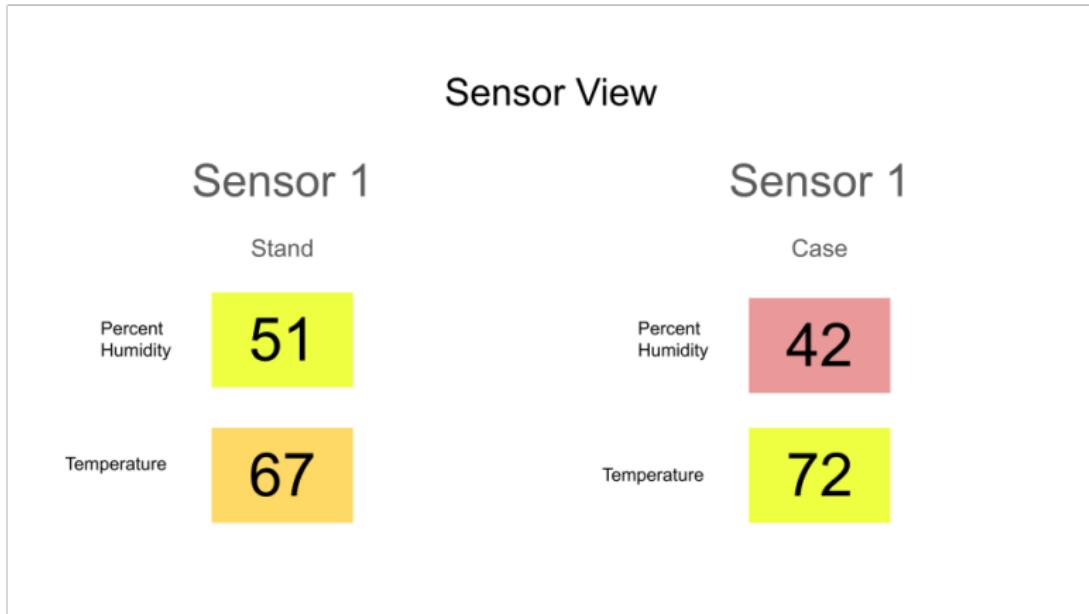
Timeline

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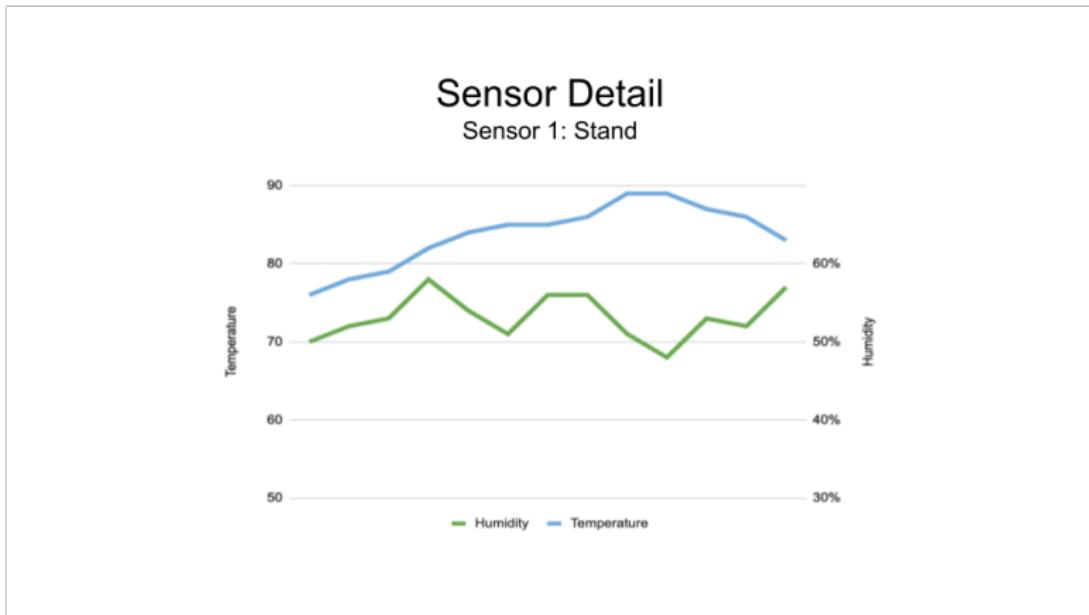
Mockups

Sensor Overview Page



Mockups

Sensor Detail Page



Mockups

Sensor Management Page

Sensor Management			
Sensor 1: Stand			
Humidity		Temperature	
Lower Limit	<div style="border: 1px solid black; padding: 5px; text-align: center;">45</div> 	Lower Limit	<div style="border: 1px solid black; padding: 5px; text-align: center;">65</div> 
Upper Limit	<div style="border: 1px solid black; padding: 5px; text-align: center;">55</div> 	Upper Limit	<div style="border: 1px solid black; padding: 5px; text-align: center;">78</div> 