DR HOUSE AT HOME: PORTABLE EKG SYSTEM
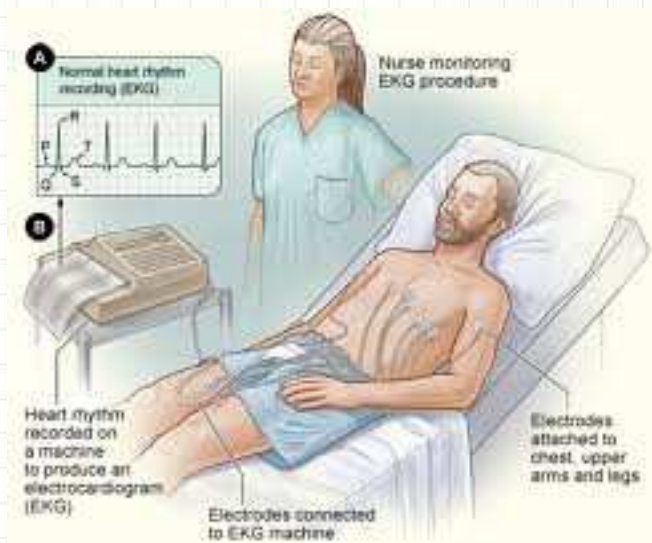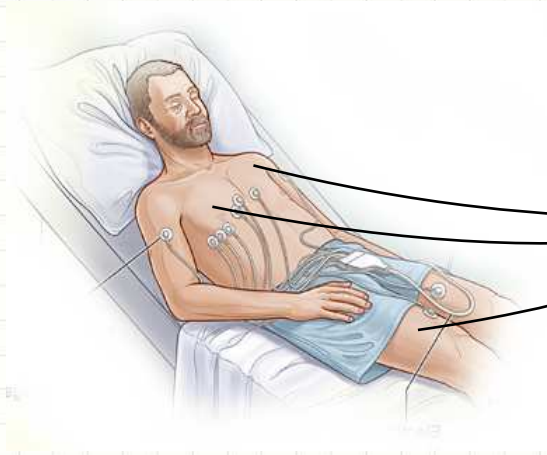
Lyne Tchapmi

Szu-Po Wang
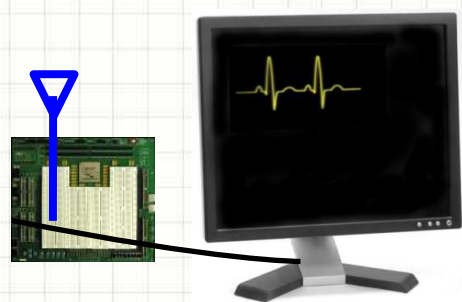
Wenting Zheng

MOTIVATION

- Heavy machinery
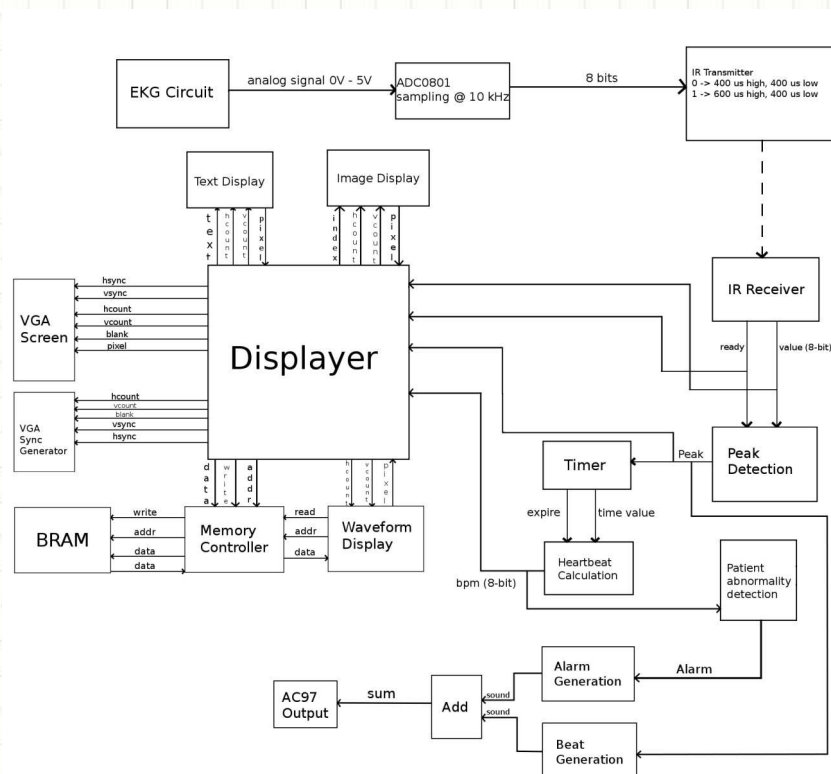- Limited mobility
- Tedious setup
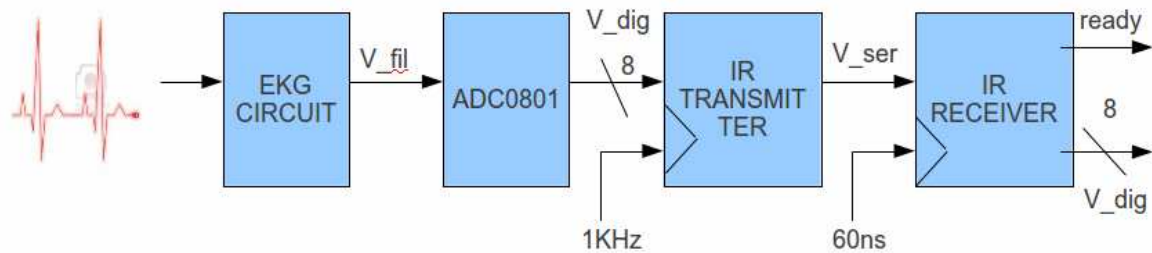
MOTIVATION

