



Expanding Domain Modeling in GIFT

Robert Sottolare, Ph.D.

5th Annual GIFT Users Symposium (GIFTSym5)

11 May 2017



Domain Modeling Challenges

ARL

- Understand and model the characteristics, similarities, and differences of military training domains (cognitive, affective, psychomotor, social, and hybrid) with respect to:
 - their associated knowledge representations
 - methods for more efficient and effective authoring, instruction, and evaluation of adaptive training tools and methods
- Understand and model the dimensions (definition, complexity, and dynamics) of training domain representations to extend the capabilities of traditional ITSs; thereby, supporting challenging, militarily-relevant training domains



- Discover/examine methods to match the nature of military tasks in training/educational environments and operational environments to optimize transfer of skills, and evaluate methods to determine the return on investment (ROI) for high levels of compatibility
- Discover methods to accurately assess learning and domain task performance in real-time
- Discover methods to promote optimal learning, performance, retention and transfer (on-the-job performance) across domains
- Discover tools and methods to support individual and team training (e.g., small unit and collective training) and education (e.g., collaborative learning and problem-solving) experiences



- Examine the efforts required to author domains of varying complexity, definition, and physical dynamics and identify methods
- Define methods to measure task domain complexity to allow comparative evaluation of different authoring systems and capabilities
- Examine domains for ill-defined and well-defined tasks to understand differences and support authoring processes for both
- Examine the composition of militarily-relevant training and education domains across the spectrum of cognitive, affective, psychomotor, and social tasks to understand requirements for authoring



Align instructional environment more closely with operational task environment to enhance transfer

- Cognitive
- Affective
- Psychomotor
- Social/Collaborative/Team

Example task: learning to hit a golf ball with a driver... psychomotor task



Which is better?



