

Feedback, Scaffolding and Problem Solving Support

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'Wissenschaftliches Arbeiten in der Informatik' (Studienordnung ab 2014)

30 min speech + 10 min discussion

3-5 pages written document

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Speech for Proseminar „Intelligente Lehr-/Lernsysteme“

Dr. Christoph Benzmüller

Focus:

What is the best form of feedback to learn dancing ?

Why ?

- Individual feedback from the dance teacher is crucial
- Use new technology (relevant data)
- Different approaches
- Synchronize movement to music
- Fun

Topics

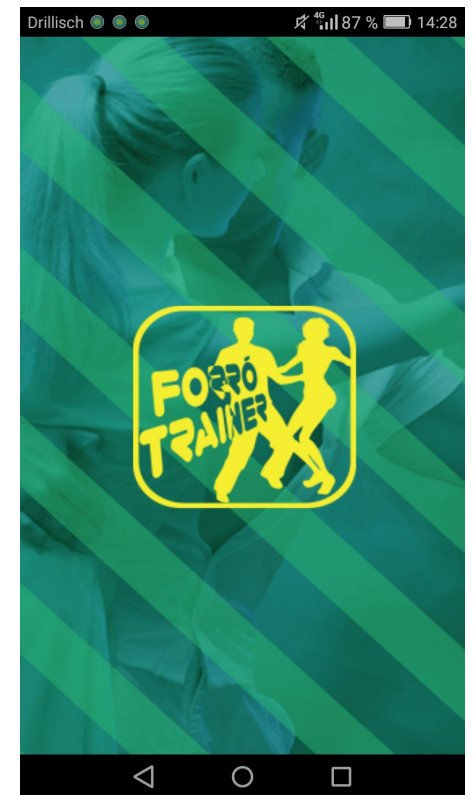
- Focus
- Feedback
 - Summaries
 - Visualisation
 - Narrative Text
 - Acoustic
 - Vibrotactile
- Pros and Cons
- Conclusion

Feedback

- Need input from the learner
- Corrective Feedback
 - Show mistakes
- Explanatory Feedback
 - Show mistakes and give advice

'Let's dance: ...'

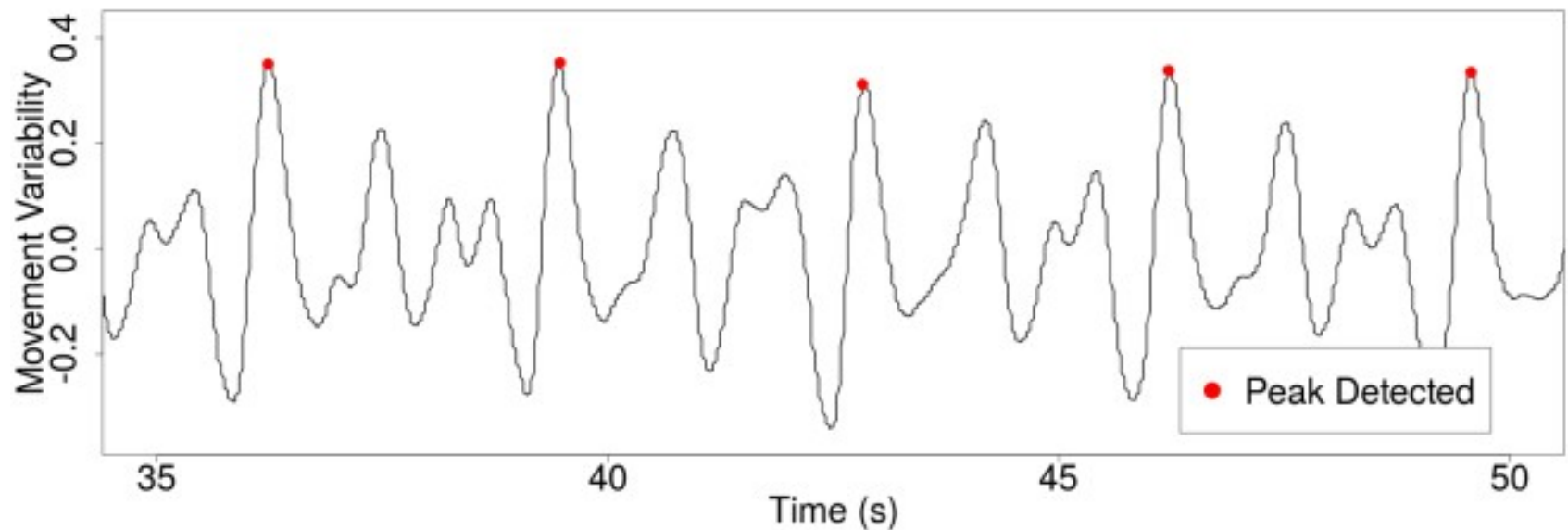
- Work from University of Sydney
- Developed software and made study
- Learn 'Forro'
- Self-learning with app
- Survey about form of feedback



'Let's dance: ...'

