Case Matching with Indicator Waves: A method for matching behaviour profiles as indicators for future events

David A. Keatley[1,2] & David D. Clarke[1,3]

[1]Researchers in Behaviour Sequence Analysis, www.ReBSA.co.uk

[2]School of Law, Murdoch University, Perth, 6150, Australia

[3]School of Psychology, University of Nottingham, NG7 2RD, United Kingdom

Temporal analysis of human behaviour has become a primary research focus in Criminology and Psychology. Several temporal methods of analysis of social interaction have been suggested, including T-Pattern Analysis, Behaviour Sequence Analysis, and Survival Analysis. Recently, a novel method of temporal analysis has been proposed: Indicator Waves. This method allows for multiple concurrent and sequential behaviours to be analysed over varying lengths of time. The output can be presented as a series of wave lines showing how likely to occur various indicators are at different points in time. Indicator Waves, therefore, can be read and interpreted by lay audiences and a wider non-academic public. The plots at each time point provide a profile of the presence or absence of indicators at that point in time. The Indicator Waves method will be outlined and explained in the first part of this presentation, with examples related to health and forensic psychology.

The second part of the presentation will outline the next important stage of Indicator Waves analysis: Case Matching. As each time point in Indicator Waves plots represents a profile of which indicators are absent or present, this provides an opportunity to measure a new individual's current state and match them to known profiles on existing Indicator Waves databases. In addition to explaining the function of case matching, a further aim of this part of the presentation is to create collaborations with experts in the field at MASI to develop the best approach for case matching in Indicator Waves. Several approaches to case matching will be outlined and discussed in relation to Indicator Waves. Therefore, the current presentation will give the audience a new method for temporal analysis, and outline how case matching may be conducted using this method. Applications of case matching in Health and Forensic Psychology will be shown.

MICROSTRATEGIES IN INTERRUPTION MANAGEMENT

Stephan Huber1, Michael Weng2, Tobias Grundgeiger1, & Penelope M. Sanderson3

1University of Würzburg, 2TU Berlin, 3The University of Queensland

Grundgeiger et al. [1] observed in an intensive care unit that nurses performing equipment checks were more likely to defer an interruption from a colleague if they could see the next steps of their task on the equipment screen. We conceptually replicated elements of the nurses' task and tested in a series of four controlled laboratory studies whether visual cues support interruption management [2].

Participants' primary task was to complete and verify several sets of linked arithmetic equations on a screen. An animated virtual character interrupted the participant at different occasions. Participants then chose whether or not to defer a response to those mimicked social interruptions until finishing their current set of linked equations.

Our results indicated that the presence of visual cues can influence their decision to defer an interruption. Post-hoc we used the T-pattern-detection of Theme to further analyse participants' behaviour during interruption lags – the time from the first occurrence of an interruption until the interrupted person responds to it. Following the maximum length of an interruption lag we searched the interaction log files for patterns lasting 30 seconds or less. By grouping the returned patterns according to the participant's last action in the primary task before they turned to the interrupting task, we identified five different microstrategies. Participants switched tasks (1) after finishing the current set of equations, (2) immediately after the invitation, (3) after finishing only single equations but not the entire set, (4) in response to a warning by the virtual character, or rarely (5) because the program forced them to after they ignored the virtual character for too long.

Across all four experiments the choice of a microstrategy depended on how many equations were left to finish the current set when the interruption occurred. In two experiments the presence of the visual cue influenced the choice of strategy. Participants in the two experiments conducted in German were more likely to defer their response until receiving the first warning than participants in the two experiments conducted in English.

1. Grundgeiger, T., Sanderson, P. M., Beltran Orihuela, C., Thompson, A., MacDougall, H. G., Nunnink, L., Venkatesh, B. Prospective memory in intensive care nursing: A representative and controlled patient simulator study. Ergonomics, 56(4), 579-589. 2013. 2. Weng, M., Huber, S., Vilgan, E., Grundgeiger, T., Sanderson, P. M. Interruptions, visual cues, and the microstructure of interaction: Four laboratory studies. International Journal of Human-Computer Studies, 103, 77-94. July 2017.

T-patterns, self-similarity and external memory from the RNA world and DNA to the only mass-social string-controlled animals: modern human citizens appeared in a biological eye-blink.

