

Tri-service Cognitive Modeling Challenge Project meeting, Keynote presentation, 5dec2011

Diversions and Resources

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Acknowledgments

ONR (N00014-11-1-0275; N091-086/P10008; N00014-10-1-0401;
#W911QY-07-01-0004; N00014-03-1-0248) DTRA(HDTRA1-09-1-0054); UK MoD (RT/
COM/3/006); Darpa (N66001-1047-411F); DMSO.

Jokes

- 😊 How many (Soarer, connectionists, cognitive modellers) does it take to change a light bulb?
- 😊 What do you get when you cross a mountain climber and a cognitive modeller?
- 😊 Massively parallel connectionist networks conference...
- 😊 I don't believe that Bayesian statistics are useful to represent human cognition, but, I'm willing to reconsider my position if you have any good evidence.

📖 are at <http://acs.ist.psu.edu/papers>

Learning-Users

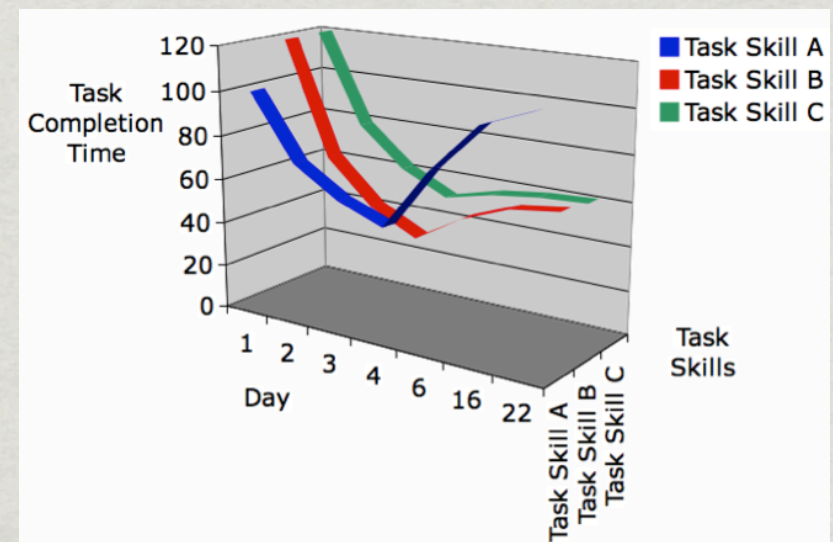
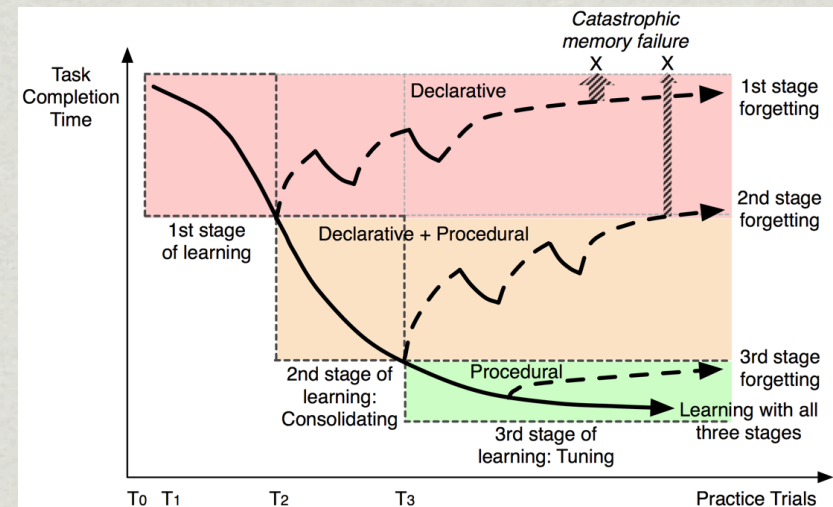
- ✳ One of the strengths/weaknesses is the members of the community
- ✳ New users



Learning: & Forgetting

- Kim, J. W., Ritter, F. E., & Koubek, R. J. (in press). An integrated theory for improved skill acquisition and retention in the three stages of learning. *Theoretical Issues in Ergonomics Science*.

three stages of forgetting v2.graffle



Learning & Forgetting-Tutoring



- ✳ Testing within the context of a Moving Target Tutor created with MCWL
- ✳ Moving towards a PSCM model in tutor as tutored knowledge, expert model, and student model framework