**Adaptive
Marksmanship**



**Adaptive
Land Navigation**

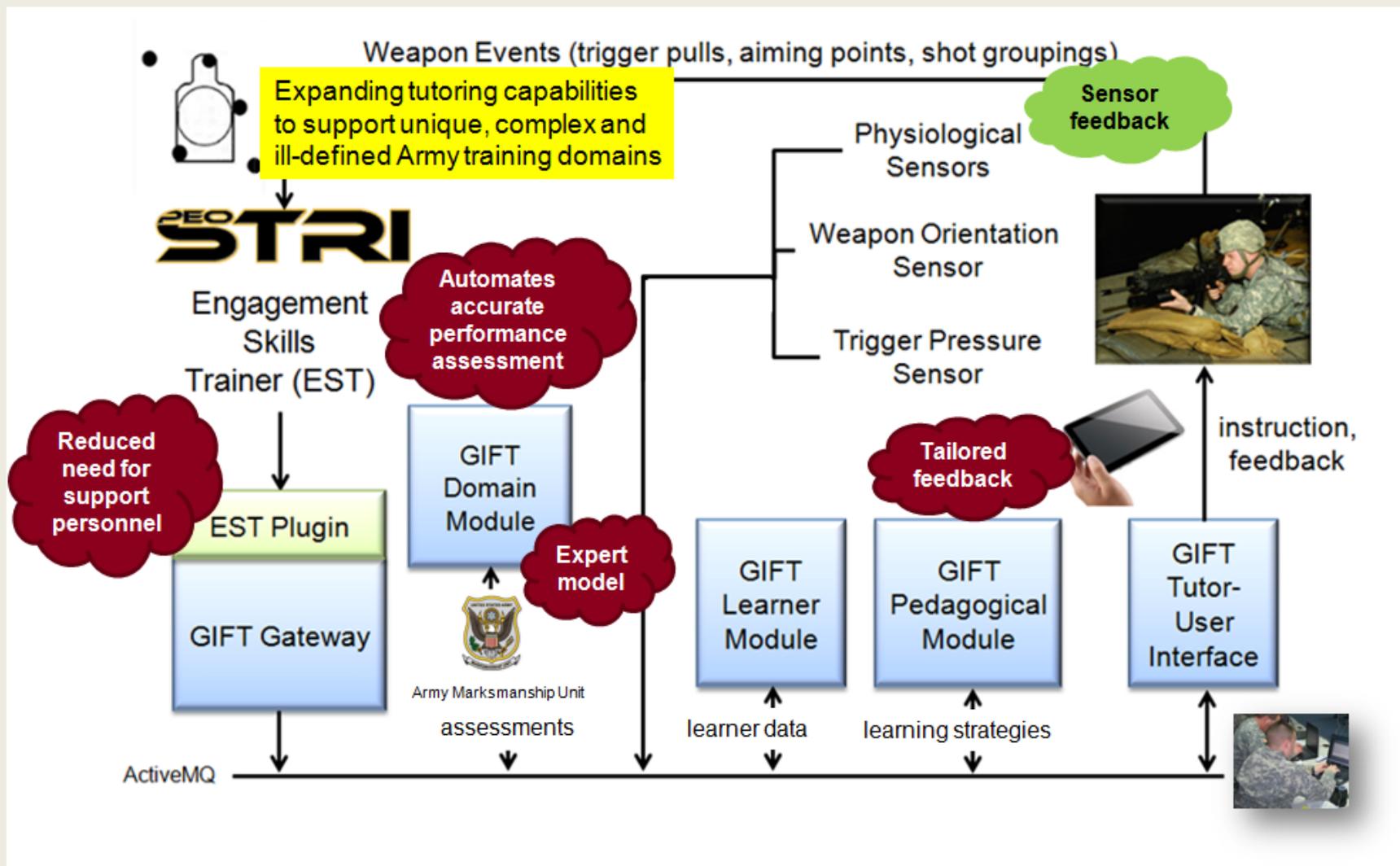


**Adaptive
Medical Triage**

Linking GIFT with external environments or the real world promotes higher alignment and higher potential for transfer.

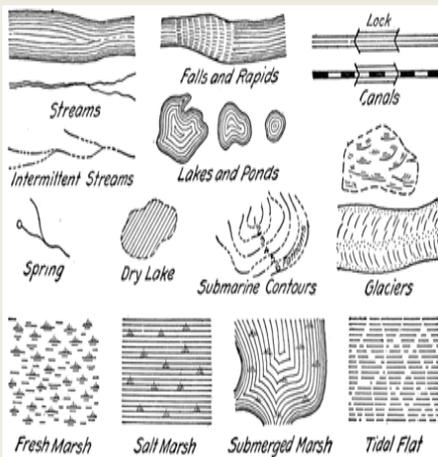
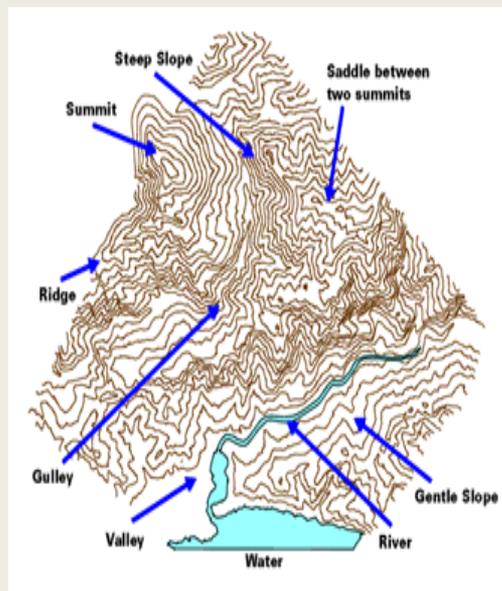


Adaptive Marksmanship





Adaptive Land Navigation



Sottolare, R. and LaViola, J. (2015). Extending Intelligent Tutoring Beyond the Desktop to the Psychomotor Domain: A survey of smart glass technologies. In Proceedings of the Interservice/Industry Training Simulation & Education Conference, Orlando, Florida, December 2015.



Adaptive Medical Triage



1 Apply tourniquet proximal to the bleeding site. Route the band around the limb and pass the tip through the inside slit of the buckle. Pull the band tight.



2 Pass the tip through the outside slit of the buckle. The friction buckle will lock the band in place.



3 Pull the band **very tight** and securely fasten the band back on itself.



4 Twist the rod until bright red bleeding has stopped and the distal pulse is eliminated.



5 Place the rod inside the clip; locking it in place. Check for bleeding and distal pulse. If bleeding is not controlled, consider additional tightening or applying a second tourniquet proximal side by side to the first and reassess.



