Infant Movement Monitoring

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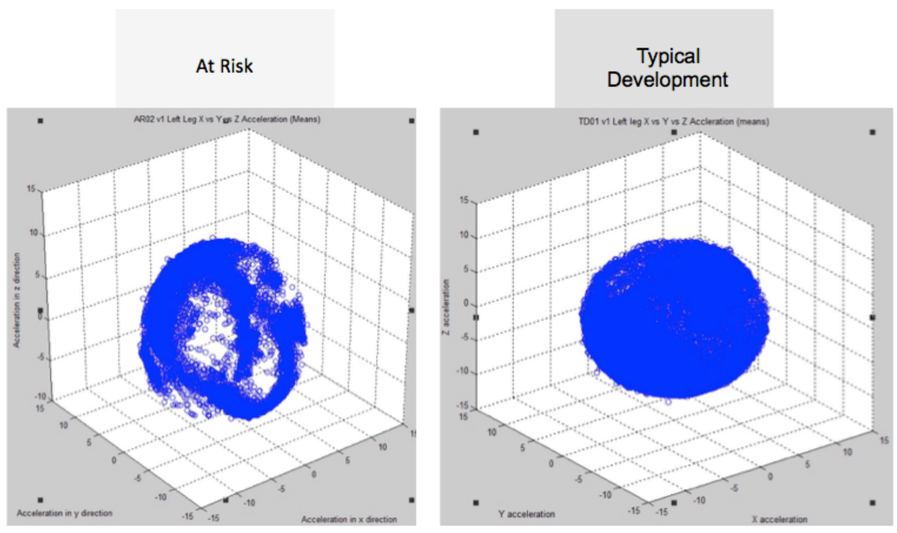
Introduction

- Monitoring and Performance Evaluation of Infants at risk of neuromotor delay using APDM accelerometers.
- Accurate early prediction of neuromotor outcomes is difficult due to high variability in developmental trajectories and infant behavior

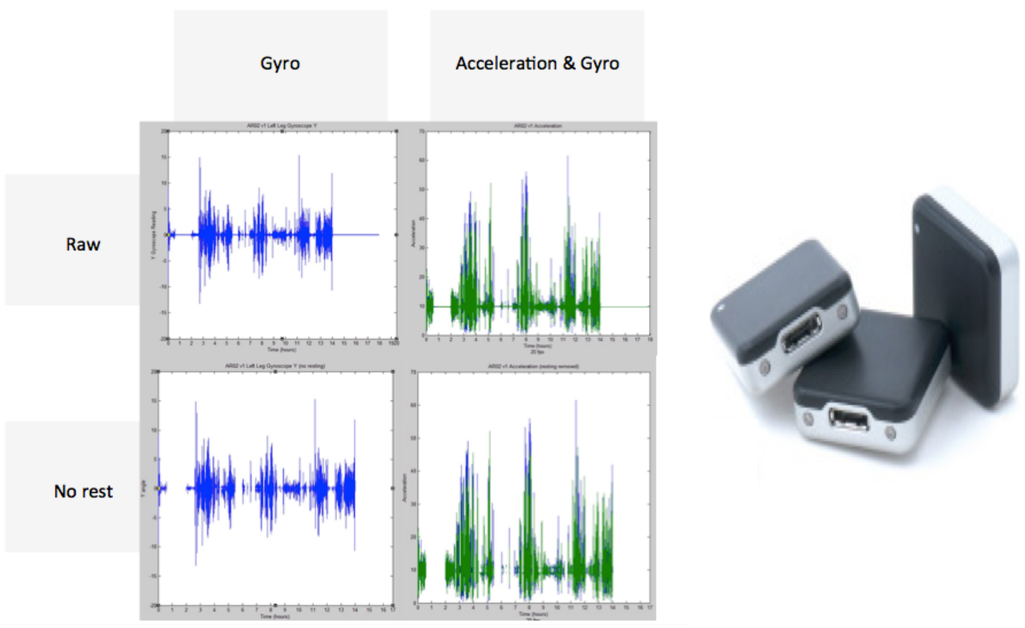
Motivation

- Neuromuscular problems requires early diagnosis and treatment.
- Detecting impairment early in infants classified at risk provides sufficient information about the treatment required
- Light weight and small sensors are available and easy to be attached to the infant body hence acquiring data about his/her movement can be done conveniently and with simple setup process.