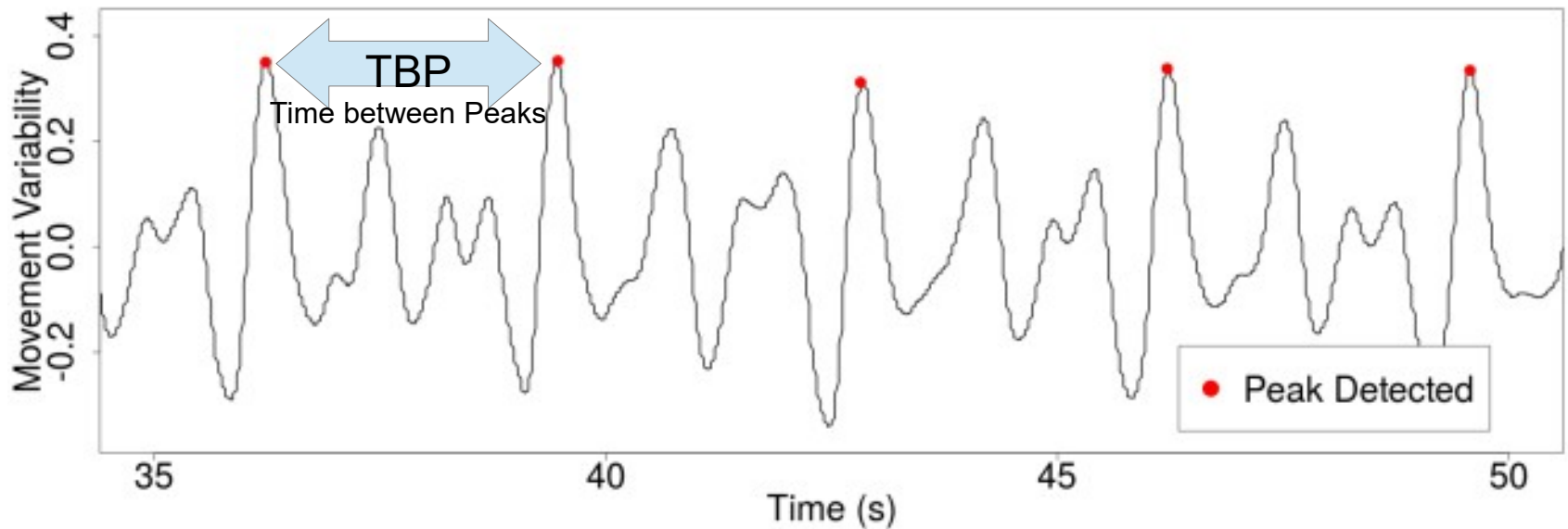
Technical details

- Data :
 - Time (Log-In, Training started)
 - Accelerometer



'Let's dance: ...'

Technical details



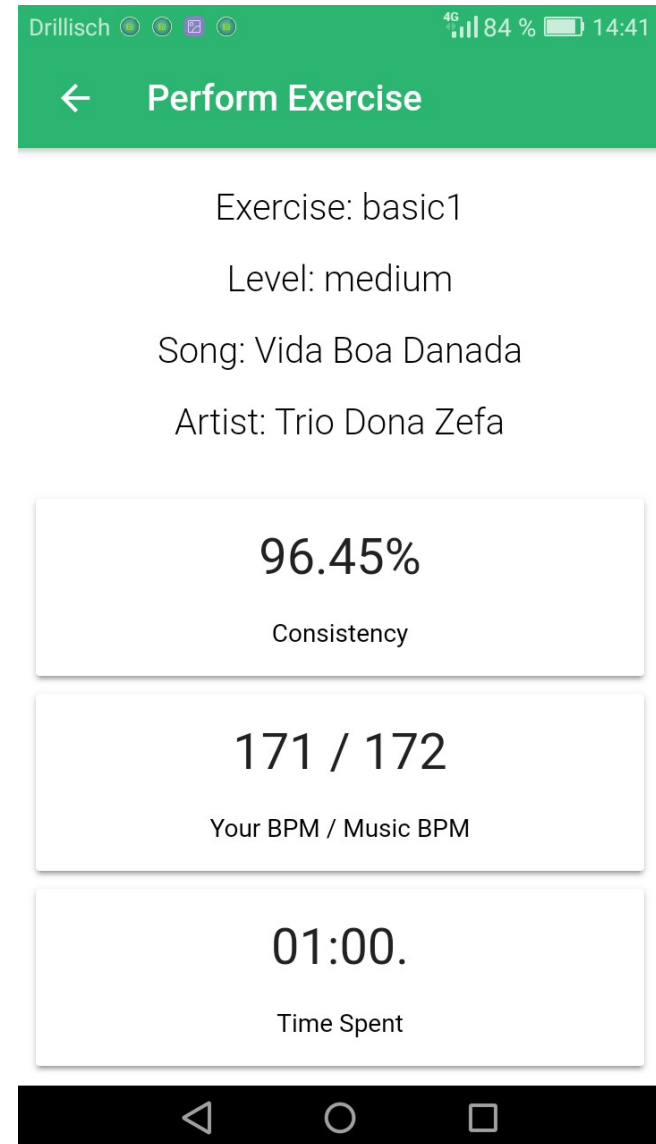
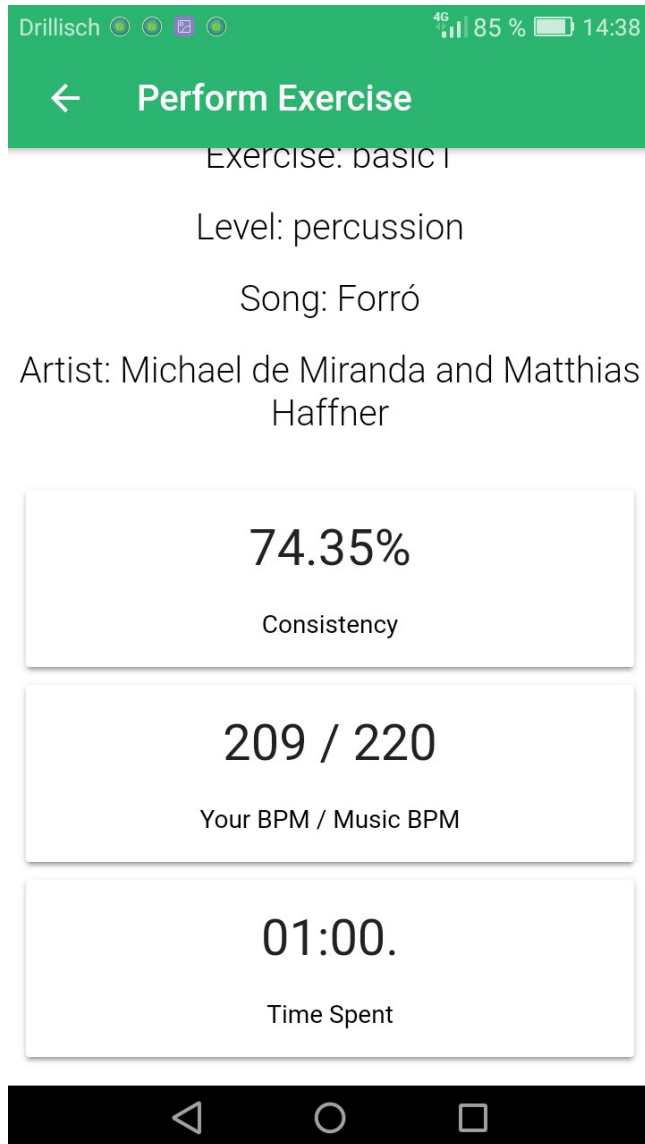
- Generating :
 - BPM $\text{Student's BPM} = \left(\text{TBP} * \frac{1s}{1000ms} * \frac{1min}{60s} * \frac{1}{8} \right)^{-1}$
 - Consistency == Coefficient of variations in percent
 - 100 % means always the same BPM

