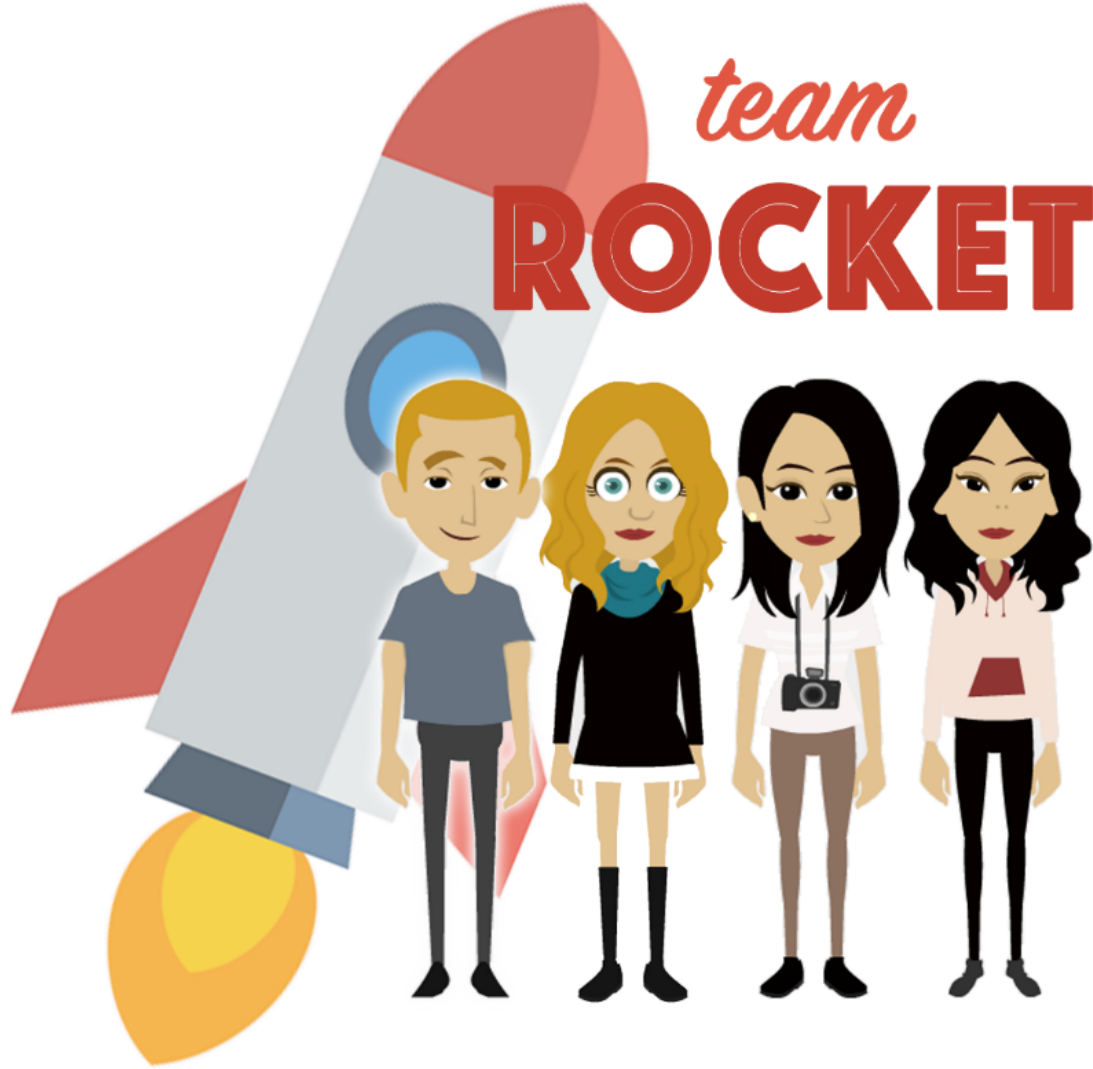


team
ROCKET



İlker Bozcan
Cansu Yılmaz
Damla Ezgi Akçora
Demet Sude Saplık

WHAT IS THE PROBLEM ?

