Research findings

Introduction

In this document you will find all literature findings that I have found for each paper. I only wrote down the most important findings filtering out all unnecessary information. Most of the information written here has already been discussed and shared within the scrum meetings.

Research findings and links towards the documents

The accelerometer project findings lab research 1.0

This paper is focused on finding the most accurate classification based on machine learning used different kinds of accelerator sensors. But in my opinion the paper gives great insights about the following topics.

3. 6 Estimating Intensity (energy expenditure)

While scanning this paper the first thing that really sticked out for me was chapter 3.6 Estimating Intensity (energy expenditure). This chapter explains what they have used to measure intensity. In the case of this paper they used Metabolic Equivalent or Task (MET), otherwise known as EE / MUMR. Where EE stands for Energy Expenditure and BUMR stands for the base metabolic rate per kg and time unit. Basically you can say EE is the number of calories burned during an activity. The best way to calculate MET is by using VO2, but other options are possible.

3.2 Validation

Since this research paper is made by the CBS, and they are going to use the same correspondents as we do. We could look into the way they validated their project. In chapter 3.2 Validation, they explain how they build their test and training set and what values they used. In the case of this paper they used a training set of 60% based off their total dataset.

3.4 Metrics

CSB tested their work on the following metrics: Accuracy, Precision, recall and F1 score. They don't mention if they used any other metrics.

5.2 Scatterplots for specific respondents

CBS mentions in their paper that there have been a phenomenon that occurs for almost all respondents. What is happening is that the when a respondent is doing an activity and switches to a different activity. As example from standing to walking the heart rate goes down while the VO2 intake goes up. CBS states that this is very strange since they would expect the heart rate to go up as well.

5.3 Conclusions

In chapter 5.3 conclusions two statements are really interesting for our project. Mainly that:

- All MAD intensity estimates seem to overestimate the intensity of jerky activities and do not record how much static force the body exerts on the environment.
- ActivPAL registers the approximate intensity of cycling well, but is not accurate enough to distinguish between light and heavy cycling. ActivePAL also overestimates the intensity of low intensity activities.

Both statements should be taken in account when looking at our statements.

Beweegonderzoek

Deze paper onderzoekt in hoeverre er een verband is tussen MET en acceleratie. Hierbij wordt gebruik gemaakt van dezelfde dataset die bij ons project wordt toegepast. In deze paper wordt beschreven welke stappen zijn gevolgd om de data uit te lezen , op te schonen en te kunnen worden geanalyseerd. Bij de analyse lag de focus voornamelijk op de MET value.

Uit dit onderzoek bleek dat zitten een gemiddelde MET score had van 1.5 en staan een gemiddelde van 1.6. Fietsen zwaar en fietsen licht kwamen erg bij elkaar in de buurt met een MET value van 6 en van 5.

Tijdens het onderzoek is naar voren gekomen dat sommige activepal bestande niet bestaan, ook zijn er verschillen te vinden tussen de verschillende vyntus metingen.

De accelerators gaan niet altijd terug naar de nulwaarde van de accelerator waardoor het voor kan komen dat bij rustige activiteiten zoals zitten en staan, de waarde boven de 1 MET kan komen.

Doordat het aantal testpersonen niet op grote schaal was uitgezet, zorgde dit ervoor dat de resultaten misschien wel accuraat waren, maar niet konden worden getest met de werkelijkheid.

Measurement-of-Phy_2016

Measurement

In this paper it explains how physical activity get measured using accelerometers. The first topic being discussed is how acceleration is measured by using the following formula (acceleration = velocity/time). This acceleration is frequently expressed in the meters per square second or by using g-force. G-Force stands for 1 g = 9.8m/s (force of gravity).

Epochs

Epochs are specific time intervals for which counts are summed for data analyses. Epochs are not always the same but are depending on the amount of data and depend on the population (different epochs for children/eldery) .

In our project we are working with adults and elders. Because of this it's recommend to use epochs of 60 seconds. (Copeland & Esliger, 2009; Freedson et al., 1998; Hendelmanet al., 2000; Miller, Strath, Swartz, & Cashin, 2010; Sasaki et al., 2011;Swartz et al., 2000);

Intensity of movement (Figure 2.2)

This paper uses a combination of counts and MET values to determine if an activity is moderate/low/high. They count the amount of data point in one minute and use cut-off points with different categories to see how intensive an activity is.

MET Calculations from On-Body Accelerometers

This paper tries to use on-body accelerometers to measure activity/met while doing activity's. To do this they used approximations they measured and compare those to known MET scores. In the paper they describe there are other ways to measure this without accelerometers by using the heart rate or using VO2. Like I have mentioned in the other conclusions of the papers, they are using cut of points based on MET values to determine what kind of activity has been done (and how intense).

Physical activity recognition

This paper goes to the basics of physical activity. It explains how physical activity can be defined: As any voluntary body movement generated by the contraction of skeletal muscles resulting in energy expenditure.

It also explains how to measure physical activity, to conclude this subject they use regular accelerometers, Piezoelectric accelerometers and capactive accelerometers. They also mention how you can estimate the energy expenditure using accelerometers. They mention that you can use MET and use features like length, weight, BMI and even body composition (fat and lean mass).

Titel	Link
The accelerometer project findings lab research 1.0	https://dehaagsehogeschool.sharepoint.com/:w:/s/AppliedDataScience_groups-ActivePal/EcCTwPfQgx1Ai4rzk35-PAMB7nVRc7oVoz4E17e8x5aa1g?e=ZKs9Ne
Beweegonderzoek	https://dehaagsehogeschool.sharepoint.com/:w:/s/AppliedDataScience_groups-ActivePal/EdpXMYXbd11Kn5GWD3SVP7QBGFuN1vFCuSC0ix_-mhTNBw?e=W8esJc
Measurement-of-Phy_2016	https://dehaagsehogeschool.sharepoint.com/:b:/s/AppliedDataScience_groups-ActivePal/EYx50LfvSVBPmXaZ2iB5sSwByTgR1hR8Aki17abe5y92AA?e=Kw7o3w
MET Calculations from On-Body Accelerometersfor	https://dehaagsehogeschool.sharepoint.com/:w:/s/AppliedDataScience_groups-ActivePal/EUSEFzKZhKxPjDgtMueTP58BA-js7_tFxQv6kRCA9Mjrkw?e=1ANGwx
Physical activity recognition	https://dehaagsehogeschool.sharepoint.com/:b:/s/AppliedDataScience_groups-ActivePal/EWJfNuKVk6tDpToNRt6DGXoBrwHNjqGZTHbtgPJeaE6hHw?e=yA6mWT