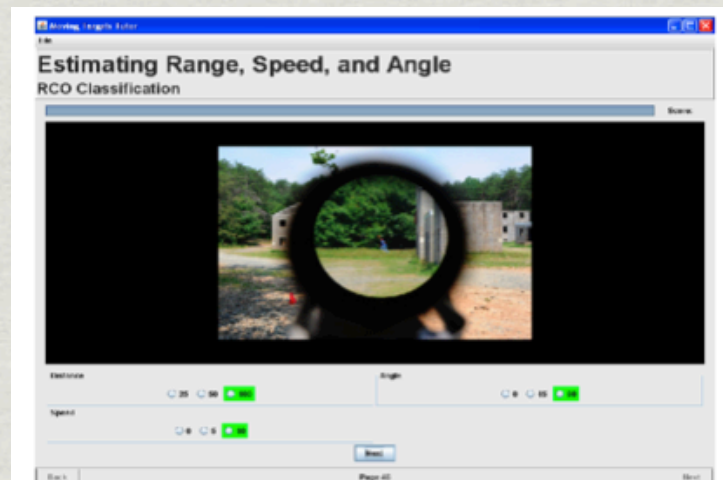
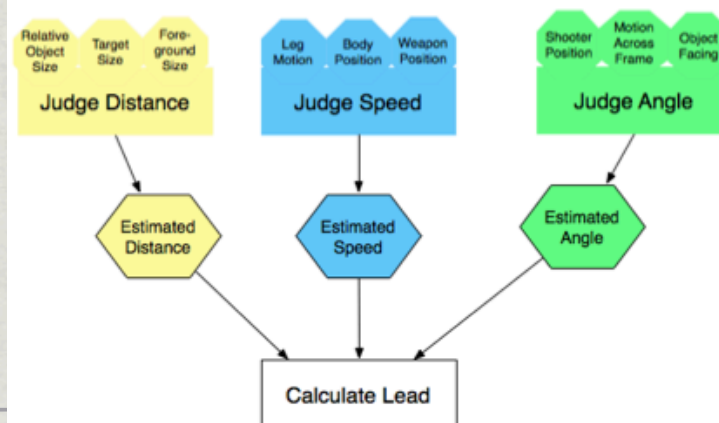


Figure 1. Practicing subskills in the MTT.



Learning & Forgetting-Testing

- ✱ Testing within the context of MIS with Joe Sanford and Dr. Joseph Siu (Nebraska)



Moderators

CaffeineZone.net

- ✱ Provides tool to describe and use caffeine
- ✱ Available on the iTunes store, free version and soon a paid, ad-free version
- ✱ Intended to be free to the military
- ✱ Done with ONR, then Applied Cognitive Systems LLC and Dr. Martin Yeh (CSE, PSU)

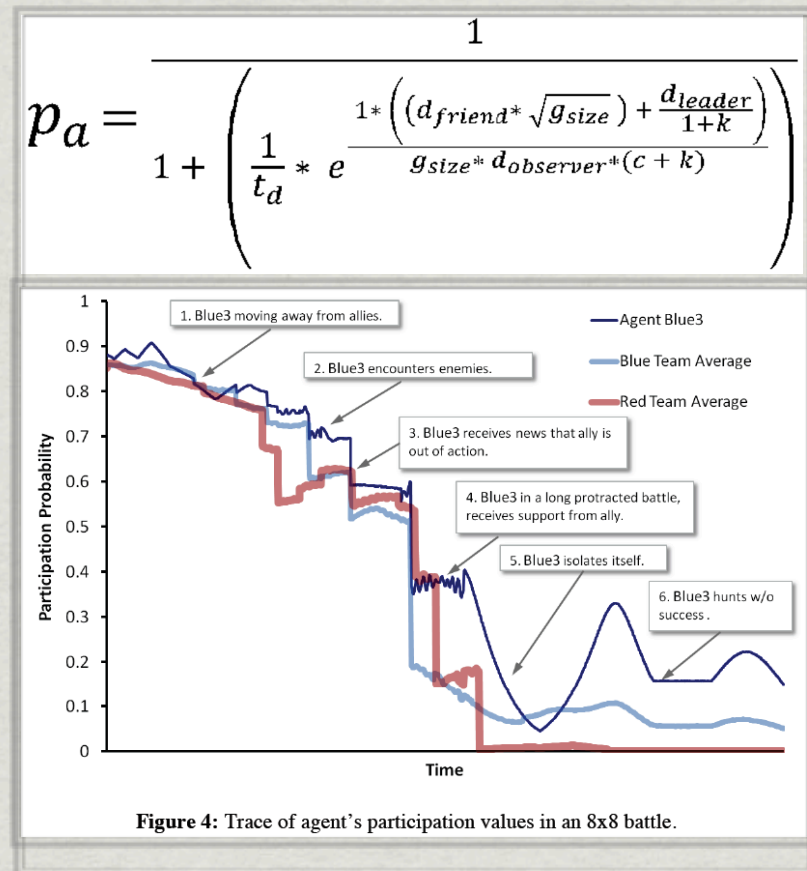


Moderators: Social impacts on cognition

- ✳ Start to represent the effects of social aspects on cognition and behavior
- ✳ How can you break the will of an agent with no will?