MOTIVATION

OVERVIEW

- Portable EKG device
- Infrared Transmission
- Remote processing of EKG data
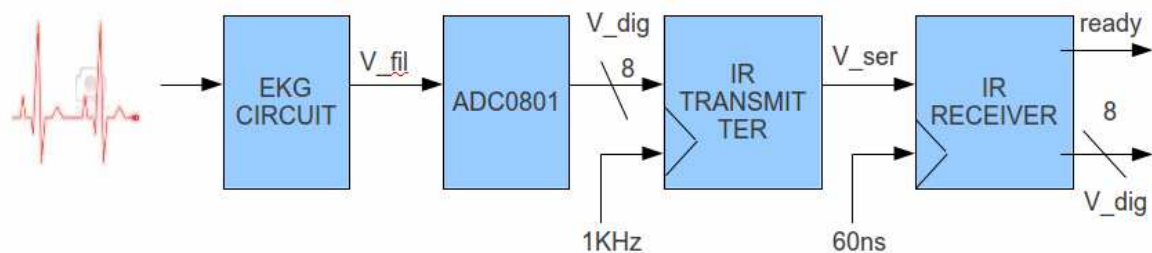- Heart rate monitoring
- Waveform display

OVERVIEW

DATA ACQUISITION

- Filtering?
- 0-5V range $\longrightarrow$ 0-255 (8-bit)
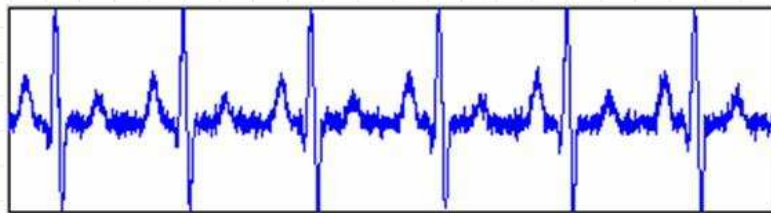- Patient ID+ CRC +Serial transmission
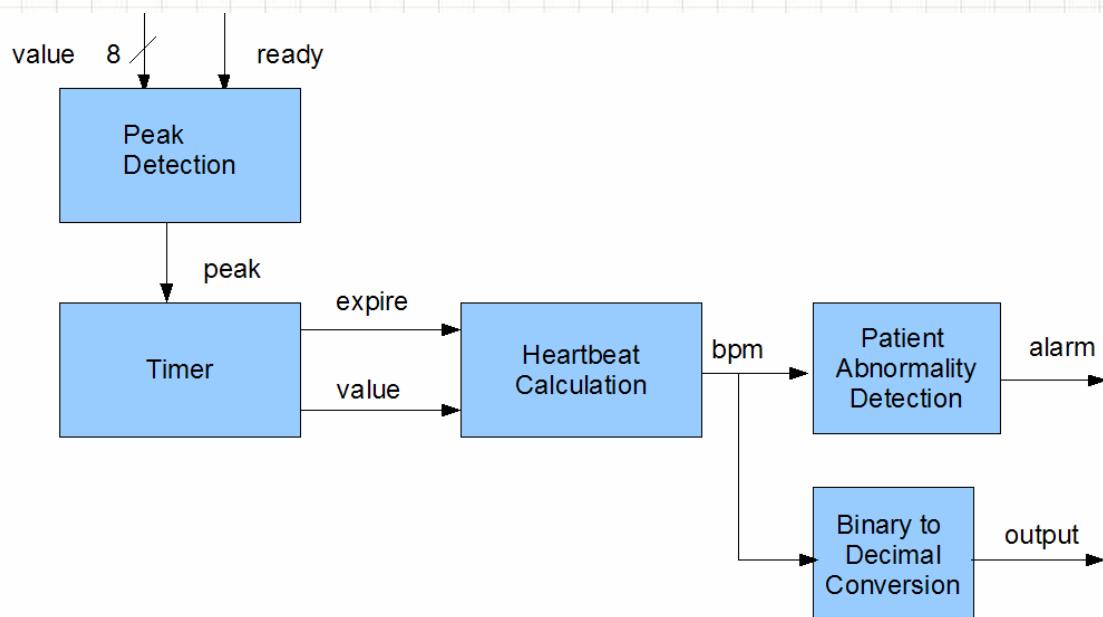