'Let's dance: ...'

Features

- Rhythm (My BPS / Music BPS)
- Consistency
- Practice (Amount of training sessions)

Summaries

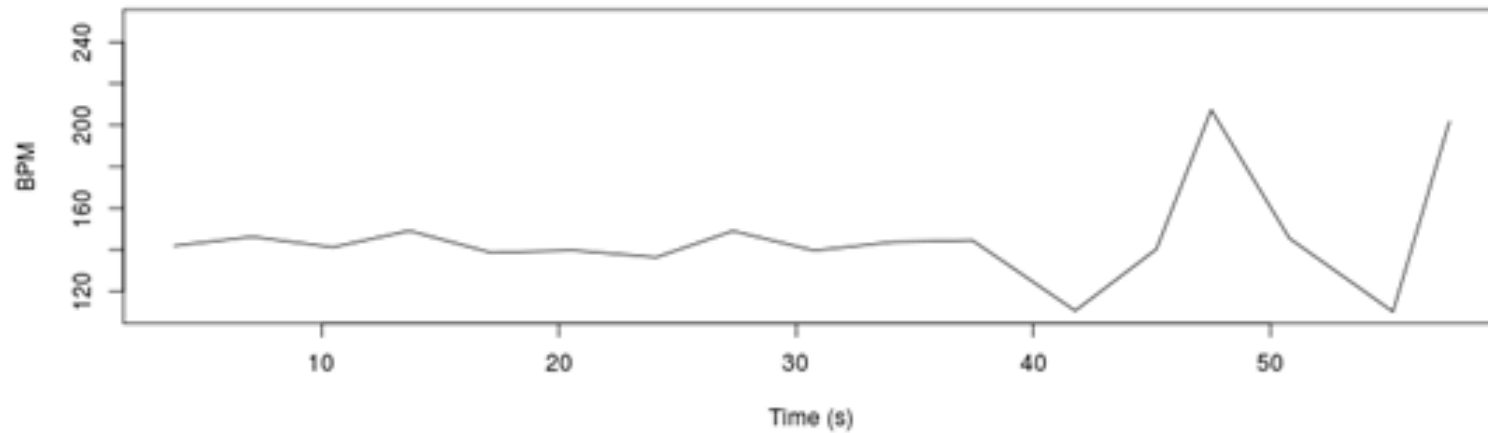


Summaries

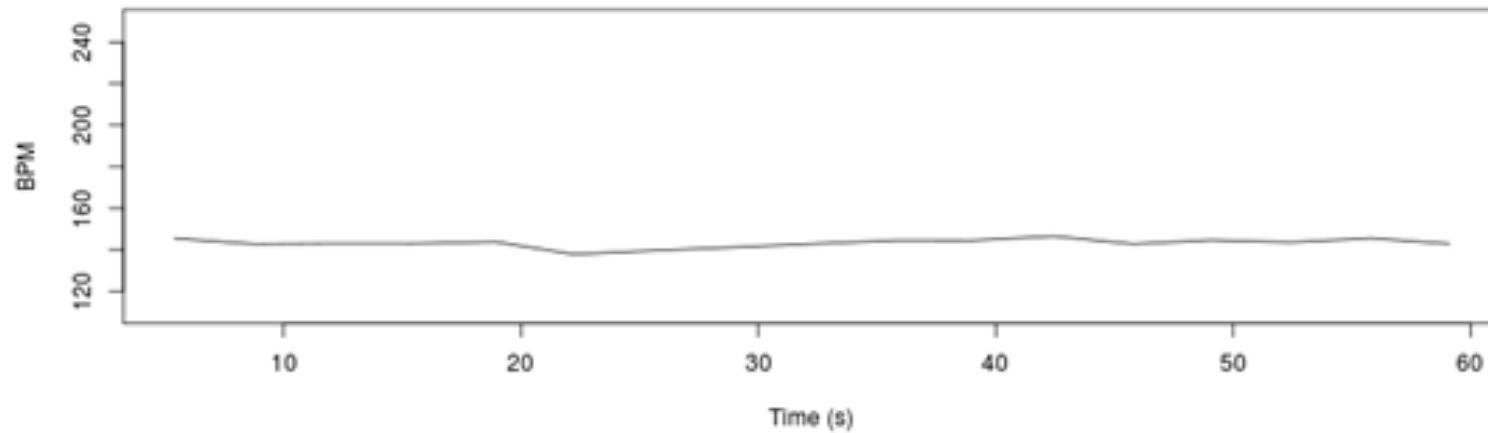
Times practice for each exercise			Times practice for each level		
Name	You	Average per Student	Name	You	Average per Student
Tap	9	20	Percussion	4	3
Weight Transfer	10	2	Slow	21	27
Walking	1	0	Medium	4	9
Basic 1	21	27	Fast	12	12