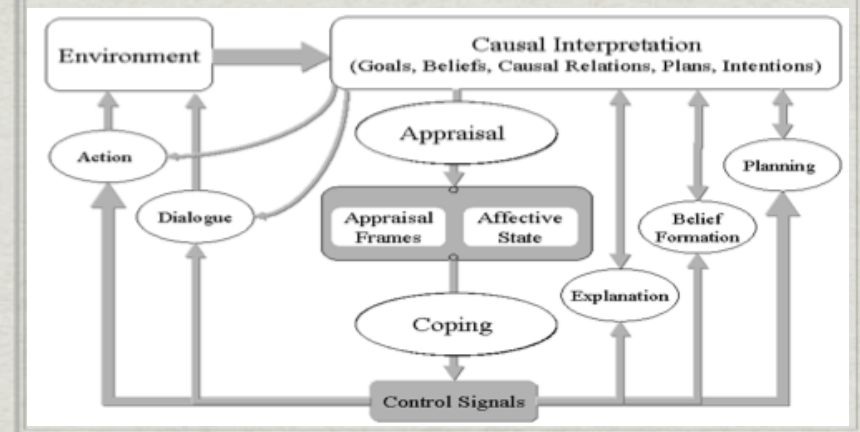
[📖 Morgan, J. H., Morgan, G., & Ritter, F. E. (2010). A preliminary model of participation for small groups. *Computational and Mathematical Organization Science*, 16, 246-270.]


Grossman, D. (1996). *on killing: The psychological cost of learning to kill in war and society*. New York, NY: Back Bay Books, Little Brown.



Moderators: Appraisal

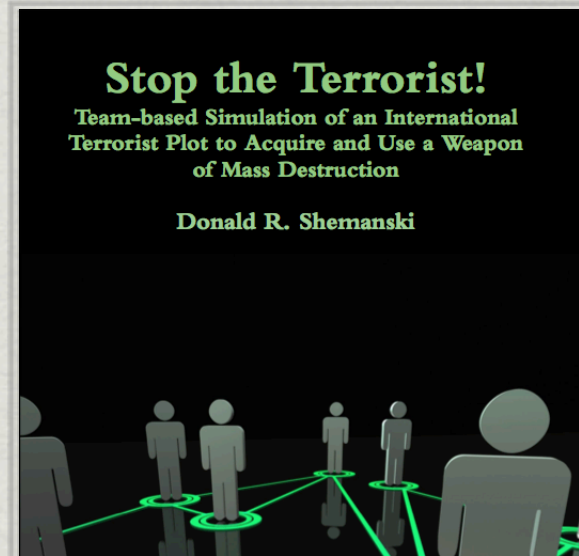
- ✱ Start to represent the effects of appraisal
- ✱ Not buildable upon
— as source code





[ Gratch, J., & Marsella, S. (2004). A domain-independent framework for modeling emotion. *Journal of Cognitive Systems Research*, 5(4), 269-306.]

Networks and Cognition: Terrorism scenarios


- ✳ Scenario for use in teaching and simulation of terrorism networks
- ✳ Created by a former FSO
- ✳ One more created, 2 more being created