Magnus S. Magnusson

Human Behavior Laboratory, University of Iceland, Iceland

Email: msm@hi.is, +354-6952098

Abstract

Beginning in the early 1970's, this longstanding primarily project concerning social interaction and organization in social insects and primates including humans, was initially inspired mainly by the work of N. Tinbergen, who with K. Lorenz and von Frisch shared the Nobel Prize in Medicine or Physiology in 1973 for their ethological research and discoveries. The smallest creatures they studied were social insects and there was no mentioning of self-similarity or any nanoscale actors nor of Cell Societies (better named protein societies). The work on this project focusing on pattern definitions has resulted in the self-similar fractal-like T-pattern recurring with statistically significant translational symmetry. Resulting also in the creation of the special purpose software THEME™ (hbl.hi.is and www.patternvision.com) allowing their abundant detection in animal and human interactions and later in neuronal interactions, showing T-patterned self-similarity of interaction between and within brains (Magnusson et al 2016; Casarrubea, 2015). T-patterning in DNA and proteins was then noticed. Moreover, T-pattern based self-similarity in social behavior and organization from "Cell City" (protein cities) to the very recent and only large-brain mass-societies; those of modern humans. Not existent in the mass-societies of insects (hives) and cells (animal bodies), but essential in protein and human mass societies are long T-patterned strings external to and far more durable than the citizens. That is, strings of molecules in protein cities, but of letters in human cites after the fundamental invention of writing now with standardized, massively copied, distributed, promoted and enforced letter strings (texts) called among other legal or holy. A form of efficient external memory finally allowing the development of modern mass-societies, science and technology. The extensive self-similarity implicating T-patterns in time and space across so many levels of biological organization and orders of magnitude suggests that T-patterns are biologically important including in social interactions.

Presenting author details
Full name: Magnus S. Magnusson
Contact number: +3546952098
Twitter account: @magnussmagnuss1
Linked In account: www.linkedin.com/in/magnussonms
Session name/ number:
Category: Oral presentation
Personal Email: msm@hi.is
• Date of Birth: 25-feb-1949
• Postal Address: Tjarnargata 40, IS101 Reykjavík, Iceland.

Behavioral Patterns of Children Involved in Bullying Episodes

Carlos Santoyo Velasco

Universidad Nacional Autónoma de México

This study applied a systematic observation strategy to identify coercive behavioral patterns in school environments. The aim was to describe stability and change in the behavioral patterns of children identified as victims of bullying. To this end, the following specific objectives were defined: (1) to identify episodes of bullying based on the frequency of negative behaviors received and power imbalances between bully and victim; (2) to describe stability and behavioral changes in student victims based on their social and academic conduct and the aggression they receive from peers and teachers; and (3) to describe the functional mechanisms responsible for the process of social organization (i.e., the Social Effectiveness, Social Responsiveness, and Social Reciprocity Indexes). The sample consisted of nine children identified as victims, nine classified as bullies, and nine matched controls, all elementary school students from the study developed at the National Autonomous University of Mexico files. A multidimensional/idiographic/follow-up observational design was used. Observational data describes asymmetry between victims and bullies based on microanalyses of the reciprocity of their behavioral exchanges. In addition, the behavioral patterns of victimized children were identified in relation to their academic activity and social relationships with peers. A model of coercive reciprocity accurately describes the asymmetry found among bullies, victims, and controls. A reduction in victimization was found to be related to: (1) responsiveness to the initiation of social interactions by peers and teachers; and (2) the time allocated to academic behavior during the study.

MOTORLAT and PATHoops to detect Profiles of Motor Laterality in young athletes' performance of simple to complex movements*

Marta Castañer[1, 2], Juan Andueza[1], Raúl Hileno[1], Sílvia Puigarnau[1], Queralt Prat[1] and Oleguer Camerino[1, 2]

[1] National Institute of Physical Education of Catalonia (INEFC), University of Lleida, Spain.

[2] Lleida Institute for Biomedical Research Dr. Pifarré Foundation (IRBLLEIDA), University of Lleida, Spain.

INTRODUCTION

Laterality is a key aspect of the analysis of basic and specific motor skills. It is relevant to sports because it involves motor laterality profiles beyond left-right preference and spatial orientation of the body. The aim of this study was to obtain the laterality profiles of young athletes, taking into account the synergies between the support and precision functions of limbs and body parts in the performance of complex motor skills. We went beyond the traditional procedures for detecting laterality (for a review, see Edlin et al., 2015), which were established on the basis of the terms left-handedness and right-handedness as they are used in sport sciences (for a review, see Tran and Voracek, 2016). Instead, we used the term motor laterality profile—right, left or mixed—which encompasses the whole body, taking into account the lateral synergy that merges postural support and gestural precision (Castañer et al., 2017).

