project proposal

customer problem

group

Regular monitoring is essential for the health of the elderly because they are more prone to heart diseases. It's probable that many older people don't have the means or awareness to regularly monitor their heart rates. Arrhythmias and other cardiovascular conditions are serious problems for elderly persons, according to [12]. The ability to detect irregular heartbeats early and administer treatment right away thanks to continuous monitoring has the potential to save lives. This is mostly brought on by a dearth of user-friendly technology, issues with cost, and a general ignorance of the importance of periodic monitoring.

Therefore, developing an easy-to-use heart rate monitor tailored for the elderly can address this gap and provide a much-needed solution. Our client will be aimed towards the elderly over the age of 65 in the Waterloo region, which is around 89,705 people[13]. It is important to note that approximately 80% of heart disease deaths occurs in people who are age 65 or older. [14]

problem the group has

1. As study showned by WHO[1, Para 2], cardiovascular diseases has became a serious problem and has caused 32% of all global deaths
2. Athletes and seniors needs to keep track their cardiovascolar efficiency to measure their health condition[2, Para 8]
3. People with heart problems need to keep track of their heart rate to detect irregular heartbeats[3, Para 4]

Initial requirement

Functional Requirements:

- Use the pulse sensor to measure the infrared light (~<780nm) emitted by human body from heartbeat [6]
- A single-color 128*160 display for displaying information [10]
- Sound alarm with buzzer since people are more sensitive to sound stimulus [8]
- abnormal heartrate indicator with red LED since people are more sensitive to red light than lights of other color[11]

Technical Requirements:

- Power outlet connected because the board cannot operate without electricity [15]
- GUI with 128*160 single-color bitmap display [16]
- buzzer that generate sound louder than 70dB but less than 85dB [17]
- red led indicator [18]

Safety Requirements:

- The maxium voltage this project will carry is no more than 5V [9]
- The alarm must generate a sound of at least 70dB but not exceed 85dB. [17]

Principles

- photoplethysmography (PPG) principle:

photoplethysmography (PPG) is a non-invasive optical technology used to detect changes in blood volume in micro vessels on the surface of tissues. It measures changes in the absorption or reflection of light as blood pulses in capillaries, thereby determining heart rate[4].

- hysteresis

hysteresis is used to prevent frequent triggering of the heart rate detection when the signal fluctuates around a threshold.[5]

- running average

Calculates a running average of the Inter-Beat Intervals (IBI) to determine the Beats Per Minute (BPM). A running average helps in smoothing out fluctuations and provides a more stable and reliable measure. [7]

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