## Augmented Cognition in Training and Education

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent-Based Practices for an Intelligent Tutoring System Architecture</td>
<td>3</td>
</tr>
<tr>
<td><em>Keith Brawner, Greg Goodwin, and Robert Sottilare</em></td>
<td></td>
</tr>
<tr>
<td>Intelligent Tutoring Gets Physical: Coaching the Physical Learner</td>
<td>13</td>
</tr>
<tr>
<td>by Modeling the Physical World</td>
<td></td>
</tr>
<tr>
<td><em>Benjamin Goldberg</em></td>
<td></td>
</tr>
<tr>
<td>Measuring Stress in an Augmented Training Environment: Approaches</td>
<td>23</td>
</tr>
<tr>
<td>and Applications</td>
<td></td>
</tr>
<tr>
<td><em>David Jones and Sara Dechmerowski</em></td>
<td></td>
</tr>
<tr>
<td>Alternate Rubric for Performance Assessment of Infantry Soldier Skills Training</td>
<td>34</td>
</tr>
<tr>
<td><em>Douglas Maxwell, Jonathan Stevens, and Crystal Maraj</em></td>
<td></td>
</tr>
<tr>
<td>Leveraging Interoperable Data to Improve Training Effectiveness Using the Experience API (XAPI)</td>
<td>46</td>
</tr>
<tr>
<td><em>Jennifer Murphy, Francis Hannigan, Michael Hruska, Ashley Medford, and Gabriel Diaz</em></td>
<td></td>
</tr>
<tr>
<td>Practical Requirements for ITS Authoring Tools from a User Experience Perspective</td>
<td>55</td>
</tr>
<tr>
<td><em>Scott Ososky</em></td>
<td></td>
</tr>
<tr>
<td>Making Sense of Cognitive Performance in Small Unit Training</td>
<td>67</td>
</tr>
<tr>
<td><em>William A. Ross, Joan H. Johnston, Dawn Riddle, CDR Henry Phillips, Lisa Townsend, and Laura Milham</em></td>
<td></td>
</tr>
<tr>
<td>Considerations for Immersive Learning in Intelligent Tutoring Systems</td>
<td>76</td>
</tr>
<tr>
<td><em>Anne M. Sinatra</em></td>
<td></td>
</tr>
<tr>
<td>Elements of Adaptive Instruction for Training and Education</td>
<td>85</td>
</tr>
<tr>
<td><em>Robert A. Sottilare and Michael W. Boyce</em></td>
<td></td>
</tr>
<tr>
<td>Adaptive Instruction for Individual Learners Within the Generalized Intelligent Framework for Tutoring (GIFT)</td>
<td>90</td>
</tr>
<tr>
<td><em>Robert A. Sottilare</em></td>
<td></td>
</tr>
<tr>
<td>Applying Augmented Cognition to Flip-Flop Methodology</td>
<td>97</td>
</tr>
<tr>
<td><em>Jan Stelovsky, Randall K. Minas, Umida Stelovska, and John Wu</em></td>
<td></td>
</tr>
</tbody>
</table>
Real Time Assessment of Cognitive State: Research and Implementation
Challenges .............................................. 107
  Michael C. Trumbo, Mikaela L. Armenta, Michael J. Haass,  
  Karin M. Butler, Aaron P. Jones, and Charles S.H. Robinson

How Novices Read Source Code in Introductory Courses on Programming:
An Eye-Tracking Experiment .................................. 120
  Leelakrishna Yenigalla, Vinayak Sinha, Bonita Sharif,  
  and Martha Crosby

Human Cognition and Behavior in Complex Tasks and Environments
Implementing User-Centered Methods and Virtual Reality to Rapidly
Prototype Augmented Reality Tools for Firefighters ............ 135
  Tess Bailie, Jim Martin, Zachary Aman, Ryan Brill, and Alan Herman

RevealFlow: A Process Control Visualization Framework ........... 145
  Ronald Boring, Thomas Ulrich, and Roger Lew

Paradigm Development for Identifying and Validating Indicators of Trust in
Automation in the Operational Environment of Human Automation
Integration .................................................. 157
  Kim Drnec and Jason S. Metcalfe

Performance-Based Eye-Tracking Analysis in a Dynamic Monitoring Task .... 168
  Wei Du and Jung Hyup Kim

Exploring the Hybrid Space: Theoretical Framework Applying Cognitive
Science in Military Cyberspace Operations ........................ 178
  Øyvind Jøsok, Benjamin J. Knox, Kirsi Helkala, Ricardo G. Lugo,  
  Stefan Sütterlin, and Paul Ward