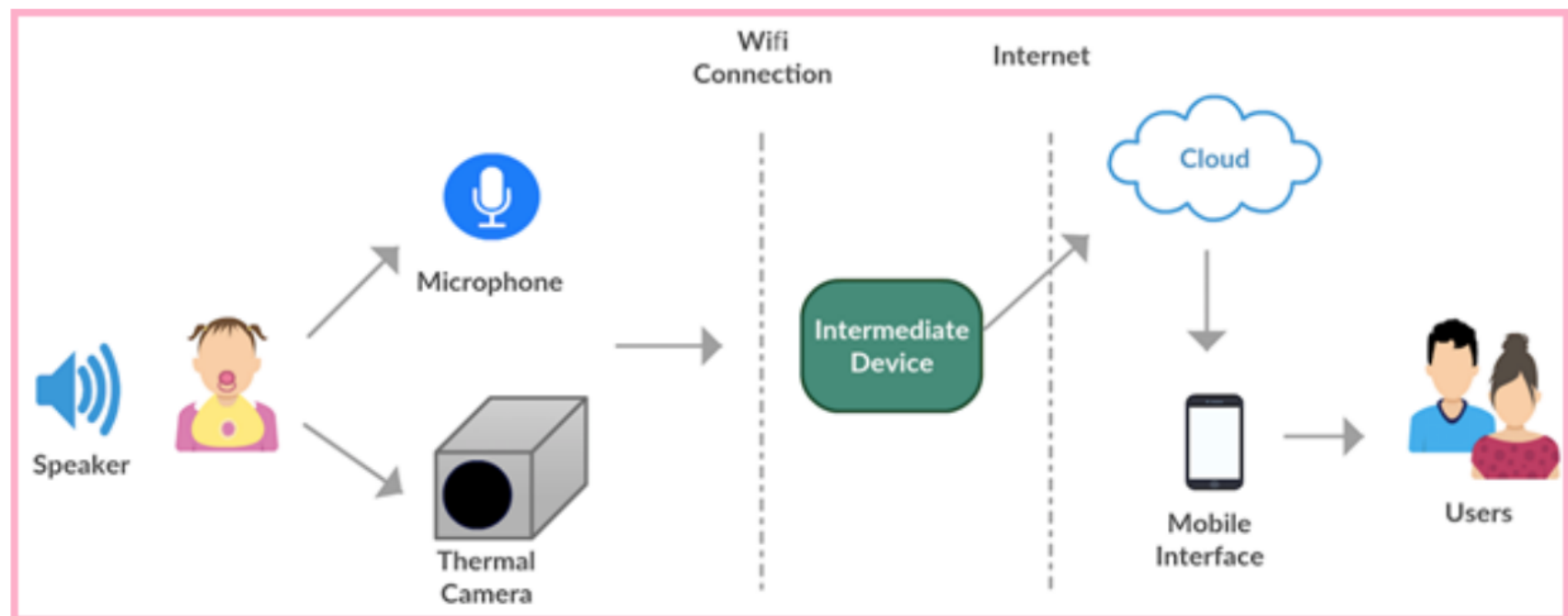
Concern for a child's health and safety is shared by parents over the world. However, keeping an eye on a child is no easy task especially for busy parents.

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.

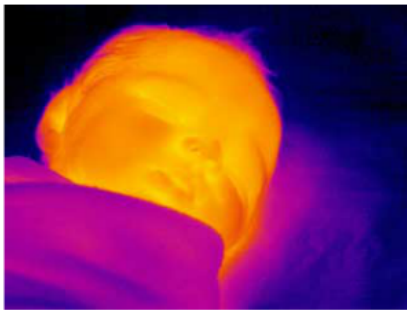
WHAT IS OUR SOLUTION ?

NON-CONTACT BABY MONITORING SYSTEM



WHAT MAKES OUR SYSTEM BETTER THAN THE CURRENT SOLUTIONS ?

