Lyne Tchapmi – **Data acquisition and transmission**

IR Transmitter module
Input: v_dig: 8-bit value from ADC
Output: v_ser: Serial output representing the 8-bit value
This module will filter the input, encode each byte and send it through the IR channel

IR Receiver module
Input: v_ser: Serial input from IR transmitter
Outputs: - v_out: 8-bit value representing a voltage level
- ready: 1 bit ready value

This module receives the serial input from the IR transmitter, checks for transmission errors, reconstructs the original 8-bit input signal and outputs it. The ready output is asserted whenever each 8-bit value is ready.

Wenting Zheng – **Signal Processing System**

Peak Detection:
Input: 8-bit sample value, ready, clk
Output: peak
Stores eight 8-bit samples in a circular buffer. Every time a ready signal is asserted from the input, update the buffer. Compare the successive samples to find peak.

Timing Block

Timer:
Input: peak, 10_hz, clk
Output: expire, 8-bit time
Each time peak is asserted, the timer module outputs the old 8-bit time value. It resets its internal counter value to zero every time peak is asserted. It resets the divider module so that the divider synchronizes with the timer, then increases its internal counter by 1 every time the divider outputs high on 10_hz.

Divider:
Input: reset, clk
Output: 10_hz
The divider module simply outputs high every 0.1 second. Once reset is asserted it ignores the previous time count sum and restarts the 0.1 second count.

Calculation block

This is a series of modules that compute beats per minute data.

HB_Calc:
Input: 8-bit time, expire
Output: 10-bit bpm
This module will take in the 8-bit time and value (multiples of 0.1 second) and keeps the four most recent values. It then calculates the frequency by averaging and taking the inverse of the sum of the 4 values. It then multiplies the entire value by 60 to get the bpm value.

Patient Abnormality Detection:
Input: 10-bit bpm
Output: alarm
If the patient's bpm data is above the high threshold or below the low threshold, assert alarm.

Binary-to-Decimal Conversion:
Input: 10-bit bpm
Output: four 4-bit decimal digits
Since the display module needs to display decimal numbers, this module will take the 10-bit bpm expressed in binary and convert it into decimal numbers. The output will have one decimal place because the original time period was expressed in multiples of 0.1 second.

Szu-Po Wang – **Sound and display**

Display:

Display Logic Module
- Integrate different display modules and generate VGA output.

Waveform Display Module
- Input current pixel position and waveform stored in memory, output RGB value of the pixel.

Waveform Memory Module
- Input writing enable, address, and input data; output the result of reading.
- Queue writing operations to prevent collision.

Text Display Module
- Input position and text, output RGB value.
- Image of character stored in ROM.
- Scale to generate characters of different size.

Image Display Module
- Input position and image serial number, output RGB value.
- Store multiple beating heart images in ROM.

User Interface Control
- Horizontal/Vertical scaling.
- Running/Periodically refreshed/Freeze waveform.

Waveform replay.

Multiple Patients (If time permits)

Display data for multiple patients simultaneously.

Sound Generation:

Alarm Generation Module

Input abnormality, output alarm signal when the input is high.

Beating Generation Module

Input peak of the heartbeats, output beating sound signal for each beat.

Add the sounds together and send to headphone