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Authors

Gray, Wayne D.

Perez, Ray

Butz, Martin V.

et al.

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Game-XP: Action Games as Cognitive Science Paradigms

Organizer & Moderator: Wayne D. Gray
(wayne.gray.cogsci@gmail.com)
Rensselaer Polytechnic Institute

Martin V. Butz
(martin.butz@uni-tuebingen.de)
Universität Tübingen

Matthew D. Sangster
(sangsm@rpi.edu)
Rensselaer Polytechnic Institute

Tom Stafford
(t.stafford@sheffield.ac.uk)
University of Sheffield

Keynote: Ray Perez
(ray.perez@navy.mil)
Office of Naval Research

Stuart Reeves
(stuart.reeves@nottingham.ac.uk)
University of Nottingham

Discussant: Fernand Gobet
(Fernand.Gobet@liverpool.ac.uk)
University of Liverpool

Why games? How could anyone consider action games as *experimental paradigms for Cognitive Science*? In 1973, as one of three strategies he proposed for advancing Cognitive Science, Allen Newell exhorted us to “accept a single complex task and do all of it.” More specifically, he told us that rather than taking an “experimental psychology as usual approach” that, we should “focus on a series of experimental and theoretical studies around a single complex task” so as to demonstrate that our theories of human cognition were powerful enough to explain, “a genuine slab of human behavior” with the studies fitting into a detailed theoretical picture. *Action games* represent the type of experimental paradigms that Newell was advocating and the current state of programming expertise and laboratory equipment, along with the emergence of Big Data (Griffiths, 2015) and Naturally Occurring Data Sets (NODS, Goldstone & Lupyan, 2016), provide the technologies and data needed to realize his vision. Action Games enable us to escape from our field’s regrettable focus on novice performance to develop theories that account for the full range of expertise through a twin focus on expertise sampling (across individuals) and longitudinal studies (within individuals) of simple and complex tasks.

This Symposium is inspired by the recent *Action Games as Experimental Paradigms for Cognitive Science* (Game-XP), issue of *Topics in Cognitive Science (topiCS)*, April 2017. It includes late-breaking work from some of the researchers represented in that topic as well as new work by new researchers.

Symposium Presentations – in Brief

- Ray Perez provides our keynote and focuses on the long history and current promise of action games as

a research tool for understanding theory and as a delivery vehicle for training.

- Martin Butz introduces a new, hybrid cognitive architecture which takes as its domain the world of *Super-Mario Brothers*TM.
- Stuart Reeves introduces our field to *Ethnomethodology and Conversation Analysis* (EMCA) research and to the questions this community asks of games.
- Matt Sangster uses 1.9 million records from 539 thousand matches of teams of 5 vs 5 people who play the world’s most popular game, *League of Legends*, to study the distinction between individual and team expertise.
- Tom Stafford uses data from a cellphone game to investigate the efficacy of *sleep consolidation* versus wake-time distributed practice.
- Fernand Gobet provides calm and perspective by discussing this recent flurry of Game-XP from the 50+ yr perspective of cognitive science research on Chess.

Ray Perez – Prequel to Game-XP: Time Spent, Player Age, Effects of Game Play, and Understanding Expertise

Within two months of its release, the video game *Call of Duty: Black Ops* (Activision Publishing Inc., 2010) was played more than 600 million hours worldwide, with sales of over one billion dollars (Albanesius, 2010). U.S children spent on average 1 hr and 13 min playing video games every day in 2010, a 300% increase from 1999 (Rideout, Foehr, & Roberts, 2010). The average age of game players is 31, with 29% under 18 years old, 32% in the 18-35 year range, and 39% being 36 year or older. Video game playing is pervasive in our society; there is growing body of evidence that video gaming can have beneficial effects on the organization and

Organized by Wayne D. Gray. Address all correspondence to Wayne Gray <wayne.gray.cogsci@gmail.com>.

function of the brain and learning. However, very little is known about the long term effects of playing video games or what is learned from these games or for that matter what expert game playing looks like and how it develops. This symposium explores the nature of extreme expertise in game playing with the focus that understanding expert game playing should inform theories of cognition.

Martin V. Butz – Mario becomes Cognitive

The SEMLINCS cognitive architecture uses the world of SuperMario™ as its task environment and endows Mario, himself, with agency. Mario learns a conceptual, generative model of its environment in the form of probabilistic production rule-like structures from its own, autonomously gathered, continuous sensorimotor experiences. As a result, SEMLINCS enables Mario not only to plan and control environmental interactions in a versatile, goal-directed, self-motivated manner – focusing, for example, on rescuing the Princess or on gathering coins – but also to verbalize this knowledge and to receive additional knowledge linguistically (Schrodt, Kneissler, Ehrenfeld, & Butz, 2017).

Stuart Reeves – The Ethnomethodology of Games

Like Cognitive Science, Ethnomethodology and Conversation Analysis (EMCA) focuses on human activities that occur during game play. Yet EMCA sets cognitive explanations of human action to one side and instead describes how such action is practically, witnessably achieved. The presentation will demonstrate the utility of the EMCA approach and emphasize the contrast between the questions asked by CogSci and EMCA (Reeves, Greiffenhagen, & Laurier, 2017).

Matthew Sangster – Finding the “I” in Team

Can we study the contribution of individual performance in a team setting? Can we find the “I” in team? Using Big Data (1.9 million records from 539 thousand matches) from League of Legends™ Sangster says “yes” and presents steps towards establishing a measure that can evaluate individuals performing in a team context.

Tom Stafford – Sleep Consolidation: A Field Study

Few researchers would expect that data collected from a cellphone action game could be used to address questions of *sleep consolidation in skill learning*. Realizing that their data set of Axon™ games included long breaks between some games, they pulled out instances in which successive games occurred across sleep or non-sleep hours, with the former (but not the latter) being candidates for sleep consolidation

effects. The approach and results demonstrate the promise of Big Data to raise questions that have little or nothing to do with the paradigm used to collect the data (Stafford & Haasnoot, 2017).

Fernand Gobet – Discussant

Newell (1973) argued that progress in psychology was slow because its empirical research focused on answering binary questions rather than building theories that were powerful enough to explain “a genuine slab of human behavior”. As measured by the work presented in this symposium and in its associated issue of *Topics in Cognitive Science* (Gray, 2017), Gobet (2017) attempts to assess the age-old question of any young field; namely, “are we there yet?”

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