In sum, we believe that the determination of laterality profiles should include a more detailed study of laterality in relation to the performance of the fundamental and specific motor skills that make up complex movements. Thus, the overall objective of this study was to obtain a broad view of motor laterality profiles by applying two complementary instruments, one which analyzes the contralateral distribution of postural support and gestural precision in a broad spectrum of motor skills (from simple to complex), and another which allowed us to detect spatial orientation by presenting participants with a novel motor situation that activated an ideomotor action as an empirical domain of the perception-action integration framework.

METHOD

We applied two instruments: (a) MOTORLAT, a motor laterality inventory comprising 30 items of basic, specific and combined motor skills, and (b) the Precision and Agility Tapping over Hoops (PATHoops) task, in which participants had to perform a path by stepping in each of 14 hoops

arranged on the floor, allowing the observation of their feet, left-right preference and spatial orientation. A total of 96 young athletes performed the PATHoops task and the 30 MOTORLAT items, allowing us to obtain data about limb dominance and spatial orientation of the body in the performance of complex motor skills. Laterality profiles were obtained by means of a cluster analysis and a correlational analysis and a contingency analysis were applied between the motor skills and spatial orientation actions performed.

RESULTS and DISCUSSION

The results obtained using MOTORLAT show that the combined motor skills criterion (for example, turning while jumping) differentiates athletes' uses of laterality, showing a clear tendency towards mixed laterality profiles in the performance of complex movements. In the PATHoops task, the best spatial orientation strategy was 'same way' (same foot and spatial wing) followed by 'opposite way' (opposite foot and spatial wing), in keeping with the research assumption that actions unfolding in a horizontal direction in front of an observer's eyes are common in a variety

CONCLUSIONS

The objective of this study was to further our understanding of body laterality, taking into account the two main functions combined by the upper and lower limbs of the body—precision and support—as well as the spatial direction and orientation of the body. To achieve this objective, we used a combination of two instruments—the MOTORLAT inventory and the PATHoops task—to describe the "tapestry" of motor skills and contextual aspects that make up the singular style of each participant. In particular, spatial orientation and turning and jumping—which demand more complexity of movement—are described in this study. The 30 MOTORLAT items cover a range of movements from simple to complex motor skills, allowing experts to choose which ones might be of interest. The PATHoops task is a good complement for observing the spatial orientation strategies employed by participants. We consider that both instruments are a good fit for motor laterality studies because there is a need for deeper study of the motor skills underpinning the complex moviments. Our next research step is to conduct a mixed method design that includes t-pattern detection technique.

REFERENCES

*This communication belongs to a recent published paper:

Castañer M, Andueza J, Hileno R, Puigarnau S, Prat Q and Camerino O (2018) Profiles of Motor Laterality in Young Athletes' Performance of Complex Movements: Merging the MOTORLAT and PATHoops Tools. Front. Psychol. 9:916.

OTHER REFERENCES

Castañer, M., Barreira, D., Camerino, O., Anguera, M. T., Fernandes, T., and Hileno, R. (2017). Mastery in goal scoring, T-pattern detection and polar coordinate analysis of motor skills used by Lionel Messi and Cristiano Ronaldo. Front. Psychol. 8:741.

Edlin, J. M., Leppanen, M. J., Fain, R. J., Hacklander, R. P., Hanaver-Torrez, S. D., and Lyle, K. B. (2015). On the use (and misuse?) of the Edinburgh Handedness Inventory. Brain Cogn. 94, 44–51.

ACKNOWLEDGEMENTS

Coach-athlete dyad in professional football: a qualitative ecological dynamics approach

Daniel Duarte[1,2], Pedro Teques[2,3] and Nuno Pimenta[1,2]

[1]CIDESD-ISMAI, Instituto Universitário da Maia, Portugal

[2]N2i, Instituto Politécnico da Maia, Portugal

[3]CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Portugal

The coach-athlete relationship has been discussed in the literature across a wide variety of topics (e.g., Jowett & Cockerill, 2003). However, the dynamics of the coach-athlete dyad in collective sports has been neglected. Thus, the aim of this study is to explore the dynamics of the coach-athlete dyad in professional football, specifically related to the psychosocial and environmental factors that may influence the actions of each of the parties and the consequent responses. Participants were 12 coaches and 12 footballers from the First and Second Portuguese Professional Football leagues. Coaches and athletes constituted 12 dyads and were conducted 24 interviews individually. Data collection, transcription and analysis were performed according to the principles of thematic analysis (Braun & Clarke, 2006). A script with open questions based on literature about the coach-athlete relationship was created. Additionally, it was interest that the script was the same for both coaches and athletes, where only change the subject of the question. The results evidenced three general categories of the coach-athlete dyad that potentially influence the actions of both actors: psychological, sociological and environmental factors. Regarding the psychological factors, leadership, motivation techniques, mutual trust, discipline and ethics emerged. From the sociological factors, the participants emphasized motivational speech and group management. Lastly, specifically the environmental factors were the culture of the club and the influence of third parties (i.e., agents, family). In addition to the factors that may influence the relationship, personal discourse was considered to illustrate the consequences of the actions of both actors of the dyad. The present study may contribute to the research and practice about the coach-athlete relationship, presenting an ecological and dynamic view of the factors that seem to influence the actions of both actors of the dyad. In addition, they seem to be processes that facilitate a set of consequences on the relationship. This ecological approach to the phenomenon may also provide sport psychologists and coaches with a holistic understanding of the role of coach and athlete in achieving collective sports performance.