Empirical Study of Secure Password Creation Habit ............... 189
  Chloe Chun-Wing Lo

Team Cognition as a Mechanism for Developing Collaborative and
Proactive Decision Support in Remotely Piloted Aircraft Systems ........ 198
  Nathan J. McNeese and Nancy J. Cooke

Supporting Multi-objective Decision Making Within a Supervisory Control
Environment .................................................. 210
  Ciara Sibley, Joseph Coyne, Gopi Vinod Avvari, Manisha Mishra,  
  and Krishna R. Pattipati

Assessment of Expert Interaction with Multivariate Time Series ‘Big Data’ .... 222
  Susan Stevens Adams, Michael J. Haass, Laura E. Matzen,  
  and Saskia King
Aircraft Pilot Intention Recognition for Advanced Cockpit Assistance
Stefan Suck and Florian Fortmann

Explaining a Virtual Worker’s Job Performance: The Role of Psychological Distance
Ayoung Suh and Christian Wagner

Training Tactical Combat Casualty Care with an Integrated Training Approach
Lisa Townsend, Laura Milham, Dawn Riddle, CDR Henry Phillips, Joan Johnston, and William Ross

Exploratory Trajectory Clustering with Distance Geometry
Andrew T. Wilson, Mark D. Rintoul, and Christopher G. Valicka

Interaction in Augmented Cognition

Serial Sequence Learning on Digital Games
Eduardo Adams, Anderson Schuh, Marcia de Borba Campos, Débora Barbosa, and João Batista Mossmann

Text Simplification and User Experience
Soussan Djamasbi, John Rochford, Abigail DaBoll-Lavoie, Tyler Greff, Jennifer Lally, and Kayla McAvoy

Shan Lakhmani, Julian Abich IV, Daniel Barber, and Jessie Chen

Assessment of Visualization Interfaces for Assisting the Development of Multi-level Cognitive Maps
Hengshan Li, Richard R. Corey, Uro Giudice, and Nicholas A. Giudice

Interactive Visualization of Multivariate Time Series Data
Shawn Martin and Tu-Toan Quach

Investigation of Multimodal Mobile Applications for Improving Mental Health.
Sushunova G. Martinez, Karla A. Badillo-Urquiola, Rebecca A. Lets, Jamie Chavez, Tiffany Green, and Travis Clements

Integrating Methodology for Experimentation Using Commercial Off-the-Shelf Products for Haptic Cueing.
LT Joseph E. Mercado, Nelson Lerma, Courtney McNamara, and LT David Rozovski
Understanding Older Adults’ Perceptions of In-Home Sensors Using an Obersiveness Framework .......................................................... 351
Blaine Reeder, Jane Chung, Jonathan Joe, Amanda Lazar, Hilaire J. Thompson, and George Demiris

The Role of Simulation in Designing Human-Automation Systems ........ 361
Christina F. Rusnock, Jayson G. Boubin, Joseph J. Giametta, Tyler J. Goodman, Anthony J. Hillesheim, Sungbin Kim, David R. Meyer, and Michael E. Watson

Navigating with a Visual Impairment: Problems, Tools and Possible Solutions ................................................................. 371
Michael Schwartz and Denise Benkert

A Systems Approach for Augmented Reality Design ....................... 382
Andrea K. Webb, Emily C. Vincent, Pooja Patnaik, and Jana L. Schwartz

Social Cognition

Modeling of Social Media Behaviors Using Only Account Metadata ...... 393
Fernanda Carapinha, John Khoury, Shai Neumann, Monte Hancock, Federico Calderon, Mendi Drayton, Arvil Easter, Edward Stapleton, Alexander Vazquez, and David Woolfolk

Mohammad Mahzoon, Mary Lou Maher, Kazjon Grace, Lilla LoCurto, and Bill Outcault

Improving Analysis and Decision-Making Through Intelligent Web Crawling .............................................................. 414
Jonathan T. McClain, Glory Emmanuel Aviña, Derek Trumbo, and Robert Kittinger

Using an Augmented Training Event to Collect Data for Future Modeling Purposes ............................................................... 421
Samantha Napier, Christopher Best, Debra Patton, and Glenn Hodges

The Art of Research: Opportunities for a Science-Based Approach ...... 431
Austin R. Silva, Glory E. Aviña, and Jeffrey Y. Tsao

Author Index ............................................................................. 443
Contents – Part I