Visualisations

BPM during worst practice - Nosso Xote - Z axis

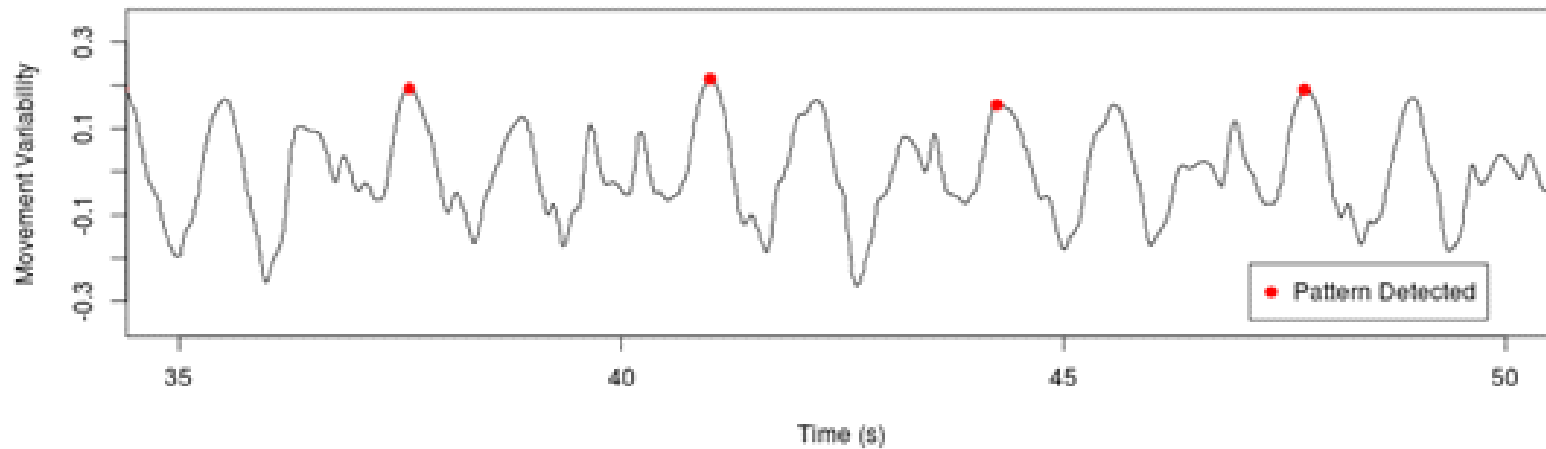


BPM during best practice - Nosso Xote - Y axis

