Projects Portfolio

Quoc Dung Tran

PICARD (Patient Initiated Controlled Analgesic Recording Dispenser)
(September 2017- July 2018)

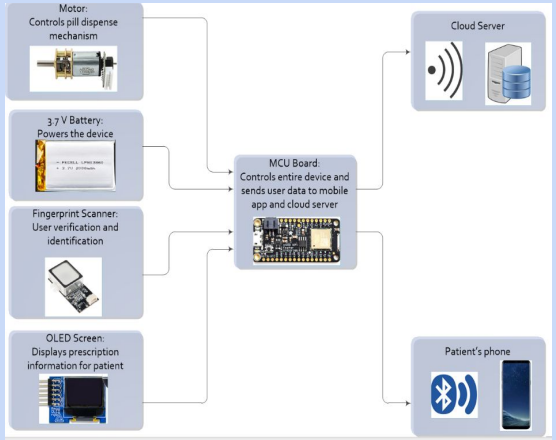


***Figure 1**: Electrical components Schematic.*

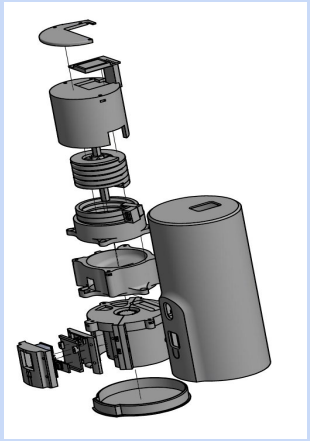


***Figure 2**: mechanical components and enclosure*

***Figure 3**: The assembled smart opioid pill bottle.*

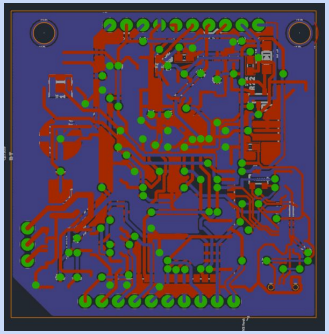


***Figure 4**: Current PCB schematic design.*

Overview:

Development process:

- The electrical team choose the electrical components and drew the schematic (figure 1).
- Base on the size and quantity of components, the mechanical team designed the physical components and dispensing mechanism (figure 2).
- After having working model (figure 3), we send to medical team to have practical survey with doctor and patience.
- Next iteration is complete the PCB design.

How PICARD works:

- The bottle records user's fingerprints and keeps track time. The bottle only dispense to the right person, right amount and right time. After dispensing or falsely attempting, the bottle logs data and send to server for pharmacist and doctors

PICARD (Patient Initiated Controlled Analgesic Recording Dispenser)

What I did in this project:

- I wrote the following drivers:
  - Fingerprint scanner by using UART protocol and C++ language.
  - SD1331-OLED screen using SPI and C++ language.
  - Digital potentiometer using 3-Wires SPI and C++ language
- I figured out the motor controller and feedback from motor encoder to make the bottle dispense the correct amount.
- I wrote the operation system program. The operating system continuously loops and waits for the interrupt signal from the buttons, the fingerprint scanner, or the cloud server.
- I collaborated with an electrical engineer to design two-cells power system and power monitoring system. To monitor the power, I used analog 2 analog pins to read voltage drop from the battery.
- Later in development process, I also designed the PCB using the Eagle CAD tool to reduce the size of the bottle.

