Vital Sign Monitoring

This section will discuss the current methods of monitoring vital signs in humans.

The aim is to acquire an understanding of the technology available.

This will help in the selection of the sensors that will be present in the device

being developed.

2.2.1 Core Temperature

The body regulates its internal temperature to create a favourable environment for chemical reactions to take place. Core body temperature is an indication of overall health. Elevated temperature due to a fever can indicate the presents of an infectious disease.

The device in development will aim to monitor temperature by means of an ear probe. Traditional locations for measuring core temperature are

2.2.2 Heart Rate

2.2.3 Respiratory Rate

All respiratory related measurements in the reviewed products rely on movement

sensors attached to the body of the infant that senses its movement.

Sensors include accelerometers and the BreathOptic

. sensor used by Sleep-

Mat. These sensors detect the chest movement produced by the infant while

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breathing. In some cases, like Mimo and Sleep-Mat, these sensors are sensitive

enough to determine the infant's respiratory rate from this movement. In other

products, such as Anglecare and Monbaby, the sensors are sensitive enough to

register the movement due to breathing, but not sensitive enough the extract

the rate of breathing. Alerts are sent wirelessly to the cellphone of the caretaker

if the movement stops for a certain amount of time. This may indicate

that the infant has stopped breathing. The problem with this method is that

products like Monbaby, Anglecare and Mimo will only alert the caretakers

once the infant has stopped breathing completely for 15 or 20 seconds. This

may be too late to prevent an infant mortality. A product is needed that can

accurately monitor the respiratory rate and warn the doctor or caretakers if

the respiratory rate drops or becomes irregular. Respiratory sinus arrhythmia

(RSA) is the baseline oscillation in heart rate in synchrony with the respiratory

rate. It is observed as an increase in heartrate during inspiration and

a decrease during expiration. According to a study done by Stratton JR et

al, the variation in heart rate due to RSA is higher in younger test subjects

with 74% increase in children vs. 52% increase in adults [5]. These \_ndings

support the use of RSA to determine the infant's respiratory rate. A study

has been done by D da He investigating the use of ballistocardiogram heart

rate measurements to detect RSA [6]. This project will attempt to detect

RSA in pulse oximetry heart rate measurements. This is a unique approach

in wearable monitoring devices. The advantage is that no extra sensors, like

accelerometers, are needed for the measurement of respiratory rate.

2.2.4 EEG