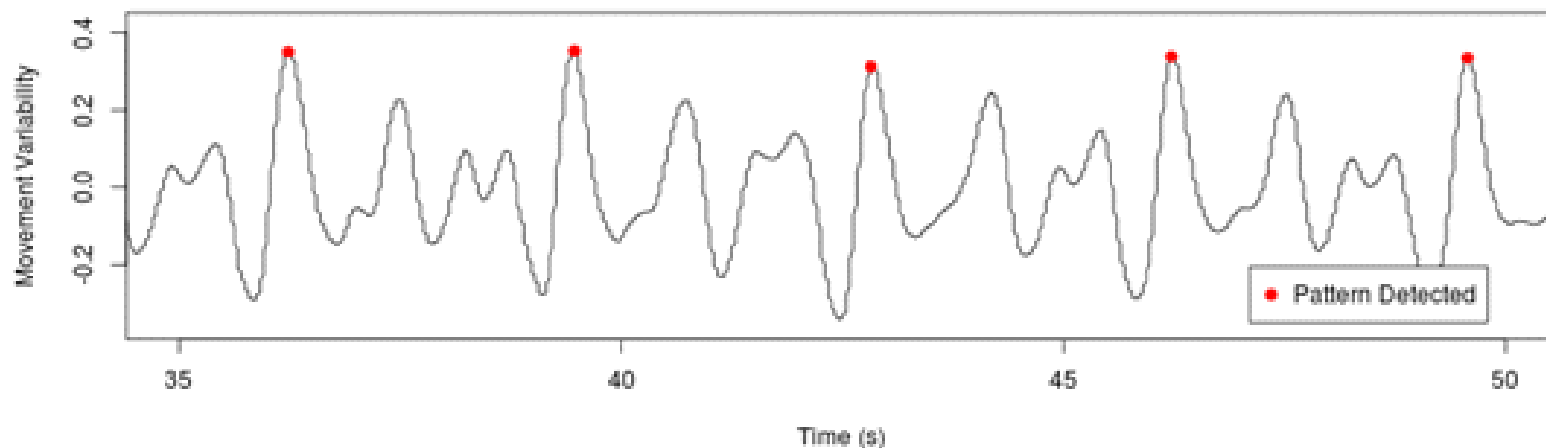


Visualisations

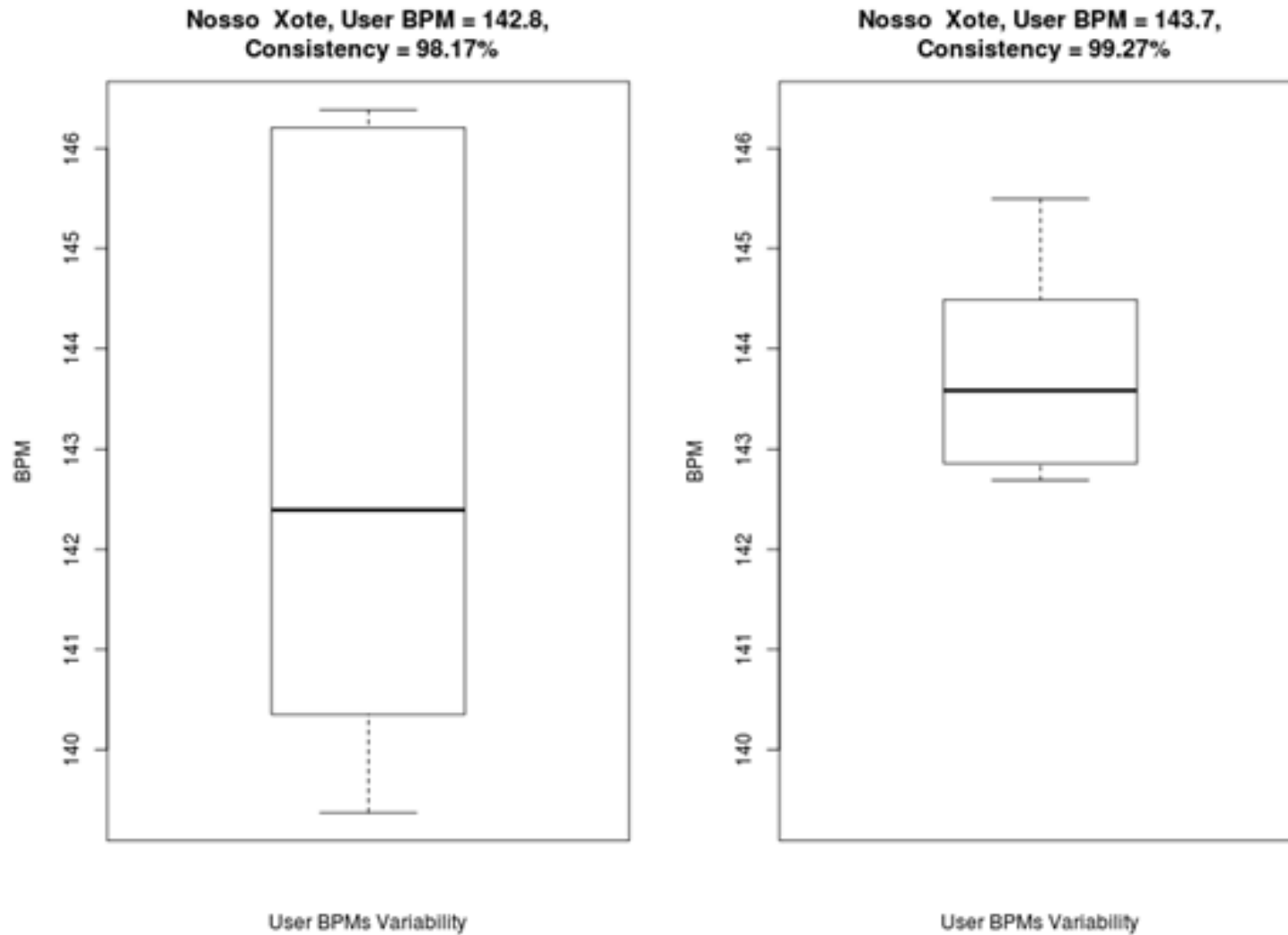
Axis movement on student best practice - Nosso Xote - Z axis



