Analysis of log data from within the body
: Learning analytics meets psycho-physiology

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Introduction
Introduction

Understand "Leaners" by their data

Learning Analytics

Who is the Learner?
Introduction

the measurement, collection, analysis and reporting of **data about learners and their contexts**, for purposes of understanding and optimizing learning and the environments in which it occurs (Siemens, 2011)
Introduction

It is all about LEARNERS

How can we know learners’ mind in online learning environment?

- learners’ online log behavior data
- Clustering learners by their online log behavior data
- ...

Introduction

- By survey?
- After 15 weeks of class?

Need fast, real-time data to understand learners in online learning environment

Psychophysiological data
Psychophysiological data
Psychophysiological data

Cognitive, emotional and behavioral responses emerged by physiological principles and phenomenon (Cacioppo & Tassinary, 1990)
Psychophysiological data

1) Advantages

- **Objectivity of data (Ravaja, 2004)**
  - Responses from autonomic nervous system
  - Able to get learners’ unconscious psychological data

- **Time series data (Lee, 2008)**
  - Able to observe changes of learners’ responses over time
  - Do not need learners’ remembrance
Psychophysiological data

2) Disadvantages

- **Measurement issues**
  - Need enough time to measure baseline data
  - Relatively expensive equipment
  - Uncomfortable measure experience

- **Difficulty of definition**
  - Hard to match each physiological status to a psychological factor
  - Unstable psychological construct (Fusco et al, 2014)

Need to study about relationships between psychological factor and physiological data by using variety of psychophysiological data
Psychophysiological data

3) Examples

- **Eye Movement**
- **Brain Activity**
- **EDA** (Electrodermal Activity)
- **ECG** (Electrocardiogram)
Psychophysiological data

3) Examples
Psychophysiological data

3) Examples

The computer calculates that there is a **96%** chance that **this** is a smile.

**Smile**
The system is correctly registering her facial expression as a smile.

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**Tracking Points**
The system identifies 25 points on the face and tracks their movements.

The software uses the angle between the two inner eye corners to estimate a head roll.

A smile is calculated by the motion and the change in the angle of the points around the mouth.

By SERGIO PEÇANHA and XAQUÍN G.V./THE NEW YORK TIMES
Psychophysiological data

3) Examples
Psychophysiological data

4) Concerns

Different data unit

- Eye-tracker: 60 frames/sec
- Face reading SW: 14 frames/sec
- EEG Sensor: 14 frames/sec
- ECG sensor in Applewatch: A frame per 5 sec

Need criteria to integrate data
Psychophysiological data

4) Concerns

- Risk of privacy invasion

Need more efforts to protect learners’ right
Psychophysiological data

5) Stimulated Recall Interview

- Find reasons of responses

**HOW?**

- Using Morae
- Within 48 hours
- Learners’ natural speech about the situation
Psychophysiological data

- Model to use psychophysiological data
Research
Research

1st Stage
[What learners do]
- Observation
- Log data

2nd Stage
[Why learners do that]
- Cause-effect
- Various data
- SR interview

3rd Stage
[How to treat learner]
- Treatment
- E.T approach

Learner Analysis
Research

1) 1st Stage

- Login Time & Frequency
- Time on Movie
- Time on Discussion
- Dropout rate
- Achievement
Research

2) 2nd Stage

- The initial attempt

Psychophysiological approach with Learning Analytics

- Psychophysiological Response
- Behavioral Log
- Test Anxiety Survey
- Achievement
Research

2) 2\textsuperscript{nd} Stage

- Repeat time
- HR rate for Exam
- HR rate for Movie
- Test Anxiety
- Achievement
Research

2) 2\textsuperscript{nd} Stage

- **Second attempt**

- Brainwave data
- Eye behavior data
- Heart Rate data
- Facial Expression data
- Psychophysiological data

Cognitive psychological factors

- Meta Cognition
- Flow
- Cognitive Load
- Motivation

Second attempt
Research

2) 2nd Stage

- Prior Knowledge
  - Major
  - Gender

- Achievement

- Eye behavior

- Heart rate

- Online

- Face expression

- SR Interview

- Cognitive Load

- Engagement

- Metacognition

- Cognitive presence

Methodologies:
- Morae
- Survey
- Eye-tracker
- Apple watch
- Log data
- Affectiva
Research

3) 3rd Stage

[How to treat learner]

Learning → Observation → Prediction → Cause Analysis → Treatment

- Design Model
- Observation Model
- Prediction Model
- Cause-effect Model
- Treatment Model
Q & A
Thank you!

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