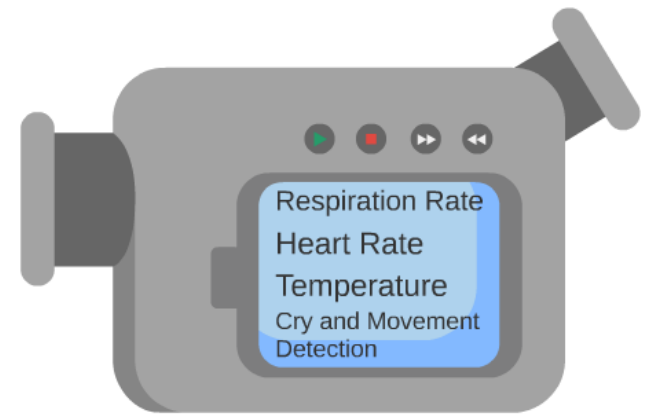
Baby Monitoring
via thermal camera



Non-Contact



Integrity



THE THERMAL CAMERA



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

INTERMEDIATE DEVICE

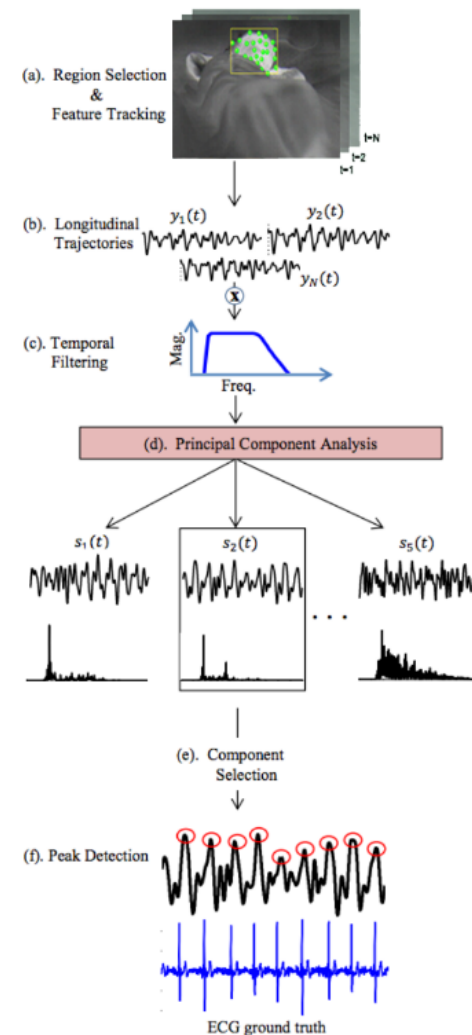


- Processing the data in Raspberry Pi 2
- Noobs version 1.5.0
- OpenCV 3.0.0, C++, Python 2.7
- Getting the data from the thermal camera
- Transmitting the result of processing to the cloud storage through wifi connection
- Simple file transfer protocol is used
- Transmitted at every 3 seconds using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



* G. Balakrishnan, F. Durand, and J. Guttag, "Detecting pulse from head motions in video," in Proc. IEEE Conf. Comput. Vision Pattern Recog., Jun. 2013, pp. 3430–3437.



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 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.

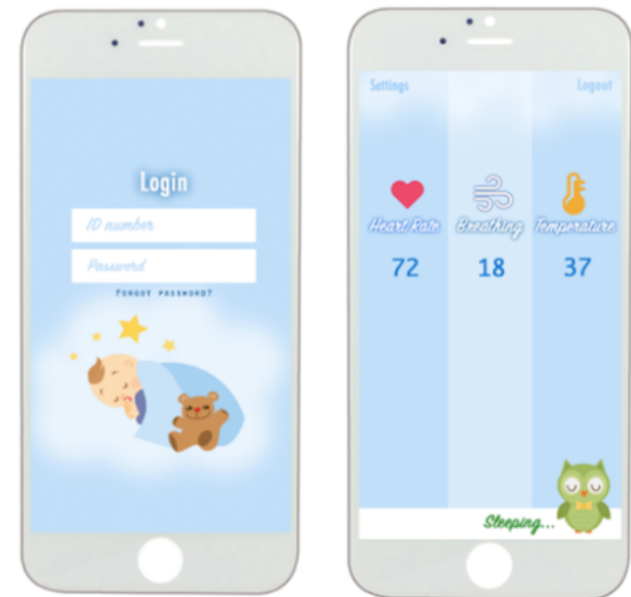


CLOUD STORAGE

- 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.





FUTURE WORK

- 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.