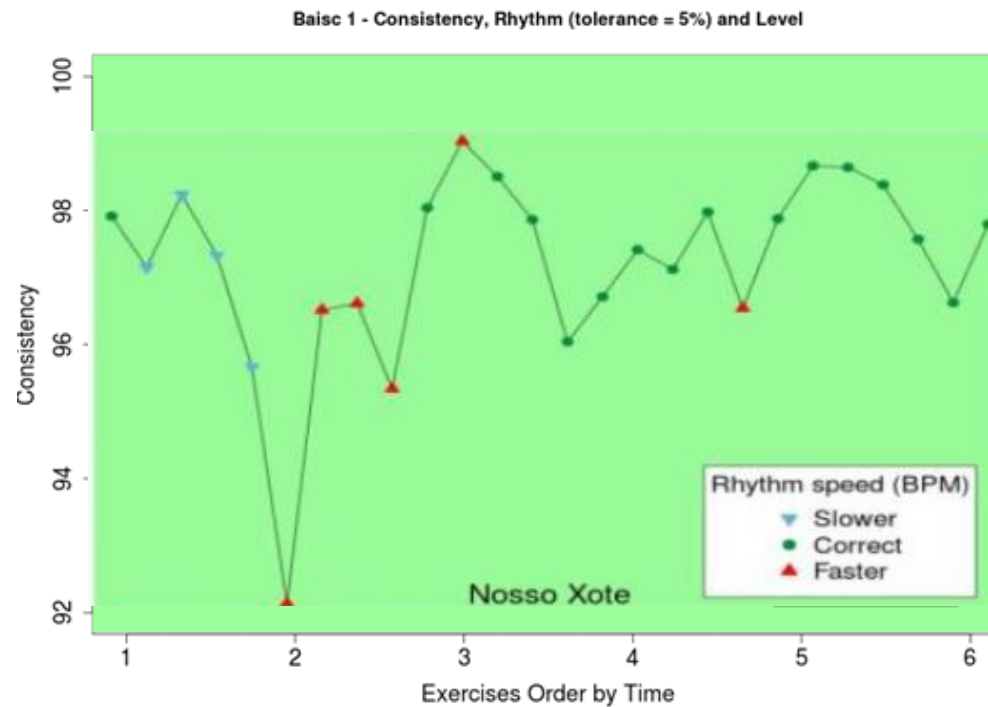
Axis movement on teacher best practice - Nosso Xote - X axis



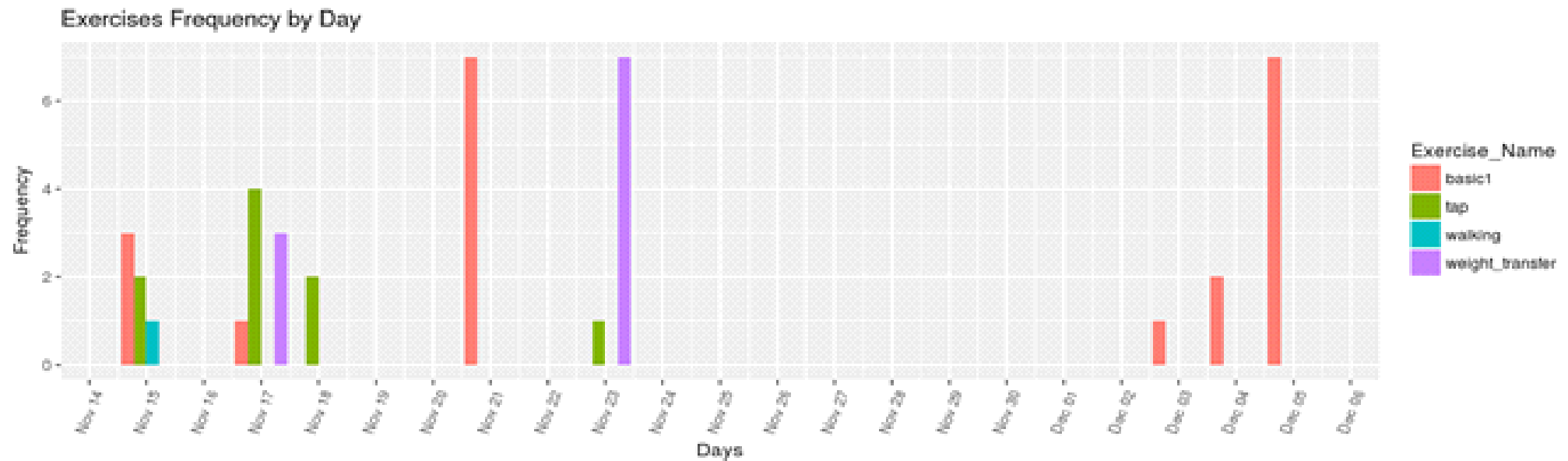
Visualisations



Visualisations



Visualisations



Narrative text

- Consists

- Diagnosis

„Dear student, your average consistency score while doing the Weight Transfer is 92.75%.“

- Actionable feedback

„We suggest you practice more the Weight Transfer exercise so you can reach scores higher than 98%. The Weight Transfer exercise will help you developing mobility in your joints and hips.“

'Saltate! ...'

- Work from Aachen, Germany
- Developed software and made study
- Slow Waltz
- Captured with Xbee
- Acoustic Feedback