Problem:

During the project, I solved some of the issues:

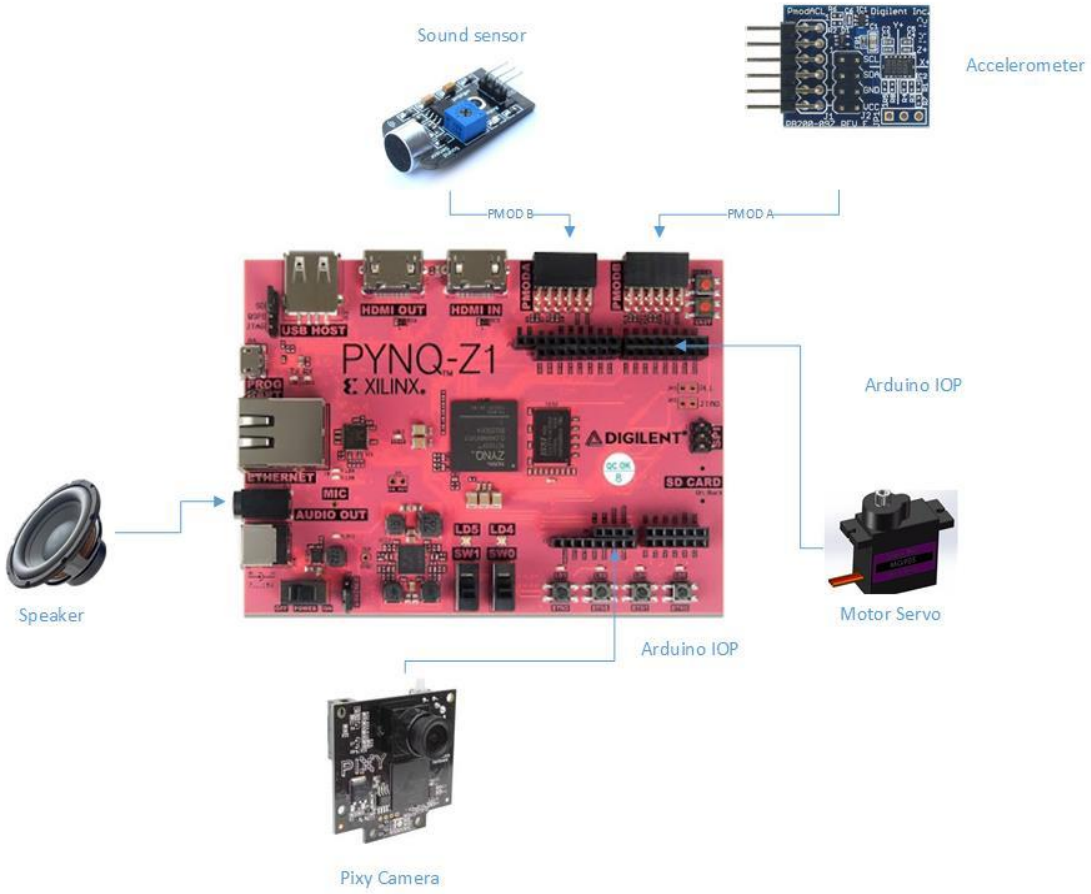
- Dispense mechanism and feedback mechanism.
- Power management: power consumption and charging time.
- Limited pins.
- Driver for 3 wires SPI.

Existing problem:

- Size.
- Dispensing for different type of pills.

