

Empatica E4 Interface for Raw Data Transfer

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github.com/j05t/e4client

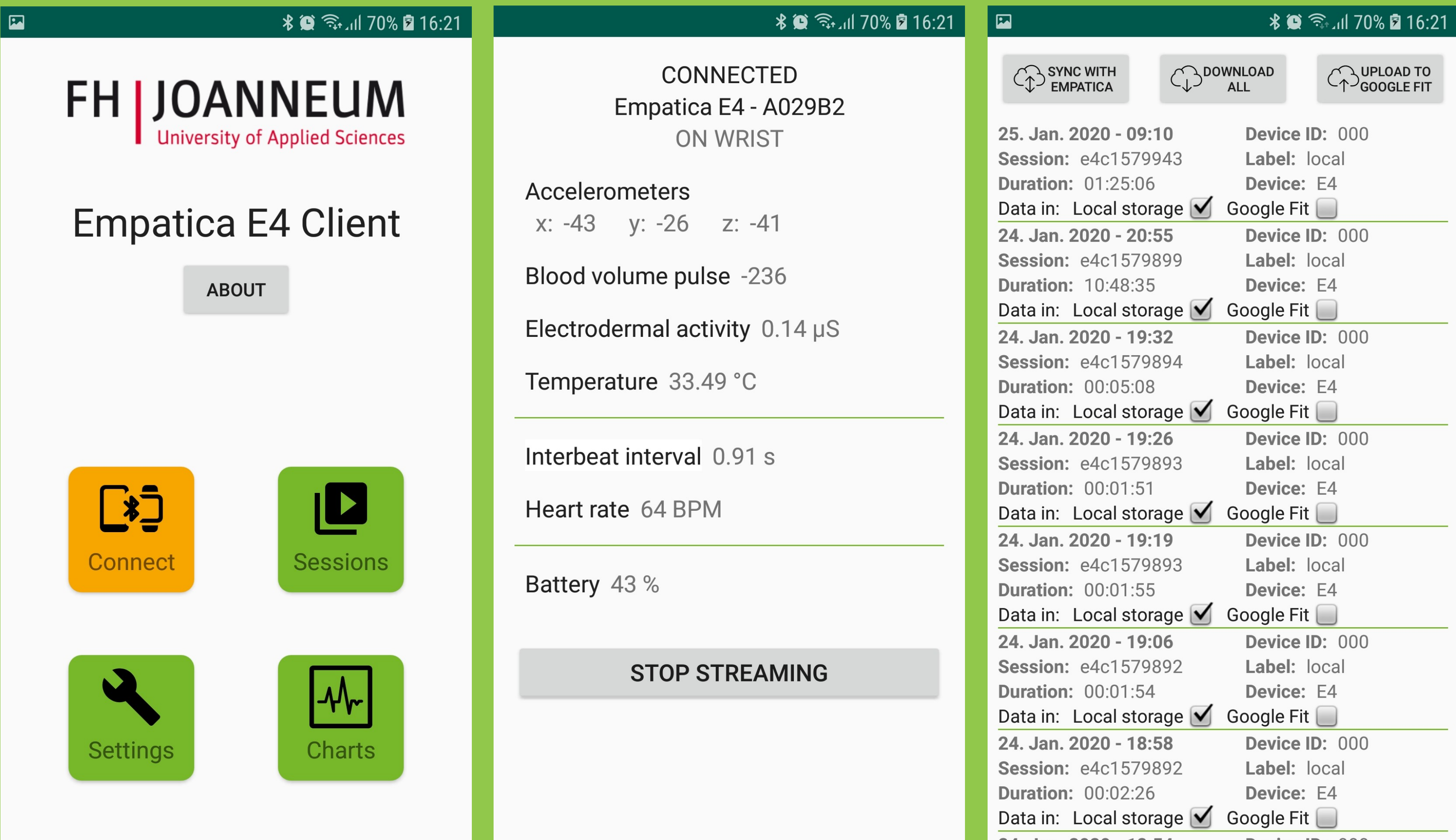


Fig. 1-3: Main menu, Bluetooth connection screen, sessions overview



Fig. 4-6: Visualization of acquired sensor data: electrodermal activity (EDA), heart rate (HR) and heart rate variability (HRV) metrics, peripheral skin temperature (Temp), acceleration (Acc), tags as vertical lines

References

Onton, J. A., Kang, D. Y., & Coleman, T. P. (2016). Visualization of Whole-Night Sleep EEG From 2-Channel Mobile Recording Device Reveals Distinct Deep Sleep Stages with Differential Electrodermal Activity. *Frontiers in Human Neuroscience*, 10.

URL: journal.frontiersin.org/article/10.3389/fnhum.2016.00605/full

BACKGROUND & OBJECTIVE

The E4 is a medical-grade wearable device that offers real-time physiological data acquisition, enabling researchers to conduct in-depth analysis and visualization.

It measures blood volume pulse (BVP), from which heart rate variability can be derived. The 3-axis accelerometer captures motion-based activity. An EDA sensor (GSR Sensor) measures the constantly fluctuating changes in certain electrical properties of the skin. An infrared thermopile reads peripheral skin temperature. The event mark button tags events and links them to physiological signals.

Raw sensor data should be extracted for further analysis. A custom App has been implemented to interface with the E4 to visualize and export raw sensor data for further analysis.

RESEARCH DESIGN / METHODOLOGY

An Android application has been developed to record acquired sensor data via Bluetooth and to allow synchronization with the Empatica and Google Fit cloud storage solutions (Fig. 1-3). Various metrics for heart rate variability are calculated.

The application visualizes recorded sessions and real-time sensor data (Fig. 4-6).

RESULTS / DISCUSSION

Heart rate variability (HRV) is calculated using the interbeat interval between all successive heartbeats. The App removes artifacts in the interbeat intervals before calculating the HRV. Google Fit transaction limits require the preprocessing of acquired raw data.

PERSPECTIVES / IMPLICATIONS

Personal health devices can increase diagnostic accuracy, enhance physician efficiency and allow more convenient data collection. Since there is no universal standard for data exchange, gaining access to raw sensor data is imperative for further analysis.