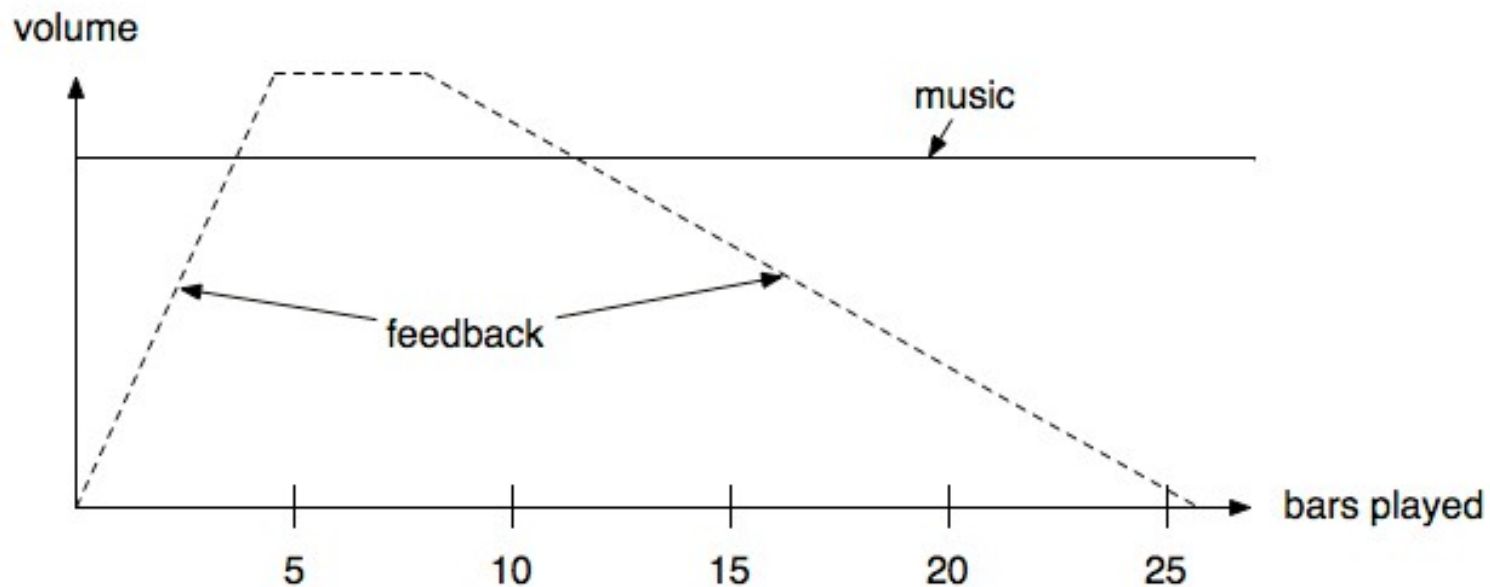
'Saltate! ...'

Technical Details

- Touch sensors for measuring
- Events:
 - Ball touch, Ball leave, Heel touch, Heel leave
- Generating move:
 - Forward Step, Backward Step, Ball Tap and Heel Tap
- Calculate beat closest to move

Acoustic feedback

- If move is wrong
 - Sound played
 - Volume of sound is louder next time



'Learning ... Dance ... with ... Augmented Feedback'

- Work from Aachen (Extension of 'Saltate!...')
- Slow Waltz
- Captured with Vicon MX
- Acoustic feedback
- Vibrotactile feedback

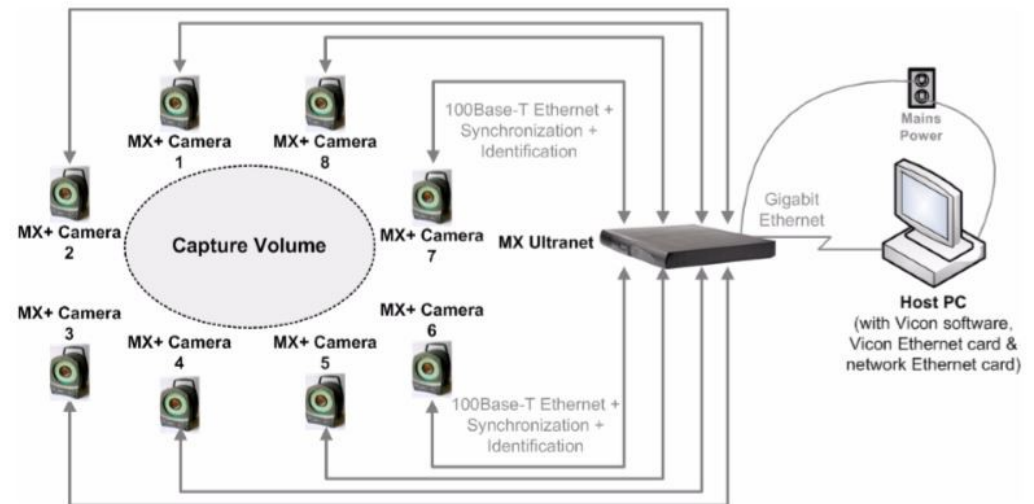


Figure 1-1: Basic Vicon MX architecture

Acoustic feedback

- Approaches
 - Use of stereo
 - Different pitches for different steps
 - Different sounds for different steps
 - Recorded speech
- Play sound/speech at beat/step

Vibrotactile feedback

- Using 4 vibrational devices
 - Front, Back, Left, Right
- Vibration at beat/step

