Remote Assessment of Vital Signs on Mobile Devices

Jesse Brizzi, Alex Brown, Brian Hatten, Jonathan Ibrahim

Background

Use a commercially available smart phone (Android platform) to measure the vital signs and physiological behaviors of an individual and determine if that person is deviating from their baseline. Monitoring should be contactless and noninvasive.

Requirements

The system should be able to remotely monitor the:
- Pulse/heart rate of an individual
- Blood pressure of an individual (systolic and diastolic)
- Blood oxygen saturation levels
- Body temperature of an individual

The system should be able to:
- Recognize multiple individuals and simultaneously monitor their vitals.
- Be operated by a non-technical person.
- Send vital sign information via E-mail/SMS

Figures

Fig. 1 – Vital Signs home screen
Fig. 2 – Heart Rate Measurement Results
Fig. 3 – Body Temperature Measurements
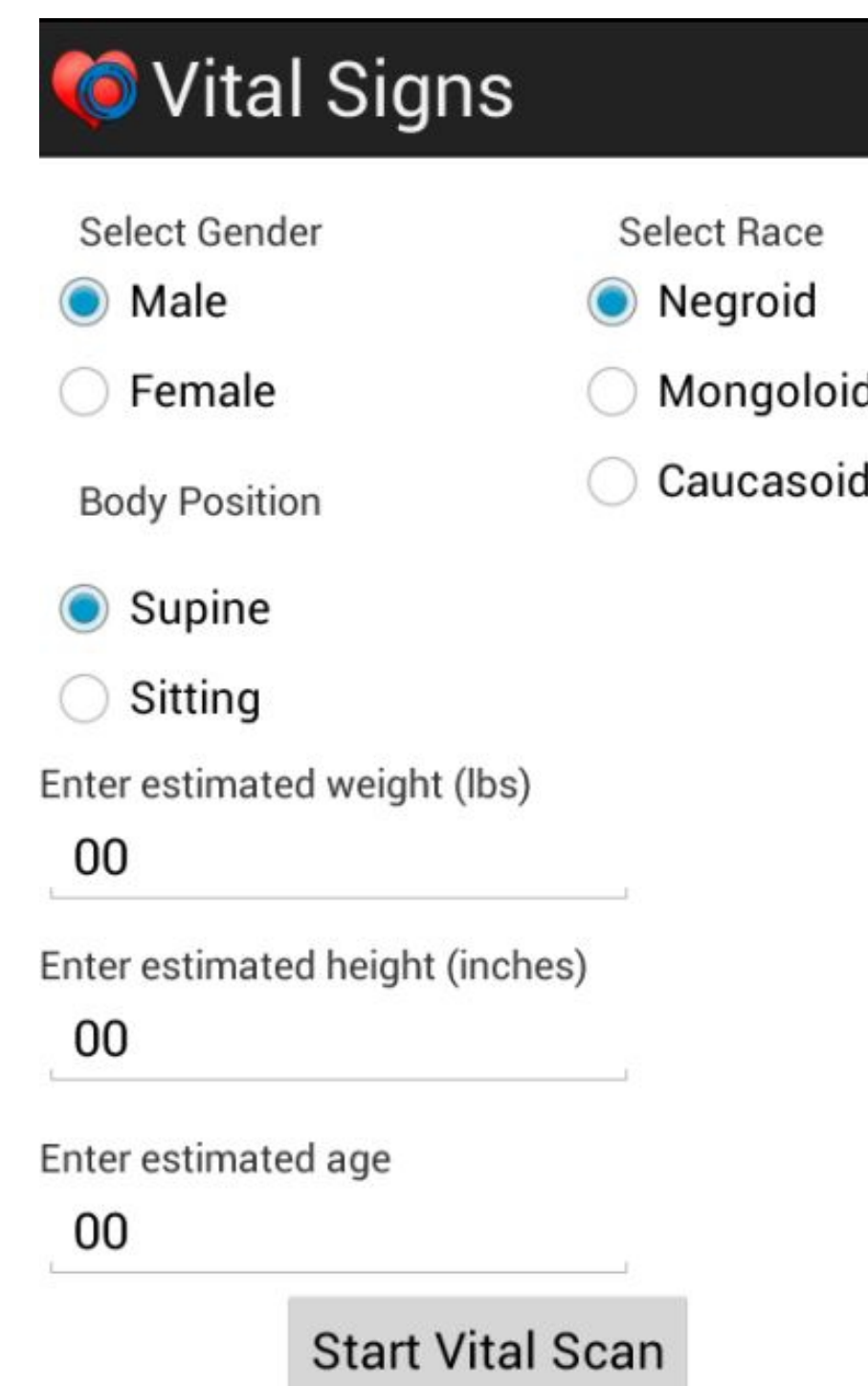*Fig. 4 – Formatted output for sending of measured vital signs via E-mail or SMS*