AutoCrip

May 2017-June 2017



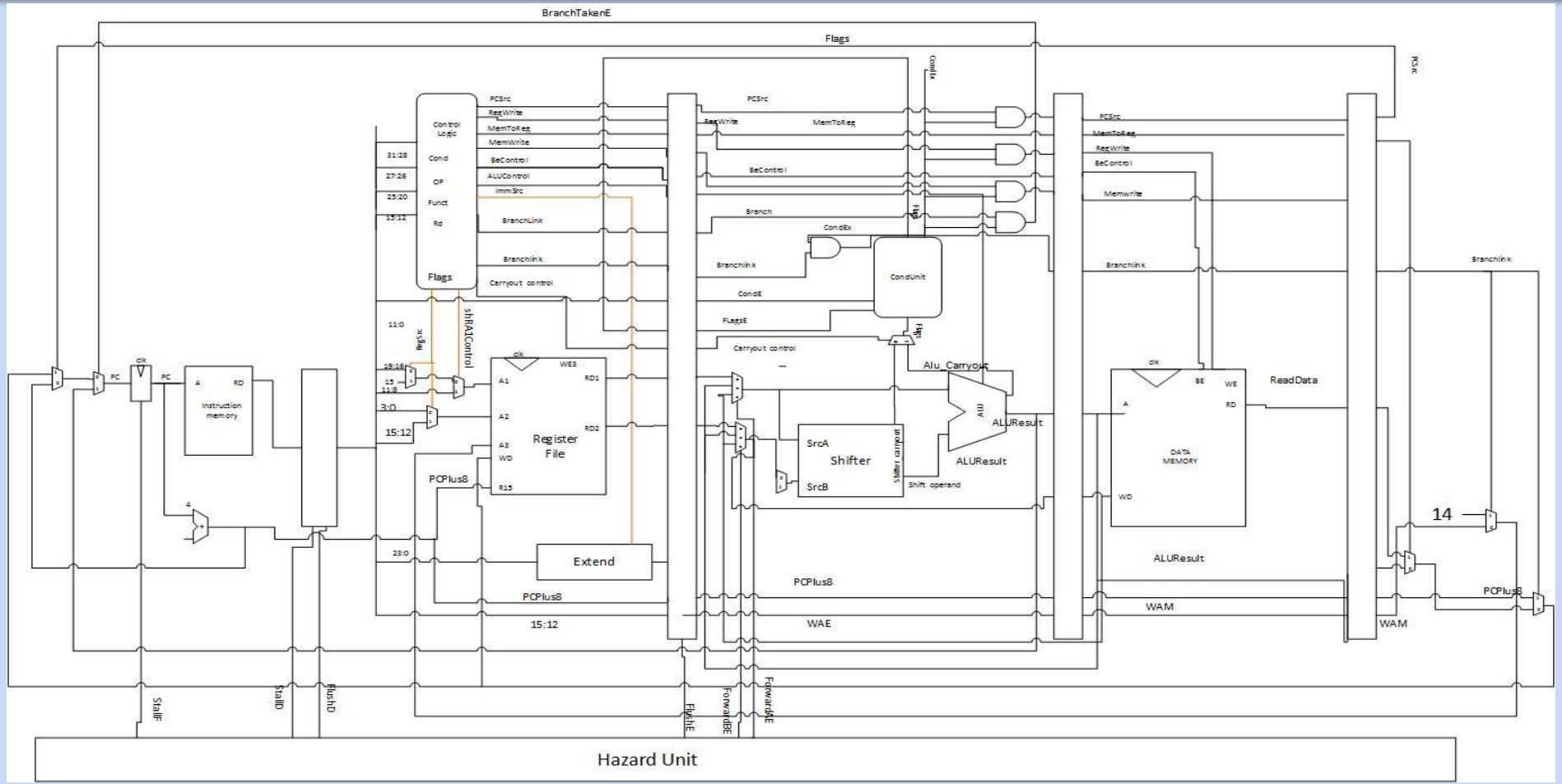
Overview:

- This project tried to create a autonomous baby-crib.
- The system will gather data from the sound sensor and accelerometer to detect baby movements and determine if the baby is awake or not. If yes, the controller will turn on the motor, play music, and steam video to parents.

What I did in this project:

- I wrote driver for accelerometer using C++.
- I wrote the Python control code. The controller will periodically read data from accelerometer and sound sensor. Then, the controller compares data to the threshold value to decide if the baby is awake. If the baby is awake, the controller will turn on the speaker, motor, and camera.

32-bits pipeline ARM processor
(January-Mar 2017)



32-bits pipeline ARM processor

Overview:

- I implement 32-bits pipeline ARM processor which can do basic instructions:
  - Arithmetic instructions: ADD, SUB, LSR, LSL, ASH, ROR, MVN, AND CMP.
  - Memory instructions: LDR, STR, LDRB, STRB, B, and BL.

What I did in this project:

- Arithmetic instructions, and hazard units