DATA ACQUISITION

- Transmission limited by IR channel rate 1kbps
- Start – 1 as 600/400us – 0 as 400/400us
- Down sampling 60ns at receiver
- Serial to parallel conversion

SIGNAL PROCESSING

- Responsible for processing data
- Perform mathematical calculations
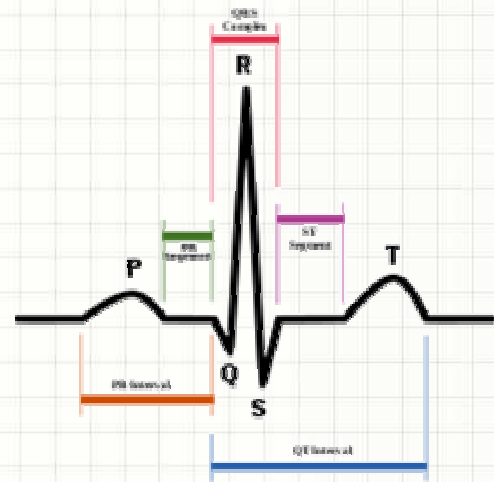- Provide the display block with the necessary outputs

SIGNAL PROCESSING

SIGNAL PROCESSING

- Peak detection will compare stored data points

- Threshold value – avoid local peaks
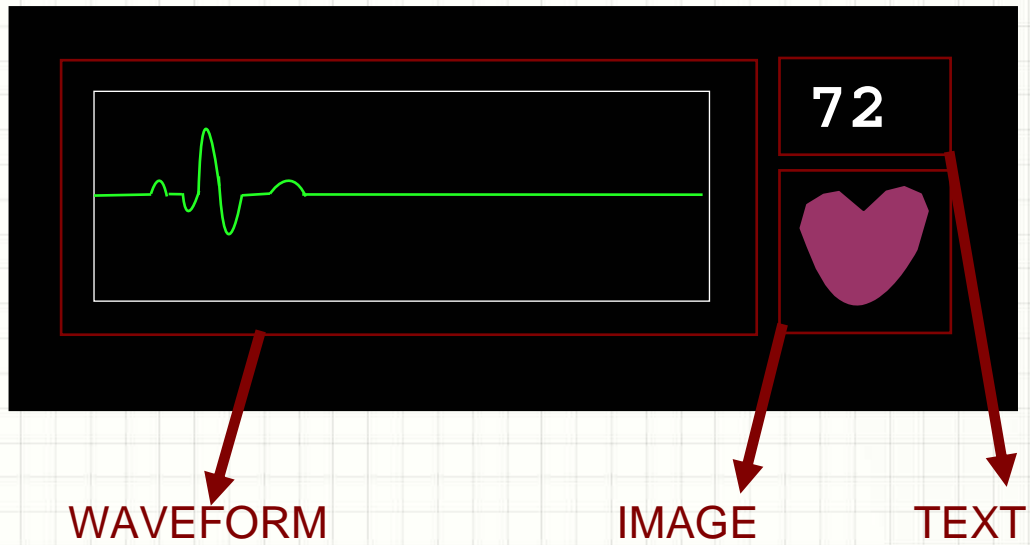
- Extension: detect P, R, and T peaks
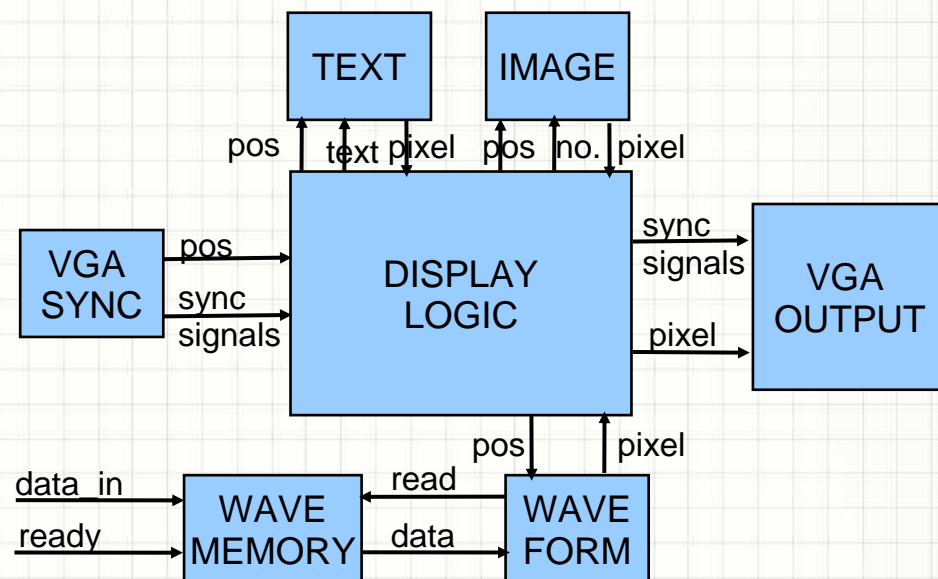

SIGNAL PROCESSING

- Timer block uses counter and divider

- Heartbeat calculation keeps past four samples

- Coregen divider

- Binary to decimal conversion

DISPLAY - Overview

WAVEFORM IMAGE TEXT

DISPLAY – Block Diagram

DISPLAY LOGIC

- If current **position** belongs to …