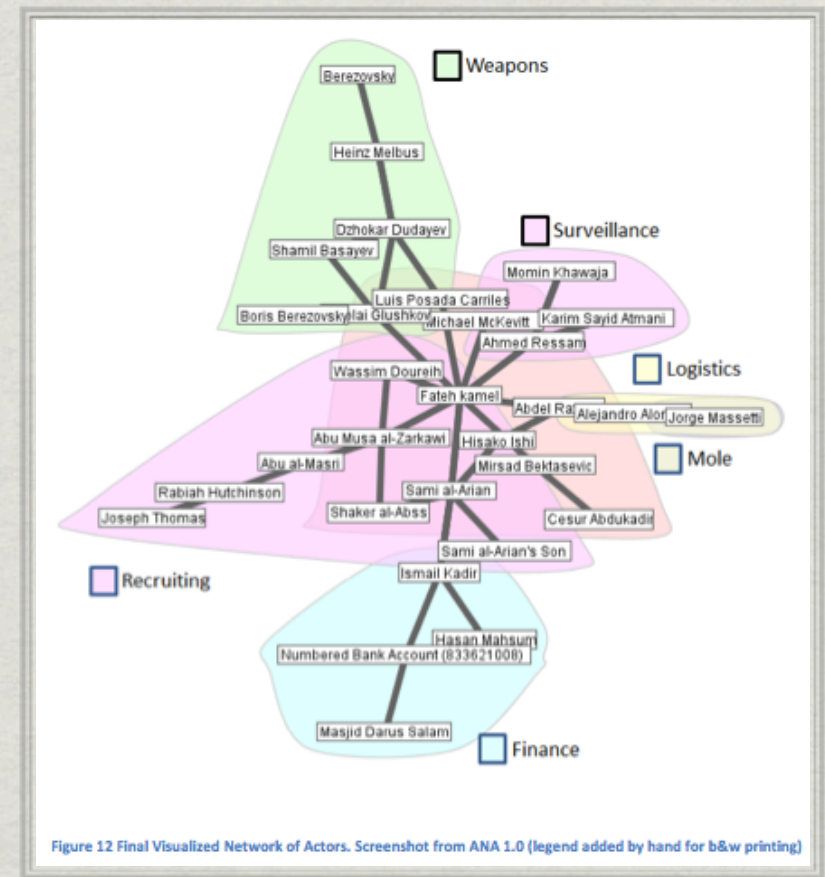


 <p>Joint FBI/NSA Intelligence Interest WARNING: This The following con NSA was able to id a female individua the terrorist sect, f is believed to be of English. Unidentified Male Unidentified Fema Unidentified Male is becoming more s (unintelligible)." Unidentified Fema some white powder Unidentified Male: further information Joint FBI/NSA Intelligence Interest ANALYSIS: Based on the fragm of "white powder"</p>	 <p>Serv (M Traduzio Subject: S On the 12 the depart conversat Rome Fin Both male was subje pick up fr Sal come to as Sal once. It w from other understan has much suitable an of Allah, (C all of this.</p>	<p>Simulated Report</p> <p>Федеральная служба безопасности Российской Федерации Federal Security Service of the Russian Federation</p> <p>Subject: Glushkov, Nikolai (parabolic microphone intercept)</p> <p>In the course of the increased surveillance of Nikolai Glushkov as a result of his prior suspicious communications (including his recent meeting with Boris Berezovsky), we intercepted portions of the following conversation, which took place between Glushkov and an unidentified, apparently disguised, male individual. Glushkov had traveled to Chachaya and met with a man whom he referred to as "Mr. Dudaev." The meeting took place in the Holiday Inn Restaurant in Grozny on August 4th, 2008. Due to ambient restaurant noise, surveillance operatives did not intercept the conversation in its entirety.</p> <p>The conversation follows:</p> <p>Nikolai Glushkov: Mr. Dudaev?</p> <p>Dudaev: Yes. My friend Boris said you wanted to see me about something?</p> <p>Nikolai Glushkov: Thank you for meeting with me. I spoke with Boris a while ago and he said that you would be the right person to speak (unintelligible)... of service?</p> <p>Dudaev: I will get straight to the point as I do not like to discuss issues such as this in public. (unintelligible) would have picked a different location, but since we are here now we will make it quick. I know a man who is a specialist in this field. I will speak with him.</p> <p>Nikolai Glushkov: Can you tell me his name?</p> <p>Dudaev: (unintelligible). mi Basayev</p> <p>Nikolai Glushkov: Thank you very much, can you give me a number or an email address so I can contact you in the future if this path is taken?</p> <p>Disclaimer: This report is intended for instructional use only. The information herein is completely fictional. Any similarity to actual events or real people is strictly coincidental.</p> <p>Page 1</p> <p>Subject Two: This will be a festival like no other!</p>
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Network and Cognition: ANA—A Network Analysis tool

- ✱ Provides visualizations of networks and network evolution


[ Orendovici, R. (2011). *Social network analysis and simulation of the development of adversarial networks*. Unpublished MS thesis, Penn State.]