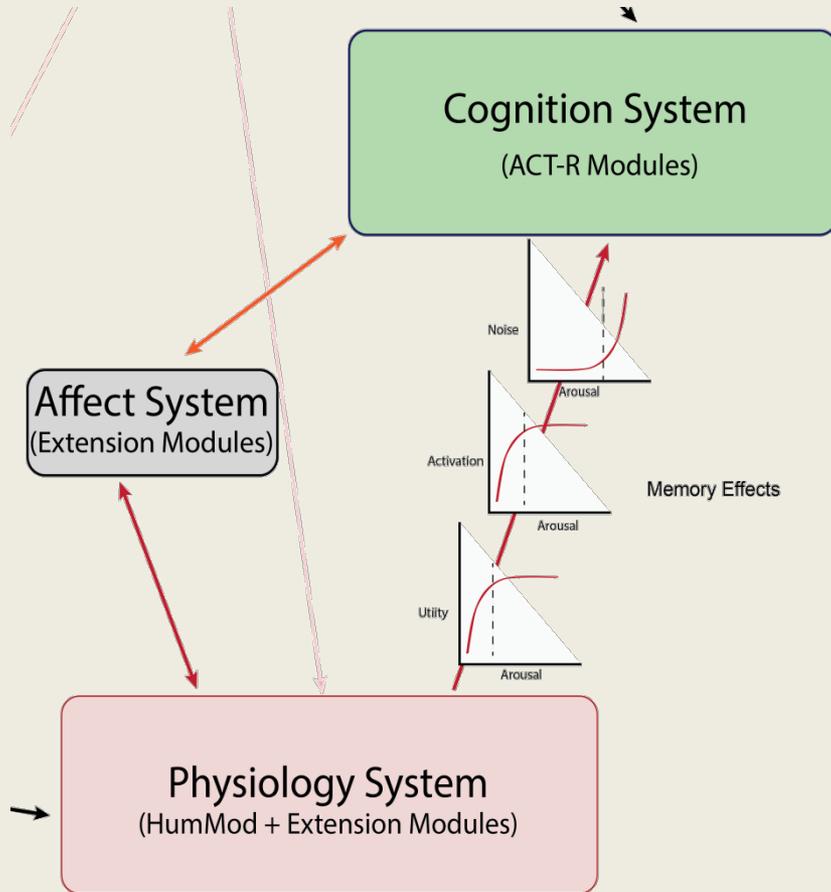
6 Secure the rod inside the clip with the strap. Prepare the patient for transport and reassess. Record the time of application.



Sottolare, R., Hackett, M., Pike, W., and LaViola, J. (2016). Adaptive Instruction for Medical Training in the Psychomotor Domain. In J. Cohn, D. Fitzhugh, and H. Freeman (Eds.) Special Issue: Modeling and Simulation Technologies to Enhance and Optimize the DoD's Medical Readiness and Response Capabilities of the *Journal for Defense Modeling & Simulation (JDMS)*.



Adaptive Sports Training



Example task: learning to hit a golf ball with a driver... psychomotor task

Which is better?

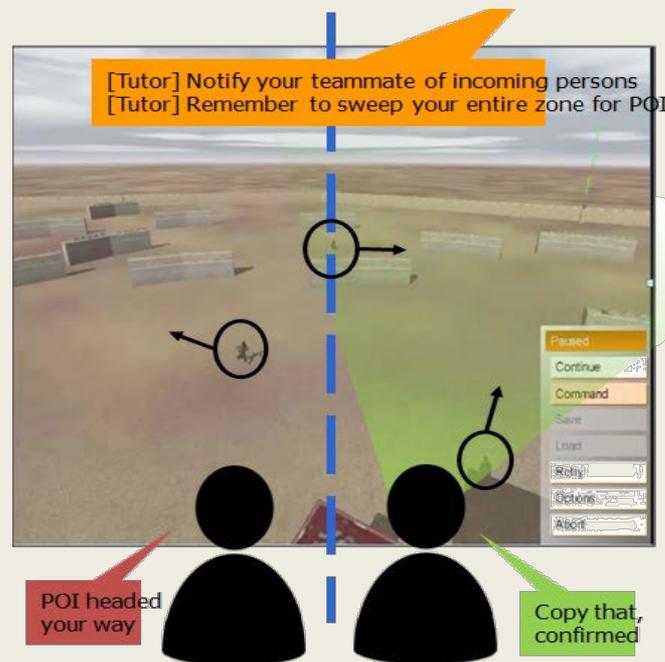
Kim, J., Dancy, C., Goldberg, B., & Sottolare, R. (2017; *in press*). A Cognitive Modeling Approach - Does Tactical Breathing in a Psychomotor Task Influence Skill Development during Adaptive Instruction? In *Foundations of Augmented Cognition* (pp. xx-xx). Springer International Publishing.



Teamwork

- ▶ Cooperation Themes
- ▶ Coaching Themes
- ▶ Communication Themes
- ▶ Coordination Themes
- ▶ Conflict Themes
- ▶ Context and Composition Themes (qualitative)

Taskwork



Team Tutoring Literature Review and Meta-Analysis

Sottolare, R., Holden, H., Brawner, K., & Goldberg, B. (2011). Challenges and Emerging Concepts in the Development of Adaptive, Computer-based Tutoring Systems for Team Training. In Proceedings of the *Interservice/Industry Training Simulation & Education Conference*, Orlando, Florida, December 2011.

Sottolare, R., Burke, S., Johnston, J., Sinatra, A., Salas, E., and Holden, H. (2015). Antecedents of Adaptive Collaborative Learning Environments. In Proceedings of the *Interservice/Industry Training Simulation & Education Conference*, Orlando, Florida, December 2015.

Sottolare, R.A., Burke, C.S., Salas, E., Sinatra, A.M., Johnston, J.H. & Gilbert, S.B. (2017, *in press*). Towards a Design Process for Adaptive Instruction of Teams: A Meta-Analysis. *International Journal of Artificial Intelligence in Education*.

**ARL**

Thank you for your attention...

Questions?