Brain-Computer Interfaces

Developing an Optical Brain-Computer Interface for Humanoid Robot Control ........................................... 3
Alyssa M. Batula, Jesse Mark, Youngmoo E. Kim, and Hasan Ayaz

Using Motor Imagery to Control Brain-Computer Interfaces for Communication ........................................ 14
Jonathan S. Brumberg, Jeremy D. Burnison, and Kevin M. Pitt

An Online Gaze-Independent BCI System Used Dummy Face with Eyes Only Region as Stimulus .................. 26
Long Chen, Brendan Z. Allison, Yu Zhang, Xingyu Wang, and Jing Jin

A Kronecker Product Structured EEG Covariance Estimator for a Language Model Assisted-BCI ......................... 35
Paula Gonzalez-Navarro, Mohammad Moghadamfalahi, Murat Akcakaya, and Deniz Erdogmus

Poor BCI Performers Still Could Benefit from Motor Imagery Training ......................................................... 46
Alexander Kaplan, Anatoly Vasilyev, Sofya Liburkina, and Lev Yakovlev

Predicting EEG Sample Size Required for Classification Calibration ......................................................... 57
Zijing Mao, Tzyy-Ping Jung, Chin-Teng Lin, and Yufei Huang

An SSVEP and Eye Tracking Hybrid BNCI: Potential Beyond Communication and Control ............................. 69
Paul McCullagh, Chris Brennan, Gaye Lightbody, Leo Galway, Eileen Thompson, and Suzanne Martin

Multi-Brain BCI: Characteristics and Social Interactions ................................................................................. 79
Anton Nijholt and Mannes Poel

Comparing EEG Artifact Detection Methods for Real-World BCI ................................................................. 91
Michael W. Nonte, William D. Hairston, and Stephen M. Gordon

Examining the Neural Correlates of Incidental Facial Emotion Encoding Within the Prefrontal Cortex Using Functional Near-Infrared Spectroscopy ..................................................... 102
Achala H. Rodrigo, Hasan Ayaz, and Anthony C. Ruocco

Exploring the EEG Correlates of Neurocognitive Lapse with Robust Principal Component Analysis .................. 113
Chun-Shu Wei, Yuan-Pin Lin, and Tzyy-Ping Jung
Augmenting VR/AR Applications with EEG/EOG Monitoring and Oculo-Vestibular Recoupling ................................................................. 121
  John K. Zao, Tzyy-Ping Jung, Hung-Ming Chang, Tchin-Tze Gan,
  Yu-Te Wang, Yuan-Pin Lin, Wen-Hao Liu, Guang-Yu Zheng,
  Chin-Kuo Lin, Chia-Hung Lin, Yu-Yi Chien, Fang-Cheng Lin,
  Yi-Pai Huang, Sergio José Rodríguez Méndez, and Felipe A. Medeiros

Electroencephalography and Brain Activity Measurement

Neural Correlates of Purchasing Decisions in an Ecologically Plausible Shopping Scenario with Mobile fNIR Technology .......................... 135
  Murat Perit Çakır, Tuna Çakar, Yener Girişken, and Ari K. Demircioğlu

Real-Time Monitoring of Cognitive Workload of Airline Pilots in a Flight Simulator with fNIR Optical Brain Imaging Technology ................ 147
  Murat Perit Çakır, Murat Vural, Süleyman Özgür Koç,
  and Ahmet Toktaş

Truthiness: Challenges Associated with Employing Machine Learning on Neurophysiological Sensor Data .................................................. 159
  Mark Costa and Sarah Bratt

Evaluation of Cognitive Control and Distraction Using Event-Related Potentials in Healthy Individuals and Patients with Multiple Sclerosis ...... 165
  Thomas J. Covey, Janet L. Shucard, and David W. Shucard

Auditory Alarm Misperception in the Cockpit: An EEG Study of Inattentional Deafness ................................................................. 177
  Frédéric Dehais, Raphaëlle N. Roy, Thibault Gateau,
  and Sébastien Scannella

Multi-model Approach to Human Functional State Estimation .................. 188
  Kevin Durkee, Avinash Hiriyanna, Scott Pappada, John Feeney,
  and Scott Galster

Using fNIRS for Real-Time Cognitive Workload Assessment.................. 198
  Samuel W. Hincks, Daniel Afergan, and Robert J.K. Jacob

Modeling and Tracking Brain Nonstationarity in a Sustained Attention Task ... 209
  Sheng-Hsiou Hsu and Tzyy-Ping Jung