References

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*. 77-101.

Jowett, S., & Cockerill, I.M. (2003). Olympic medalists' perspective of the athlete-coach relationship. *Psychology of Sport and Exercise*, *4*, 313-331.

Combining information from multiple sources: SEM approach for understanding the precursors of human behaviour in sport

Pedro Teques

[1]N2i, Instituto Politécnico da Maia, Portugal

[2]CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Portugal

Over the last few years, researchers described the multiple types of data sources using diverse research designs – qualitative, quantitative, observational, electronic, images, and sensor data, among others – that might be used to improve the level of detail to understand behaviour in sport. Multivariate statistical analyses have long used to improve the quality of research designs that used a large amount of data from surveys, and we noted how a number of studies are currently published using structural equation modelling (SEM) analysis in social and sports sciences. These investigations share common features, specifically related with data from surveys. However, our approach is that information from other different sources (e.g., systematic observation, surveys) could be combined. In this work, I will present statistical methods for combining information, identify research needs, and propose steps that can be taken to facilitate a new paradigm for understating precursors of behaviour in sport. That paradigm would shift from sole reliance on surveys to a system that relies on surveys along with in situ observations and other research methods, making use of the strengths of each data source. I will describe research that are currently produced and summarizing some of the features of data sources that might be combined. Next, I will summarize the statistical methods that have been proposed for combining information using data from two studies with coaches and parents in sport, where the choice of method was reliant on the research purpose, the nature of the available data, and other considerations related with coaches' and parents' behaviours. Finally, I also outline research that is needed in the area of statistical methodology and describe a framework for promoting the development of methods for combining data sources.

Keywords: coaching behaviours, multiple data sources, parents' behaviours, research methods, structural equation modelling.

LINCE PLUS: new computer video-graphic record program

Alberto Soto1, Oleguer Camerino1, 2, Marta Castañer1, 2, and M. Teresa Anguera3

1 National Institute of Physical Education of Catalonia (INEFC), University of Lleida, Spain.

2 Lleida Institute for Biomedical Research Dr. Pifarré Foundation (IRB-LLEIDA), University of Lleida, Spain.

3 Faculty of Psychology, Institute of Neurosciences, University of Barcelona, Spain.

INTRODUCTION

LINCE (Gabin, et al. 2012) is a computer video graphic record program that from 2012 has been consolidated, and its use has increased in multitude of investigations of many ambiences, and especially in the sport and the psychology.

In the next months, there will be available a new version (LINCE, V2), which increases the possibilities of the current one. It will be characterized essentially by the incorporation of the option of work in group of several investigators from any device with Internet connection, including the support to tactile devices and, also, being able to realize the work from several videos simultaneously. On having used diverse in sync videos, we will be able to extend the analysis of the behavior with different identical records (to control the quality of the fact) or complementary (to enrich it by means of different perspectives of the observed episodes) and to contribute instantaneous statistical calculations on having incorporated the statistical engine of the software R, of Bell Laboratories and supported by Lucent Technologies (Iaka and Gentleman, 1996)

METHODS

The platform Lince (Gabin et al. 2014) has successfully used in many investigations (Hernández-Mendo et al., 2014), with big support of the community, giving viable answers the scientists who have used it but causing that as tool has found an architectural barrier.

The natural evolution of the platform centers on the possibility of settling and/or of being used in any operating system or platform, including tablets and mobiles. The above mentioned evolution will not affect to the privacy of the information, making possible that the technological progress does not reverberate by no means in the fulfillment of the ethical requisites.

RESULTS AND DISCUSSION

The resultant software allows the execution of tasks of visualization and record of information of form collaborative, allowing, also, that the statistical calculations to be realized from an engine

based in java and R (Ruiz and López, 2009) thanks to the adaptations of the free code of BeDataDriven (http://www.bedatadriven.com/).

CONCLUSION

There appears a new version of the program LYNX that allows the investigator to have a compacted tool, that is characterized for; the shared visualization, the record allows collaborative uses and the analysis of the conducts in an agile and versatile platform of free software; that in the future will be able to incorporate artificial intelligence skills.