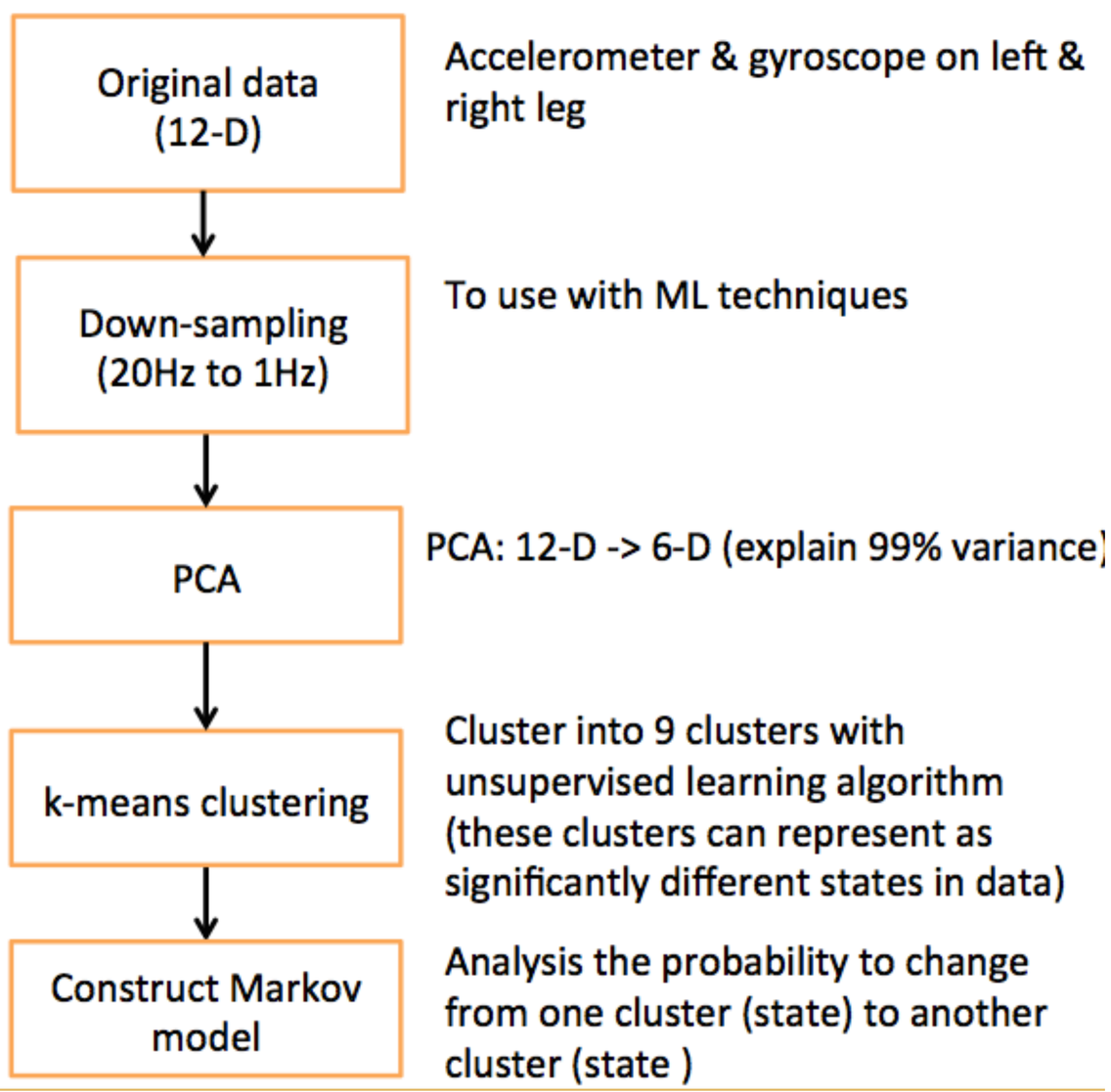
Data Acquisition

- Data acquired from 12 infants with typical development and 24 infants at risk for delay, 1-20 months of age. Each infant wore a sensor on each leg all day and was tested 3 times, with 2 months between testing.
- Sensors used:
    1. Accelerometer.
    2. Gyroscope.
    3. Magnetometer



Unsupervised Classification

- Identify several states (clusters) acting as features to significantly separate typical cases from atypical cases.
- Two techniques are suggested:
    1. Quantitative analysis: classification is based on duration of staying in a state and the frequency of possessing this state.
    2. Entropy-based analysis: classification is based on the degree of disorder of the states possession distribution.



Related Research

- Features detection and motion modeling.
- Error modeling/reduction.
- Signal Processing: segmentation, alignment and signal sampling .
- Machine Learning: unsupervised clustering, k-means and time-series analysis.
- Databases: storage and accessibility

Conclusion and Future Work

- Method described shows significance in infant classifications.
- Classification can be improved by filtering the data.
- Segmenting the data into interpretive segments requires a prior knowledge and modeling of the common infant legs moves.
- Since the data is an “almost” random time-series streams, it is possible that a deep-learning techniques to be the right choice to classify the infant.

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