A Wearable Pulse Oximeter
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Design Goal
A pulse oximeter is a non-invasive device capable of monitoring the blood’s oxygen saturation. It has been widely used in the medical, fitness and clinical care worlds. A low-cost wearable oximeter can significantly expand its applicability.

Principles of Operation
-Oxygenated and deoxygenated hemoglobin have different absorption coefficients in the near infrared(NIR) range.
-Two LEDs will emit light at two different wavelengths.
-Photodetector converts the received light intensity to electrical signal.
-Oxygen saturation can then be calculated as: 
\[ \text{SaO}_2 = \frac{\text{HbO}_2}{\text{Hb} + \text{HbO}_2} \times 100\% \]  

Design-Hardware
The hardware part of the project consists of:
I) Optical Transmitter: Two LEDs (680 nm, 940 nm) (Size: 0.827” × 0.827”)
II) Optical Receiver: Photodetector+Transimpedance Amplifier+ Filter (Size: 1.772” × 0.984”)
III) Wearable Microcontroller (Size: 1.299” × 0.709”)
IV) Wearable Bluetooth (Size: 1.378” × 0.590”)
V) Display (Size: 1.574” × 1.411”)

Programmed included three parts:
I) Programmed the microcontroller to process the data from the receiver and calculate heart rate and oxygen saturation.

Design-Software

Measurement and Integration
Testing the Bandpass Filter:
- **BW**: (0.8-3) Hz, **Gain**: 37.71 dB

III) Make the connection between the Bluetooth and the Phone App

- Another Phone App receives data wirelessly and is used for real-time display data then sends information as text message.

Final Result
Portable and Wearable
1) Low Cost
2) Real-Time display of heart-rate and SO\text{$_2$}
3) Phone App receives data wirelessly

Our design will have applications in:
1) Clinical applications
2) Neonatal and Elderly Care
3) Exercise and Fitness

References
[1] Young-Dong Lee, Sang-Joong Jung, Yong-Su Seo and Wan-Young Chung “Measurement of Motion Activity during Ambulatory Using Pulse Oximeter and Triaxial Accelerometer”