A. Kundu / Prof. P. C. Pandey (Supervisor), "Photoplethysmographic signal acquisition with light-level control, automatic baseline correction, and gain control for pulse oximetry," *M.Tech. Dissertation*, Department of Electrical Engineering, Indian Institute of Technology Bombay, June 2021.

ABSTRACT

Photoplethysmography (PPG) is a non-invasive technique for monitoring blood volume variation under the skin. It is widely used for monitoring the heart rate in wearable devices and the blood oxygen level in pulse oximeters. The conventional methods for PPG signal acquisition use fixed-level light source, fixed-gain detector circuit, highpass filtering of the detector output to remove the baseline drift, and lowpass filtering to suppress high-frequency noise. An analog frontend is developed for pulse oximetry with two-channel PPG signal acquisition using a sensor comprising red and infrared LEDs with controlled light outputs and a photodetector with baseline correction and gain control for optimal use of the ADC input range for subsequent digital processing. The two light outputs are controlled by programmable currents. The two sensed signals are amplified with automatic baseline correction and gain control the gain. The unit is realized with a low component count using an off-the-shelf mixed-signal system-on-a-chip (SoC) with on-chip ADC, DACs, op amps, programmable signal routing, and microcontroller.