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What is the problem?

Concern for a child’s health and safety is shared by parents over the world. However, keeping an eye on a child is no easy task especially for busy parents.

What are the current solutions?

Current video monitors provide little or no information about the health of a baby and wearable devices reporting vital signs can be uncomfortable, restrictive, and potentially dangerous for active babies.
What is our solution?

Non-Contact Baby Monitoring System
What makes our system better than the current solutions?

Baby Monitoring via thermal camera

Non-Contact

Integrity

- Respiration Rate
- Heart Rate
- Temperature
- Cry and Movement Detection

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**The thermal camera**

- Opgal Thermal Camera
  - 640 x 480
  - Analog Output
- Connected to the Raspberry Pi using EasyCap USB Video Capture Adapter

**Intermediate device**

- Processing the data in Raspberry Pi 2
- Noobs version 1.5.0
- OpenCV 3.0.0, C++, Python 2.7
- Getting the data from the thermal camera
- Transmitting the result of processing to the cloud storage through wifi connection
- Simple file transfer protocol is used
- Transmitted at every 3 seconds using cron
FEATURES OF OUR SYSTEM

Heart Rate

- We use the small movement in the head region to measure the heart rate.
- Facial region is manually selected by the user.

Respiration Rate

- Selecting the nasal area manually
- Tracking the nasal area using OpenTLD library
- Observing the pixel difference in this area
- Since there is a difference between the temperatures of the air that baby breathe in and breathe out, there is an obvious change in pixel values.
- We get the respiration rate from this information.
CRY DETECTION

- Extracting MFCC features of the audio from USB microphone.
- Classifying the sound using Artificial Neural Network.
- 2 classes of audio samples: Cry Sound, Environment Sound.
Movement Detection

- Detecting movement from the difference between the value of pixels in two consecutive frames.
- Movement is detected if the difference is greater than a threshold value.
- The threshold value is dependent on the thermal camera.
Measuring the Body Temperature

- Measuring environment temperature using the temperature sensor DS18B20.
- We fit a camera response function curve and calibrate the frame accordingly.
CLOUD STORAGE

- Digital Ocean Cloud Server is used
- Express Framework is used.
- Node.js and MongoDB Application are running on the cloud.
- Data is sent from Raspberry Pi at every 3 seconds and stored in the database.
- Data is requested from the mobile application.
MOBILE APPLICATION

- An Android application is developed.
- Both current and historical data are accessible.
- The application notifies the users in case of emergency.
- More testing on the overall system with more data.
- Interpretation of the movements of the baby while sleeping.
  - We want to be able to provide meaningful results to the parents about their baby's sleep such as waking up time prediction.
- Cry Classification
  - We also want to provide information related to the reason of the cry of the baby to the parents such as hunger, sleeplessness etc.