Final Project

Matt Hartnett
ECEN 5813

Agenda

- Project Overview
- Scope Changes
- Implementation Details
- Learning
- Demo
- Questions

Project Overview

- **Project Objective:** Design a motion-based alarm clock.
- **Hardware:**
  - STM32 Nucleo-64 development board
  - Digital Passive Infrared (PIR) motion detector
  - Piezoelectric buzzer
- **Functionality**:
  - User set time and alarm
  - Alarm activates every 14 hours
  - Emits a repetitive alarm tone upon activation
  - Alarm deactivates when motion is detected by the PIR sensor

Scope Changes

Added:

- Processor sleep mode
  - Most of the time, the processor is just keeping track of the time
- POST and debug mode

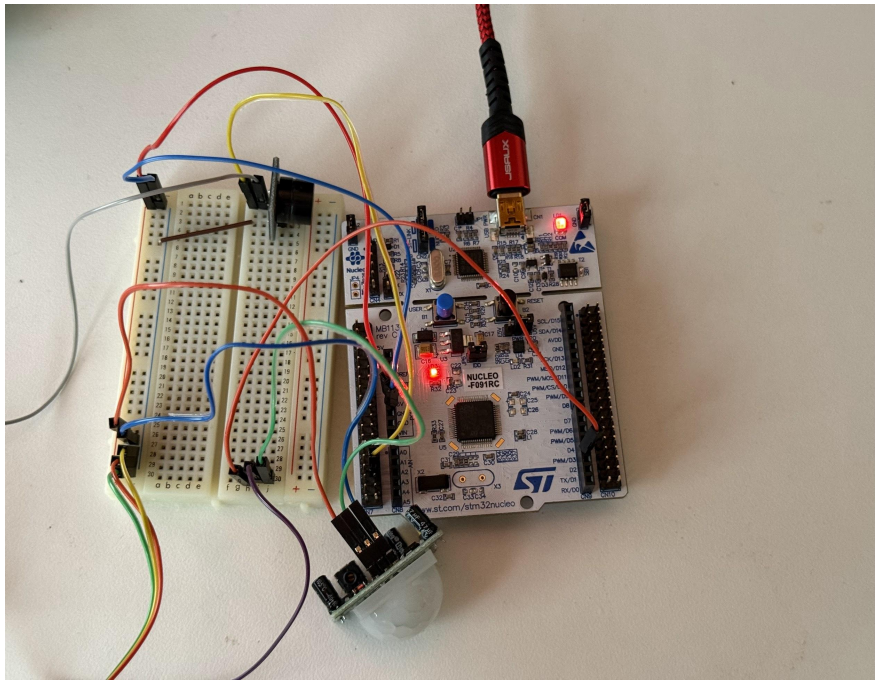
Removed:

- Volume changing as alarm goes on
  - Decided against it due to computational concerns
  - Feature was not critical

Implementation Details

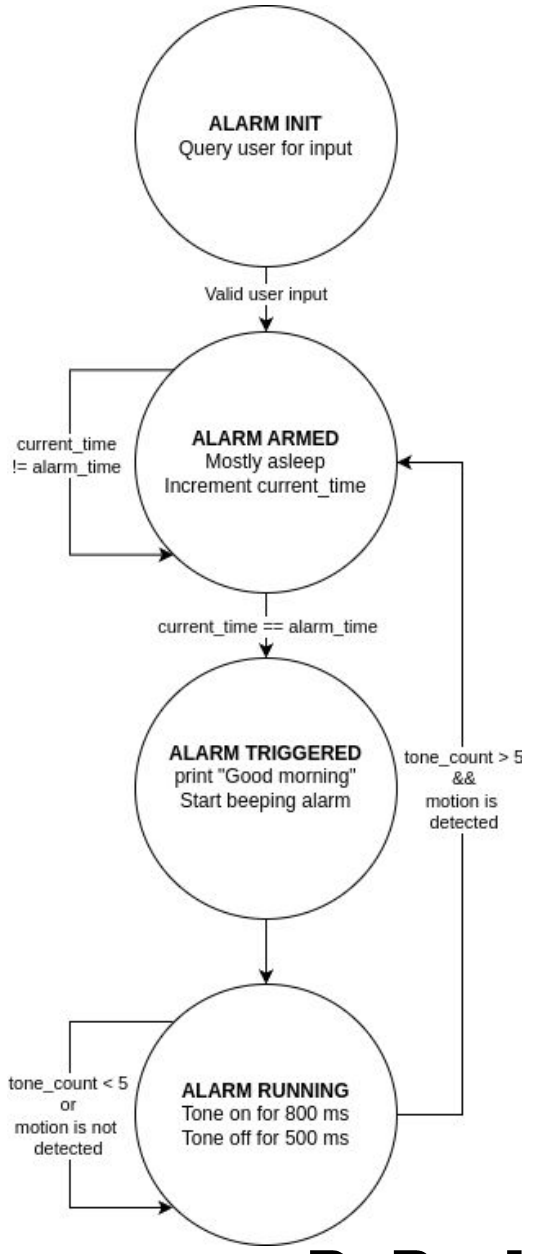
Project is fully operational, every feature is implemented except one

Hardware configuration:



Software Details

- All based around a FSM that controls operation
- Zeroth step is peripheral initialization and tone computation
- First step is asking the user for info
- Once configured, the processor sleeps and checks the time
- If the time is right, the alarm starts
- After 5 tones, motion turns off the alarm
- FSM resets back to armed state
- DMA handles transfer to DAC



Learning

- System integration: even if you have all the pieces, it's hard to get them all together…
- Sleep modes
  - Debugging can be particularly difficult
- Incremental testing is very valuable
- Hardware can be uncooperative
  - Piezoelectric buzzer introduced some nasty distortion to the alarm tone
  - Motion sensor is most likely too sensitive for this application

Demo

Questions

Thank you!