  - Text region: choose TEXT module's output
    - Pixels of characters stored in **ROM**
  - Image region: IMAGE module
    - Images of heart stored in **ROM**
  - Waveform region: WAVEFORM module
    - Waveform data retrieved from **WAVEFORM MEMORY**

WAVEFORM MEMORY

- Single-port BRAM
- reading from WAVEFORM has priority
- write operations are stored in queue
  - Wait until the BRAM is not being read

SOUND GENERATION
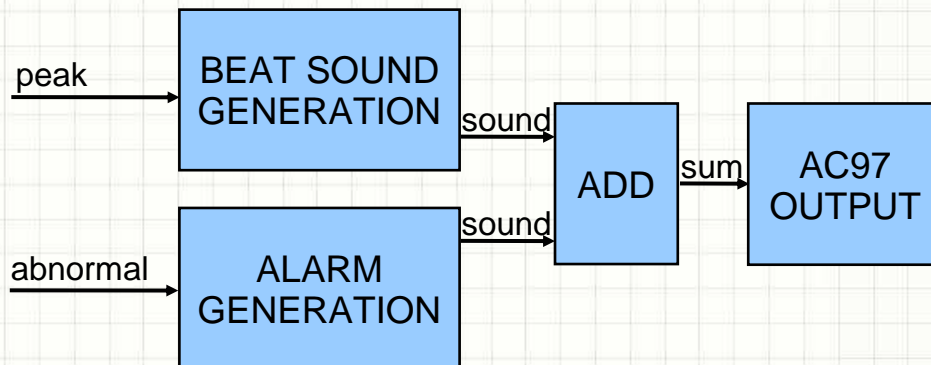
- Output heartbeat sound in each period
- Output alarm if detected abnormality

TIMELINE

- 11/16 - 11/22
  - Lyne: Draft for data acquisition modules
  - Wenting: Peak detection and timer
  - Szu-Po: Waveform and text display
- 11/23 - 11/29
  - Lyne: Test data acquisition and transmission
  - Wenting: Heartbeat calculation and abnormality
  - Szu-Po: Image display and sound generation
- 11/30 – 12/05: Integration and Testing

QUESTIONS?