Systolic blood pressure estimation using PPG during physical exercise

Citation for published version (APA):

Document status and date:
Published: 01/08/2016

Document Version:
Accepted manuscript including changes made at the peer-review stage

Please check the document version of this publication:

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Systolic blood pressure estimation using PPG during physical exercise

Shaoxiong Sun1,2, Rick Bezemer1,2, Xi Long1,2, Jens Muehlsteff3, Ronald M. Aarts1,2,
1Department of Electrical Engineering, Eindhoven University of Technology, The Netherlands
Email: s.sun@tue.nl

Introduction
- Continuous monitoring of blood pressure not only provides immediate physiological parameters for patient care and monitoring, but also reveals health risks that might eventually lead to hypertension and arteriosclerosis.
- Measurements using brachial cuff can be only obtained intermittently. Measurements using finger cuff is not suitable for long-term use. Measurements using an invasive arterial catheter expose patients to infection risks.
- Photoplethysmography (PPG) has been considered as a method to estimate blood pressure.
- We designed a model using multiple PPG-derived features to estimate systolic blood pressure (SBP) for healthy people during physical exercise.

Materials and Methods
- N = 19 healthy subjects doing 30-minute cycling exercise
- We initialized the model for each subject at rest.
- We derived 18 features (including 4 proposed features), combined these features using linear regression and quantified their contribution by means of normalized weights.
- We evaluated model performance using leave one subject out cross validation (LOSOCV).

Results

<table>
<thead>
<tr>
<th>Table 1 Model performance</th>
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<tr>
<td><strong>Bias</strong></td>
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<td><strong>Standard deviation</strong></td>
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<td><strong>Median intra-subject correlation coefficient</strong></td>
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<th>Fig. 5. Bland-Altman plot for estimated and measured SBP</th>
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Conclusions
- The estimated SBP had high correlations with the measured SBP, while the RMSE still warrants further attention.
- The features we proposed such as dpmean and spvar played important roles as indicated by the larger normalized weights.