Linking Indices of Tonic Alertness: Resting-State Pupil Dilation and Cingulo-Opercular Neural Activity .......................... 218
  Stefanie E. Kuchinsky, Nick B. Pandža, and Henk J. Haarmann

Evaluating Neural Correlates of Constant-Therapy Neurorehabilitation Task Battery: An fNIRS Pilot Study ........................................ 231
  Jesse Mark, Banu Onaral, and Hasan Ayaz
Overloaded and Biased? Using Augmented Cognition to Understand the Interaction Between Information Overload and Cognitive Biases

Randall K. Minas and Martha E. Crosby

Session-to-Session Transfer in Detecting Steady-State Visual Evoked Potentials with Individual Training Data

Masaki Nakanishi, Yijun Wang, and Tzyy-Ping Jung

Paired Associative Stimulation with Brain-Computer Interfaces: A New Paradigm for Stroke Rehabilitation

Nikolaus Sabathiel, Danut C. Irimia, Brendan Z. Allison, Christoph Guger, and Günter Edlinger

Single Trial Variability of Event-Related Brain Potentials as an Index of Neural Efficiency During Working Memory

David W. Shucard, Thomas J. Covey, and Janet L. Shucard

Cognitive Modelling and Physiological Measuring

A More Complete Picture of Emotion Using Electrocardiogram and Electrodermal Activity to Complement Cognitive Data

Danushka Bandara, Stephen Song, Leanne Hirshfield, and Senem Velipasalar

Real-Time Fatigue Monitoring with Computational Cognitive Models

Leslie M. Blaha, Christopher R. Fisher, Matthew M. Walsh, Bella Z. Veksler, and Glenn Gunzelmann

Introduction to Real-Time State Assessment

Brett J. Borghetti and Christina F. Rusnock

User Abilities in Detecting Vibrotactile Signals on the Feet Under Varying Attention Loads

Alison Gibson, Andrea Webb, and Leia Stirling

Estimate Emotion Method to Use Biological, Symbolic Information Preliminary Experiment

Yuhei Ikeda, Yoshiko Okada, and Midori Sugaya

Job Analysis and Cognitive Task Analysis in National Security Environments

Robert Kittinger, Liza Kittinger, and Glory E. Avina

Measuring the Effect of Tangible Interaction on Design Cognition

Mary Lou Maher, John Gero, Lina Lee, Rongrong Yu, and Tim Clausner

Psychophysiological Baseline Methods and Usage

Avonie Parchment, Ryan W. Wohleber, and Lauren Reinerman-Jones
Physiological Measures of Arousal During Soldier-Relevant Tasks Performed in a Simulated Environment ................................. 372
   Debra Patton and Katherine Gamble

Theoretical Versus Mathematical Approach to Modeling Psychological and Physiological Data ...................................................... 383
   Lauren Reinerman-Jones, Stephanie J. Lackey, Julian Abich IV,
   Brandon Sollins, and Irwin Hudson

Monitoring Attention with Embedded Frequency Markers for Simulation Environments ....................................................... 394
   Bartlett A.H. Russell, Jon C. Russo, Ian P. Warfield,
   and William D. Casebeer

Augmenting Robot Behaviors Using Physiological Measures of Workload State ................................................................. 404
   Grace Teo, Lauren Reinerman-Jones, Gerald Matthews, Daniel Barber,
   Jonathan Harris, and Irwin Hudson

Posture Based Recognition of the Visual Focus of Attention for Adaptive Mobile Information Systems ................................. 416
   Martin Westhoven, Christian Plegge, Timo Henrich,
   and Thomas Alexander

Considerations in Physiological Metric Selection for Online Detection of Operator State: A Case Study ......................... 428
   Ryan W. Wohleber, Gerald Matthews, Gregory J. Funke,
   and Jinchao Lin

Sensing and Assessing Cognitive Workload Across Multiple Tasks ........ 440
   Matthias D. Ziegler, Amanda Kraft, Michael Krein, Li-Chuan Lo,
   Bradley Hatfield, William Casebeer, and Bartlett Russell

Author Index ........................................................................ 451
Foundations of Augmented Cognition:
Neuroergonomics and Operational Neuroscience
10th International Conference, AC 2016, Held as Part of
HCI International 2016, Toronto, ON, Canada, July
17-22, 2016, Proceedings, Part II
Schmorrow, D.D.; Fidopiastis, C.M. (Eds.)
2016, XX, 446 p. 108 illus., Softcover
ISBN: 978-3-319-39951-5