REFERENCES

-Gabin, B., Camerino, O., Anguera, M. T., and Castañer, M. (2012). Lince: multiplatform sport analysis software. Procedia - Social and Behavioral Sciences, 46, 4692-4694. doi: 10.1016/j.sbspro.2012.06.320

-Hernández-Mendo, A., Castellano, J., Camerino, O., Jonsson, G.K., Blanco, A., Lopes,A., & Anguera, M.T. (2014). Programas informáticos de registro, control de calidad del dato, y análisis de datos. Revista de Psicología del Deporte, 23(1), 111-121.

-Ruíz, M. y López, E. (2009). El entorno estadístico R: ventajas de su uso en la docencia y la investigación. Revista Española de Pedagogía, 67(243), 255-274.

-Iaka, R. & Gentleman, R. (1996). R: A language for data analysis and graphics, Journal of Computational and Graphical Statistics, 5, pp. 299-314.

ACKNOWLEDGEMENTS

COMPLEMENTARITY BETWEEN T-PATTERNS AND POLAR COORDINATES ANALYSIS WITH ANONIMIZED DATA FROM DAILY LIFE: MORE ABOUT INTEGRATION OF RESULTS

M. Teresa Anguera. *University of Barcelona, Barcelona, Spain*

Gudberg K. Jonsson. *Iceland University. Rejkyavík, Iceland*

Pedro Sánchez-Algarra. *University of Barcelona, Barcelona, Spain*

In the study of daily life we consider that observational methodology is the best approach to study the hidden structures underlying an interactive situation, and from a previous observation instrument build *ad hoc*, and that implies some dimensions and a category system for each dimension, and later a systematic record of episodes in a same situation.

Both techniques of data analysis imply a possible convergence in results in the study of social behavior, with independence of field of study: Detection of T-Patterns and polar coordinates analysis.

Detection of T-Patters implies the discovering of hidden relations that should reveal us those aspects of social interaction that are not immediately observable. The recorded episodes of behavior are governed by structures of varying stability, and can be visualize by obtaining T-Patterns, that have proven to be an exceptional analytical tool. These temporal patterns can be detected with THEME 6.0.

Polar coordinates analysis search a vectorial image of the complex network of interrelations between categories that make up the different dimensions of the observation instrument. The values of length and angle of vectors, and their graphical representation is achieved by free software HOISAN. .

The aim of this paper is to analyze the degradation of T-Patterns from first until the last, and study some convergence through polar coordinate analysis.

Method

We worked with two successive sessions of anonymized data from daily life, in order to analyze comparatively two techniques of data analysis: the T-Patterns detection and polar coordinates analysis. Both techniques of data analysis have a common aim, that is to discover some hidden relations between observed behaviors, but each one has a different algorithm and aims.

Results

We compare the degree of convergence between the results of codes relations obtained from both techniques.

Key words

T-Patterns, degradation of T-Patterns, polar coordinates, parameters, variability of relations

Corresponding author:

M. Teresa Anguera
Department of Social Psychology and Quantitative Psychology
Faculty of Psychology
Campus Mundet
Pº Vall d'Hebrón, 171
08035 Barcelona, Spain
E-mail: tanguera@ub.edu

Theme Analysis of Data Collected with Smart Devices

Jonsson, G.K.

Human Behaviour Laboratory, University of Iceland

Abstract

The tech world is creating a future of wearable devices that promises to entertain consumers and help them live healthier lives. Technology companies' interests in health and wellness have sparked the creation of a myriad of wearable devices, from fitness bands that monitor activity and sleep patterns to flexible patches that can detect body temperature, heart rate, hydration level and more. These devices produce data that, often enabled with analytics, can be used by consumers to manage their health and potentially increase well-being and reduce costs through systems such as remote monitoring. As wearable technology becomes cheaper and more sophisticated, and data quality improves, these devices and their associated apps will become a part of consumers' lives and the health ecosystem. The presentation focuses on analysing merged pilot data obtained with different devices.

Emotional autoregulation development: T-Patterns detection in a classroom

Marina Alarcón

University of Barcelona, Spain

University of La Frontera, Chile

M. Teresa Anguera

University of Barcelona, Spain

Paula Samper

University of Valencia, Spain

Abstract

Introduction

Emotional autoregulation processes collaborate to reduce the risk about aggressive behaviors and other maladjusted behaviors in psychosocial area of human behavior. For this reason, they have been considered as protector factors than make easier the adaptation of each person from childhood until adulthood. This is very good to promotion idoneous behaviors in classmate relationships, academic performance, interpersonal auto efficacy, and emphatic auto efficacy.