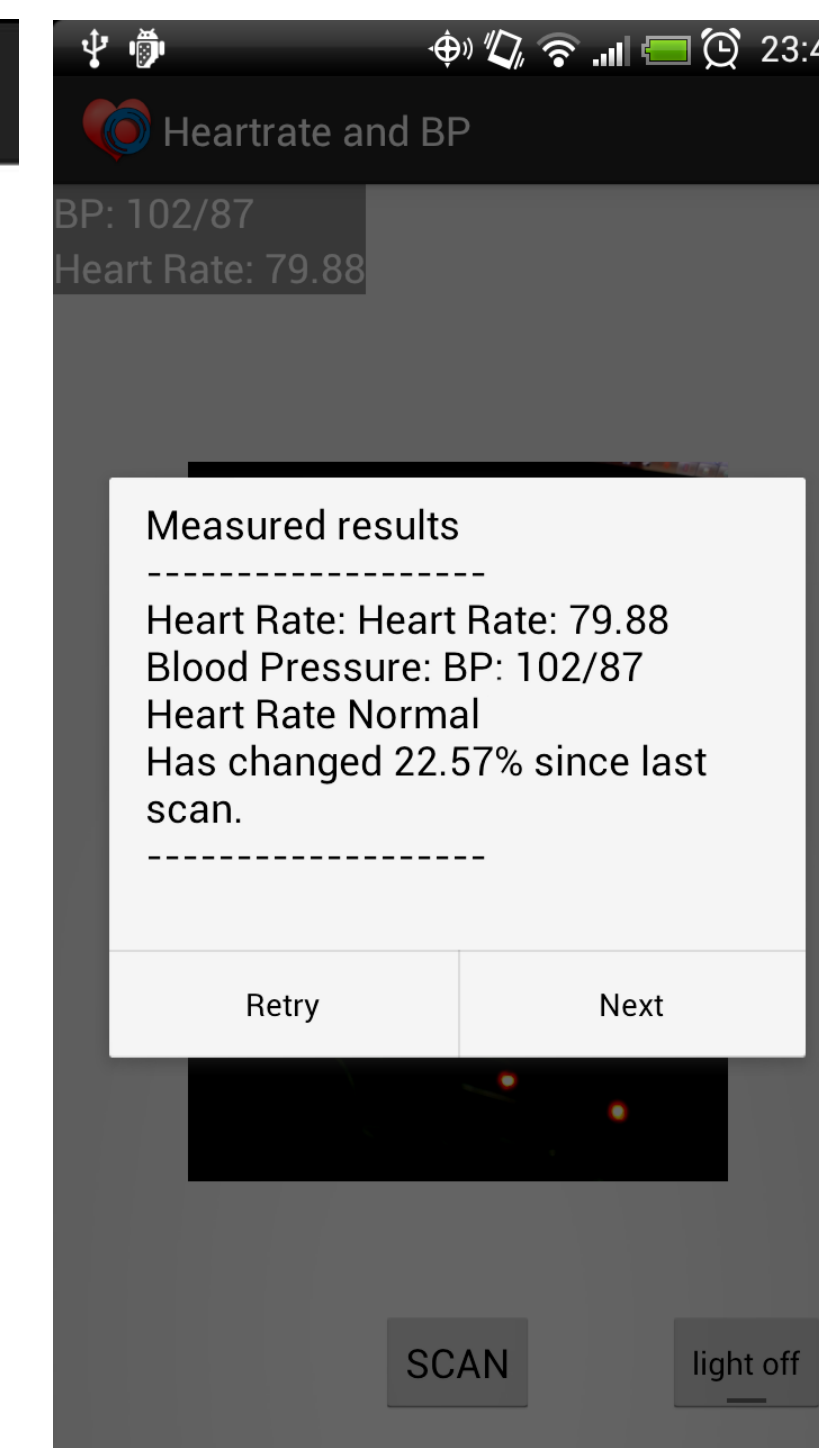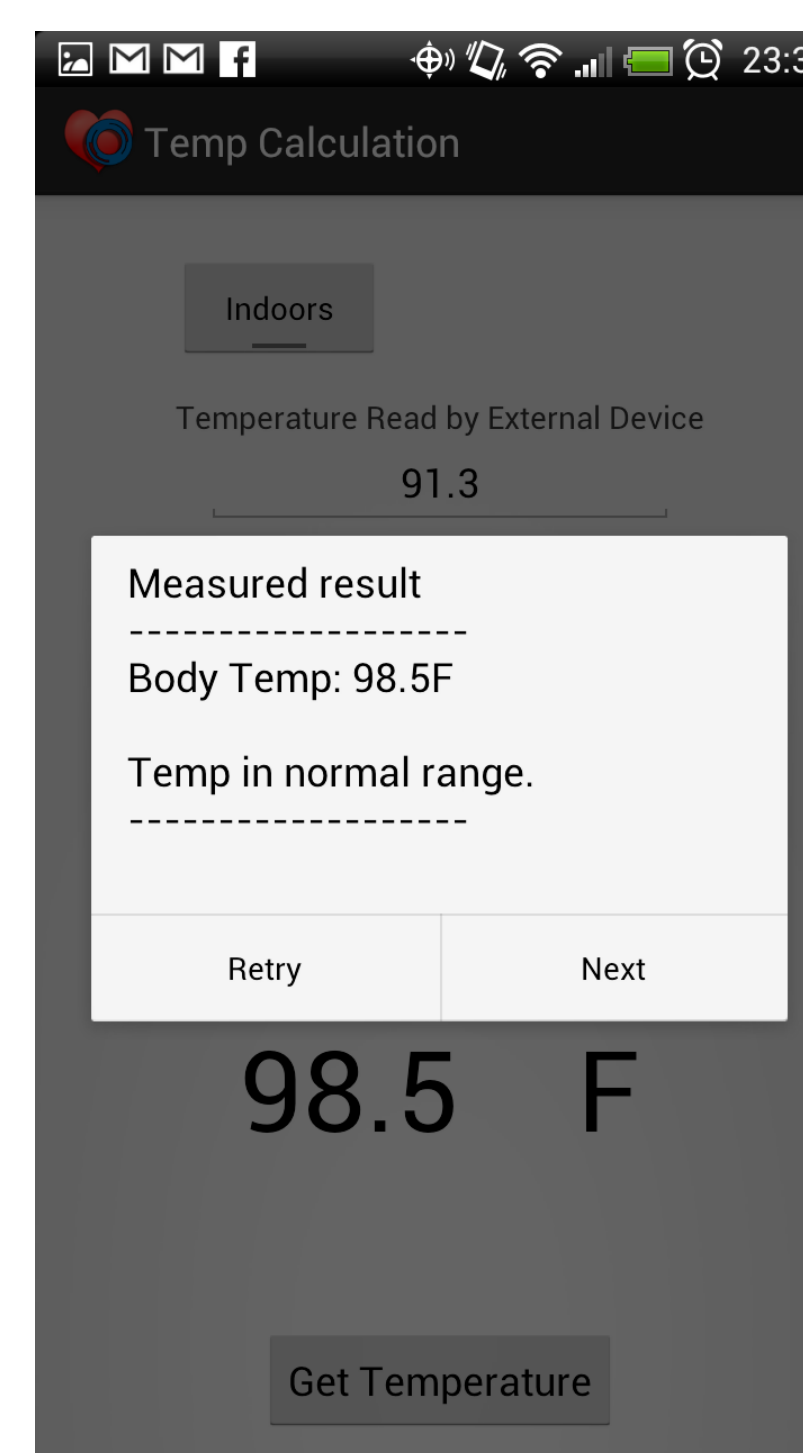
Figure 1
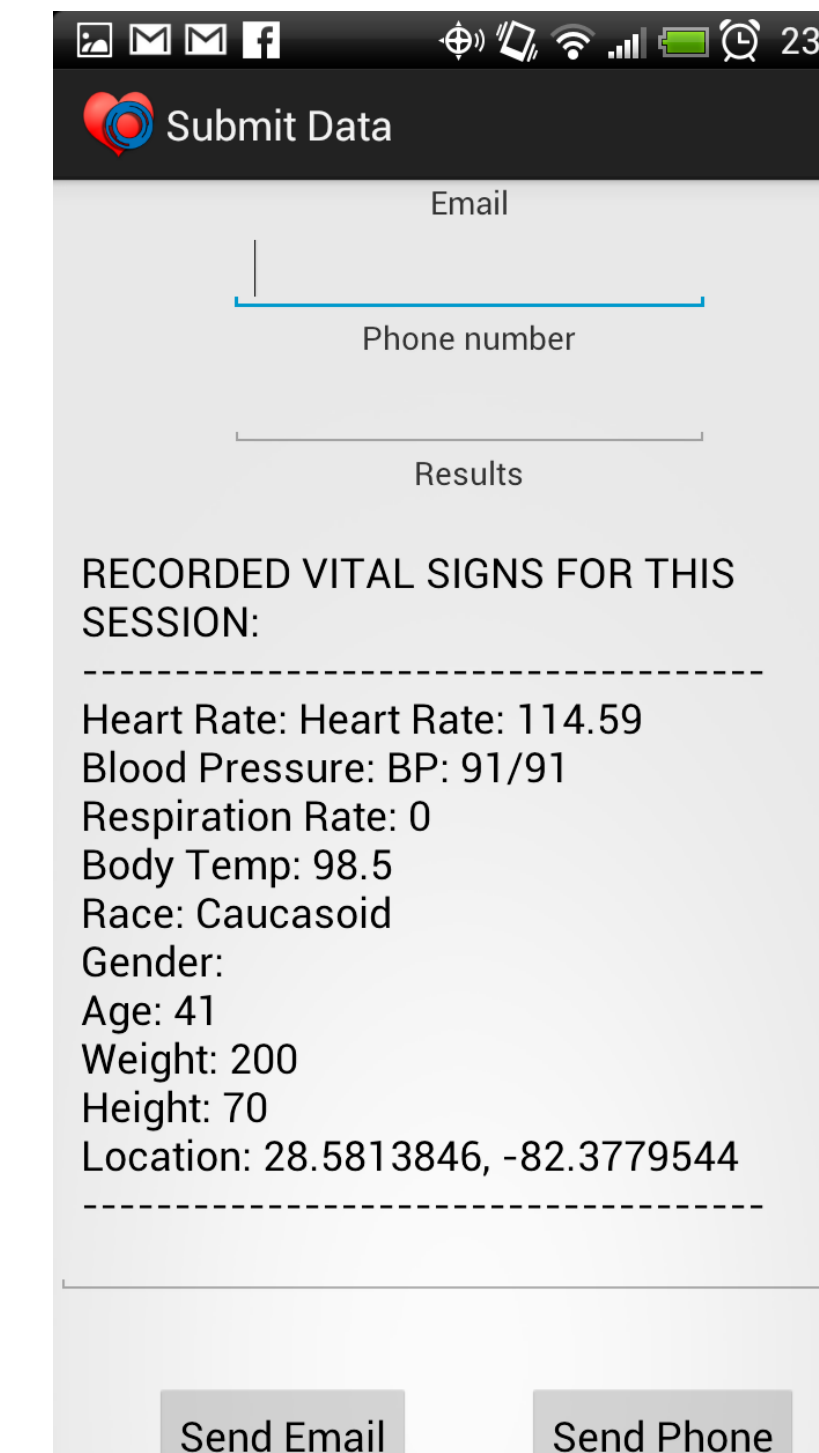
Figure 2

Figure 3

Figure 4

Implementation and Design

Pulse/Heart Rate
Utilizes the rear facing camera to detect a person's pulse rate from the micro-blushes appearing on their face.

Blood Pressure
Derived from a combination of heart rate, gender, race, age, weight, body composition and vascular resistance.

Blood Oxygen Saturation
Utilizes the rear facing camera pressed against a person's finder to measure their Red (blood cells) and Blue (hemoglobin) values. Using a ratio of ratios $\frac{Red_{max}}{Red_{min}}$ to $\frac{Blue_{max}}{Blue_{min}}$, blood oxygen saturation is determined.

Body Temperature
Utilizes an external infrared thermometer to obtain the skin temperature along with the Accu-Weather API for gathering ambient temperature. The core body temperature is then calculated using the following equation:

$$Temp_{core} = (1 + k) * (Temp_{skin} - Temp_{amb}) + Temp_{amb}$$

Acknowledgements

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