Patients with diabetes need to painfully draw blood several times per day in order to properly record the trend in their blood glucose level. To ensure accuracy, patients must test more frequently often leading to additional pain and a lowered quality of living. Our objective is to improve quality of life by reducing and possibly eliminating painful blood tests by using neoreflexive infrared testing for blood glucose levels through a wrist mounted device.

A wrist mounted, noninvasive glucose testing "watch" designed to be worn throughout the day to make glucose testing as easy and painless as possible. Additionally, data stored on the watch will be offloaded to a personal device to make long term tracking easier than ever before.

**Watch Band**
The watch band is made from a flexible polymer with three levels of rigidity for comfort and functionality. The stiffest part of the band incorporates a two-peg fastener for wearing the watch comfortably while ensuring a snug fit. The second part of the band is slightly less rigid than the first part. This acts as a transition to the fully flexible part which wraps around the wrist.

**Probe Housing**
The probe housing is made from an ABS material and houses our LEDs and photodiodes. The housing is unique such that it pinches the skin creating a more focused and enclosed area of skin for sensing.

**Software**
The software consists of the watch software and iOS app. The watch software is responsible for collecting, analyzing, and displaying blood glucose on the LCD display. Furthermore, the watch is able to transmit blood glucose readings via Bluetooth LE to the companion iOS app where the data is stored and displayed graphically for the user.

**Results and Analysis**
Testing used a stationary clamp to test light absorption through a consistent distance of tissue measured via oscilloscope. Simultaneous testing using a store bought pin-stick glucometer was conducted to correlate changes in voltage over time to change in glucose concentration. Due to environmental noise and changes in the clamp pressure caused by tissue deformation, percent error was upwards of 75%. However, under ideal conditions, positive and negative trends could be seen for changes in ±40mg/dL of blood glucose.

**Conclusion**
We were able to design and implement a non-invasive blood glucose sensor using an innovative neoreflective sensing system that can be worn on the wrist. Furthermore, the device is accompanied with an iOS app which provides additional insights about a patient’s blood glucose trends.

**Ethical Consideration**
Ethics played a central role in this project. We went through the appropriate approval process and obtained and IRB to conduct human testing. Furthermore, we encrypted the test results and related health data to ensure privacy and security.

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