The communication network that there is in a classroom implies several interaction modes, with specific rules and codes that are reciprocally interdependent. The aim of this work is to identify communication patterns in everyday verbal and nonverbal behavior in the classroom.

Method

Because of its flexibility, observational methodology can be used in a classroom, and during one session. This is an exploratory study, and we use direct and indirect systematic observation, in order to focus verbal and vocal behaviors from tape recordings.

Researchers need a system that allows them to objectively record and analyze verbal and vocal behaviors. If record data are processed appropriately, it is possible to carry out a rigorous quantitative analysis in order to evaluate emotional autoregulation processes.

The first step of the process is decide how to organize the heterogeneous information available through an 'ad hoc' observation instrument.

Second step is to record and code the data, through some decisions. As a consequence, we obtain a matrix of codes. The columns correspond to the dimensions of observation instrument, while the rows correspond to the successive units observed over time. The matrix is thus created by assigning each of the observation or textual units to the corresponding category within the corresponding dimension to ensure correct coding. Each row shows the string of codes for categories that occur simultaneously. In this methodological paper we have worked with simulated data that corresponds to a program intervention in clinical psychology, considering the specific scientific literature.

Third step consists on the adjustment of data matrix, in order to get the THEME, v. Edu software requirements, and the analysis of data, in order to detect T-Patterns.

Discussion

We will comment the results, in order to identify communication patterns in everyday verbal and nonverbal behavior in the classroom.

Conclusion

We expect that the T-Patterns structure could be an important evidence about emotional autoregulation processes in a classroom.

Post-processing T-patterns Using External Tools from a *mixed method* perspective

István Szekrényes

University of Debrecen

szekrenyes.istvan@arts.unideb.hu

Mixed methods research represents "a new movement, or discourse, or research paradigm (with a growing number of members) that has arisen in response to the currents of qualitative research and quantitative research" (Johnson et al., 2007, p.113). Many researchers do not mix qualitative and quantitative approaches in optimal ways, according Powell, Mihalas, Onwuegbuzie, Sulto, & Daley (2008), but qualitative techniques can be used to enhance the development of quantitative instruments, as scales, and vice versa (Collins et al., 2006). Its potential is very broad, and includes instrument fidelity, "maximizing the appropriateness and/or utility of the instruments used, whether quantitative or qualitative)" (Onwuegbuzie, Bustamante, & Nelson, 2010, p.57).

The aim of our work is oriented in this direction focusing some concrete methodological issues which are related to post-processing technics of hidden patterns detected in time-aligned data. The developments are motivated by the research questions (Hunyadi et al., 2016a) of the HuComTech project (Hunyadi et al., 2016b) aims at exploring the temporal structure of multimodal communication based an annotated corpus which contains 50 hours of spontaneous speech in both formal and informal situations. For T-pattern detection, we used the Theme program (Magnusson 2000). Although it has several excellent functions for post-analyzing the resulting hidden patterns of behavior (e.g. visualizing pattern structures, filtering results by event types and quantitative attributes, separating markers, predictors etc.), it cannot be really required that they satisfy the needs of every custom research. If any special demands arise which can not be handle within the tool, one can achieve other ways of processing by using the built-in option of data extraction as the first step. Conversion of behavioral data (as the input of detection) is supported by ELAN (Wittenburg et al., 2006), but there is no available tool for importing the resulting T-patterns back into the various software environments (they are usually annotation tools) where the data originally created. However, it would be beneficial to see the patterns as "part of the data" aligned with the source media (audio and video files) and supported by the special processing functions of the particular environment. Another issue is that if we want to analyze behavioral data separately (and not using "multisample files") but interested in the common patterns of different datasets, it is better to consider the exported output tables of Theme as an almost-ready relational database they have to be converted. The current study aims to demonstrate some practical solution for the above mentioned issues selecting Praat (Boersma et al., 2016), ELAN, MySQl and XML as target

environment. Once they are tested on our multimodal corpus, we are ready to share the methods and our results with the growing research community of this specific field.

References

1. D. Boersma, P., Weenink, D. Praat (2016). Doing phonetics by computer [computer program]. version 6.0.22. http://www.praat.org/. retrieved 15 November 2016.