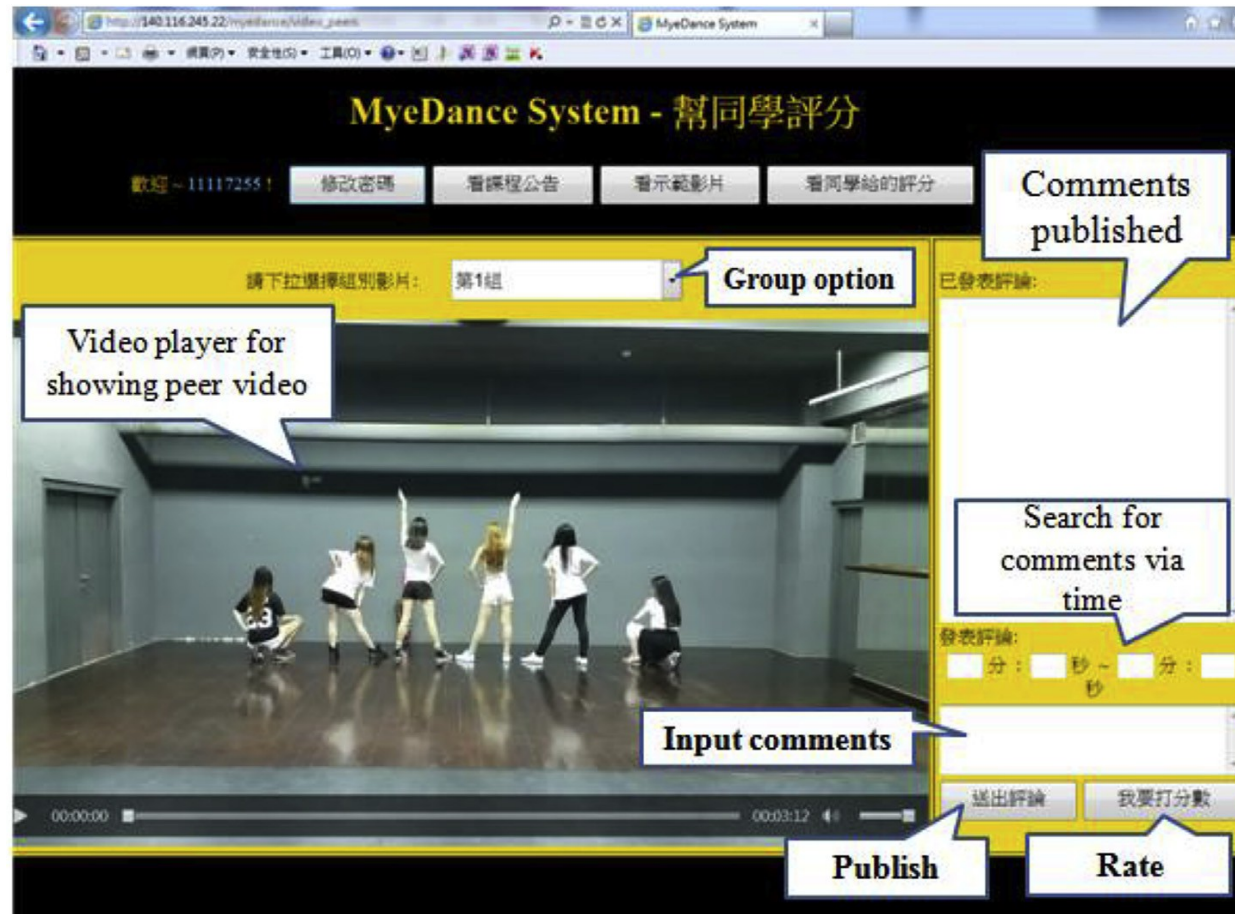
Pros and Cons

	Pro	Cons
Summaries	<ul style="list-style-type: none"> • Clear information • Comparable with the peer or the teacher 	<ul style="list-style-type: none"> • Requires a baseline metric to assess • Corrective feedback
Visualisation	<ul style="list-style-type: none"> • Allows deeper understanding • Comparable with the peer or the teacher 	<ul style="list-style-type: none"> • Requires a baseline metric to assess • Unclear information • Not useful • Corrective feedback
Narrative Text	<ul style="list-style-type: none"> • Clear • Useful • Explanational feedback 	
Acoustic ('Saltate!...')	<ul style="list-style-type: none"> • Clear • Useful 	<ul style="list-style-type: none"> • Corrective feedback
Acoustic (extended work) (No studies)		<ul style="list-style-type: none"> • Corrective feedback
Vibrotactile (No studies)		<ul style="list-style-type: none"> • Corrective feedback

Conclusion

- Narrative text is the only explanatory feedback
- Visualisation and summaries need narrative text to become explanatory feedback
- Summaries and visualisation are good for comparison, but need a baseline metric
- Comparing is not motivational for everybody
- Acoustic feedback is a good form of corrective feedback because it has low latency

Effects of different online peer-feedback



Conclusion

- Accoustic feedback is a good form of corrective feedback, because it has low latency

Conclusion

- Summaries and visualisation are good to compare, but need a baseline metric

Conclusion

- Comparing with the peer is not motivational for everybody

Sources

- (1) Dias Pereira dos Santos, A., Yacef, K., & Martinez-Maldonado, R. (2017, July). Let's dance: how to build a user model for dance students using wearable technology. In Proceedings of the 25th Conference on User Modeling, Adaptation and Personalization (pp. 183-191). ACM.
- (2) Dieter Drobny, Malte Weiss, and Jan Borchers. Saltate! - A Sensor-Based System to Support Dance Beginners. In CHI '09: Extended Abstracts on Human Factors in Computing Systems, pages 3943–3948, New York, NY, USA, 2009. ACM
- (3) Dieter Drobny and Jan Borchers. Learning Basic Dance Choreographies with different Augmented Feedback Modalities. In CHI '10: Extended Abstracts on Human Factors in Computing Systems, New York, NY, USA, 2010. ACM Press
- (4) Moreno, R. & Mayer, R. Educ Psychol Rev (2007) 19: 309. <https://doi.org/10.1007/s10648-007-9047-2>
- (5) Haftendorn, Dörte. „Kurven verstehen durch zwei Perspektiven“.Lecture. Freie Universität Berlin. 8 February 2018

Pictures are taken from this sources

Thank you



<http://d2trtkcohkrm90.cloudfront.net/images/emoji/apple/ios-10/256/woman-dancing.png>