2. Collins, K., Onwuegbuzie, A.J., & Jiao, Q.G. (2008). A Mixed Methods Investigation of Mixed Methods Sampling Designs in Social and Health Science Research. Journal of Mixed Methods Research, doi/10.1177/1558689807299526

3. Hunyadi, L., Kiss, H., Szekrényes, I. (2016a). Prosody enhances cognitive info-communication: Materials from the hucomtech corpus. In A. Esposito and C. L. Jain, editors, Toward Robotic Socially Believable Behaving Systems - Volume I: Modeling Emotions, pages 183–204. Springer International Publishing, Cham

4. Hunyadi, L., Váradi, T., Szekrényes, I. (2016b). Language technology tools and resources for the analysis of multimodal communication. In E. Hinrichs, M. Hinrichs, and T. Trippel, editors, Proceedings of the Workshop on Language Technology Resources and Tools for Digital Humanities (LT4DH 2016), pages 117–124. University of Tübingen, Tubingen

5. Onwuegbuzie, A. J., and Turner, L. A. (2007). Toward a definition of mixed methods research. J. Mix. Meth. Res. 1, 112-133. doi:10.1177/1558689806298224

6. Magnusson, M. S. (2000). Discovering hidden time patterns in behavior: T-patterns and their detection. Behavior Research Methods, Instruments, & Computers, 32(1):93–110

7. Onwuegbuzie, A. J., Bustamante, R. M., and Nelson, J. A. (2010). Mixed Research as a Tool for Developing Quantitative Instruments. J. Mix. Meth. Res. 4, 56-78. doi:10.1177/1558689809355805

8. Powell, H., Mihalas, S., Onwuegbuzie, A. J., Suldo, S., & Daley, C.E. (2008). Mixed methods research in school psychology: A mixed methods investivation of trends in the literature. Psychology in the Schools, 45(4), 291-309.

9. Wittenburg, P., Brugman, H., Russel, A., Klassmann, A., Sloetjes, H. (2006). Elan. a professional framework for multimodality research. In Proceedings of LREC 2006, pages 213–269.

Discovering behavioral patterns in large amounts of highly structured data using *Theme*

Laszlo Hunyadi

University of Debrecen

The HuComTech corpus consists of the annotation of 50 hours of video-audio recordings of Hungarian formal and informal dialogues. The purpose of the corpus is manifold: it wishes to supply a wide ranges of data for the understanding of human-human communication to be used in human-machine interaction, psychology, linguistics as well as communication in general. For this purpose both video and audio – separately as well as combined – were annotated for perceived emotions, turn management, pragmatics. In addition to such interpretative labeling physical gestural parameters were also marked, observing, among others, eye movement, head movement, hand movement, posture. For speech – pitch, intensity, voiced/unvoiced, tempo, and word level time alignment were annotated. Automatic morphological parsing resulted in a detailed morphological analysis of the recordings. A special syntactic annotation was designed to capture the syntactic organisation of spoken utterances.

A portion of this multimodal and multilayered annotation was translated to *Theme* (excluding syntax and morphology). This subset submitted to *Theme* consists of a maximum of 19 classes, 112 items and 266 event types across 222 files with a maximum of 59134 data points within a maximum 1830355 sec. of observation time for a file.

The analysis of these data poses a few kinds of challenges. One is the amount of data to be processed at the same time. Even with 64 Gb base memory and 20 dual-core processors it was practically beyond the system's capacity to simultaneously process all categories and all items even for three levels of search. Reasonably reducing the number of classes and items was of course helpful, but by doing so we had to give up the chance to discover some of the "hidden hidden" patterns. Another possibility for us was to shorten the files: we cut the files into shorter pieces to analyse, based on well defined turning points in the dialogues.

Another challenge is that within some of the patterns the standard deviation of corresponding critical intervals was expected to be rather small (for event types containing physical parameters), whereas for event types of interpretative data (emotions, pragmatics etc.) it was larger. Accordingly, in our search for these two kinds of patterns (or their combinations) we had to accommodate both of them in setting the maximum and the maximum critical interval.

Yet another challenge was that each subject's behavior was in a way unique, that was manifest in their difference in the amount of data points (average: 17695, stdev: 9082). Accordingly, whereas in order to reduce the amount of patterns found (and, accordingly, the load of processing) it was a good idea to limit the amount of patterns discovered at one level to be passed over to the next one (actually, our limit was a uniform 75% for all files), it could also cause

a disproportionate reduction of possible patterns in files with fewer data points. In any case, the maximum number of different patterns was 60037 (average: 4338, stdev: 6703) with respective pattern occurrences maximum 228194 (average: 16525, stdev: 25052). After better understanding the option "Adapt to data" we expect to solve this specific issue deriving from the above natural characteristic of individual behavior.

Comparison of T-Pattern Detection with two additional approaches for analysis

of behavioral structure during media use

Frank Schwab & Michael Brill

When studying structural aspects of concomitant behavior during media use, objective process measures and appropriate methods of analysis are necessary to obtain insights beyond summative indices. Such insights can aid researchers when looking for objective, corroborating indicators for subjective media use experiences. The present study evaluated methods for analyzing relations between behavioral structure in spontaneous eye-blink behavior and self-reported spatial presence experiences. Three methods were used to quantify behavioral structure in—where appropriate—three different media environments. Based on existing literature, inter-blink interval variability, indicators for spike train synchrony, and T-pattern detection were used for the analysis of observational data.

The three media environments were a video excerpt from a non-interactive, conventionally edited TV show in study 1 (N = 62), a video excerpt from a continuously edited feature film in study 2 (N = 61), and a racing simulation video game as an interactive, continuous stimulus in study 3 (N = 48). Experimental designs were following established evaluation studies for alternative presence measurement methods, and tried to induce lower or higher levels of presence experiences by means of different instructions. An established spatial presence self-report measure was used as a validation standard in all studies. Because results of studies 1 and 2 showed that the presence manipulation yielded unexpected results, no manipulation was applied in study 3. As a consequence, the results could not be interpreted coherently with regard to the relation between behavioral structure and presence self-report. However, all three methods could be evaluated in regard to their analytical value. While method 1 could not replicate findings from existing studies, methods 2 and 3 were in agreement on the amount of structure in the analyzed behavioral data. However, the objective indicators were not in agreement with the subjective self-report measures. This suggests that

the mere quantity of structure in spontaneous eye-blink behavior is not a suitable indicator for self-reported presence experiences, and that qualitative aspects underlying the structure need more consideration.

In conclusion, the results suggest that among the three methods under evaluation, T-pattern detection is the most appropriate method for analyzing structural aspects of behavior in interactive media environments. The method considers both user events and media events, and is flexible enough for analysis of human behavior during use of interactive media.

Interaction patterns in musical ensemble rehearsals

Nicola Pennill

Music ensemble interactions have been shown to be highly ambiguous and paradoxical, relying as they do on a complex mix of interpersonal dynamics, highly specialised skills, and an often pressurised performance setting. While the context may have distinctive characteristics, in these respects they resemble many other types of 'expert' team. This research presents an interdisciplinary, mixed methods study of music ensemble coordination and interactions in a rehearsal setting. Its main contributions are in the areas of systematic musicology (ensemble coordination and dynamics), organisation studies (small group interactions) and methods (mixed methods, including pattern detection using THEME). Two case studies with newly-formed advanced student ensembles provided the basis for the exploration of interaction patterns, including their significance as enablers of ensembles as 'swift starting' groups, and characteristics of their emergence over time. Comparison of rehearsal approaches involving music of contrasting structure, and the ways that interaction patterns relate to emerging leadership in the musical setting were also explored.

Research questions

How do ensemble members work together in a self-directed group?

- How does this develop over time? Are there systematic patterns in the way verbal interactions are distributed?

- What are the contributions of objective and subjective measures of interaction to 'leadership' in the ensemble?

Methods

This research adopted a longitudinal case study approach. Two newly-formed *a cappella* vocal ensembles were tracked for the first 3-6 months of their development. Each group comprised five advanced-level postgraduate students, three female, two male. In the first, students recorded their own, self-directed rehearsals, which were later transcribed and coded using a predefined schema of generic team behaviours, and used as the basis for time-stamped coded data for t-pattern analysis using THEME. The second group rehearsed in a controlled lab setting, where they worked

on material of contrasting structure. Using laryngography (Lx) equipment, their vocal synchronisation was also measured over a series of rehearsals. Rehearsals were transcribed and coded as with the first group, and also analysed for patterns using THEME. Members of both groups were interviewed for their perceptions and experiences of group development.

Main findings

Case Study 1:

The development of interaction patterns supported previous work on swift-starting teams, in which it is hypothesised that interaction patterns enable early progress while social relationships are established, and in which the influence of less vocal members may both feature earlier and persist in patterned behaviour.

Case Study 2:

Individual verbal contributions, group vocal synchronisation, perceptions of group members and t-patterns detected using THEME revealed complex relationships and leadership patterns based on dominant verbal behaviour, rank timings and patterned behaviour. No differences were found in patterns relating to rehearsals of different musical structures were found.

Exploring small musical ensembles as examples of self-directed teams provides insights for musicians and researchers of small group behaviour. The use of mixed methods to explore implicit behaviours (pattern detection, vocal quintet synchronisation) may provide additional insights not achievable from observation alone. Further exploration their relationship to more specific musical behaviours (e.g. musical expression, rehearsal tasks, tuning) is ongoing.

Nicola Pennill
Department of Music
University of Sheffield
http://wrocahensemble.sites.sheffield.ac.uk
+44 776 413 2151