Network and cognition:

VIPER & Intelligent Heterogenous Agent Networks

- ✱ Provides visualizations of networks and network evolution

[ Zhao, Cw., Hiam, J. W., Morgan, J. H., Ritter, F. E. (2011). A multi-strategy spatial navigation model in a text-based environment. In *Proceedings of the 20th Conference on Behavior Representation in Modeling and Simulation*. 251-258. 11-BRIMS-036.]

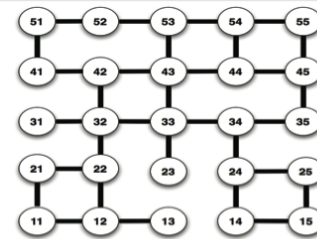
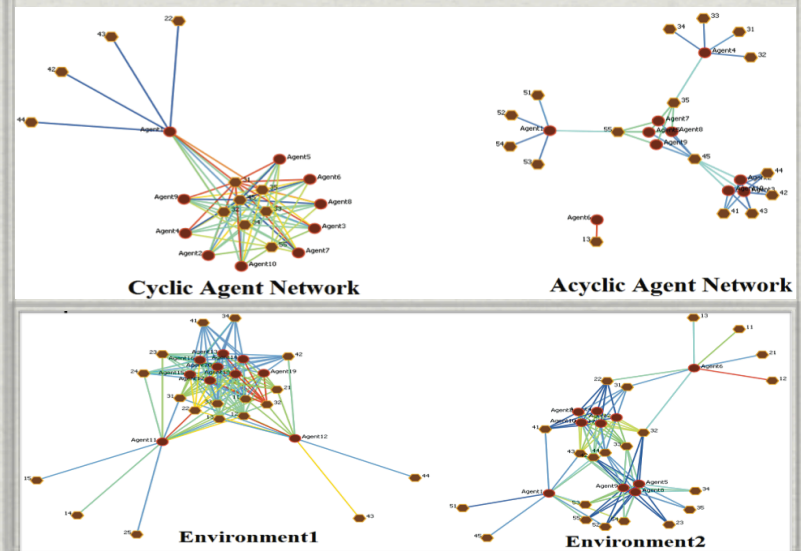


Figure 3: Spatial layout, environment 2.

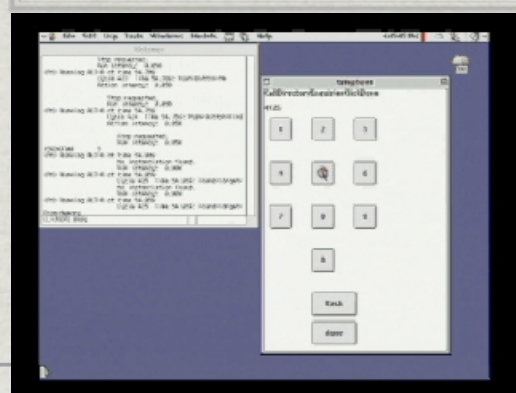
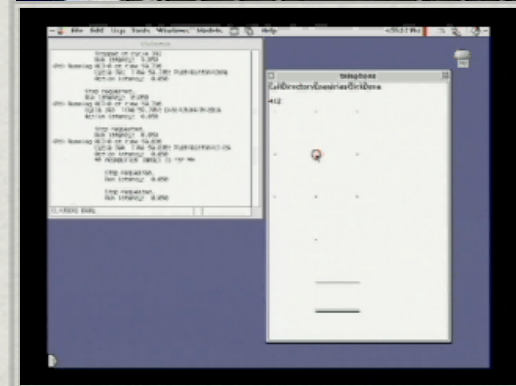
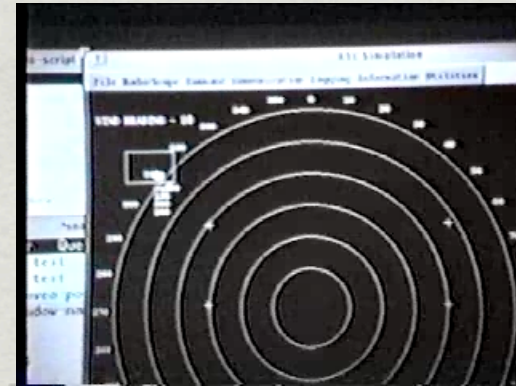


Interaction: Early Sim-eye & -hand

- ✱ Joke on interaction
- ✱ Provide models access to simulations and thus knowledge


📖 Ritter, F. E., Baxter, G. D., Jones, G., & Young, R. M. (2000). Supporting cognitive models as users. *ACM Transactions on Computer-Human Interaction*, 7(2), 141-173.

short-nott.2.mov




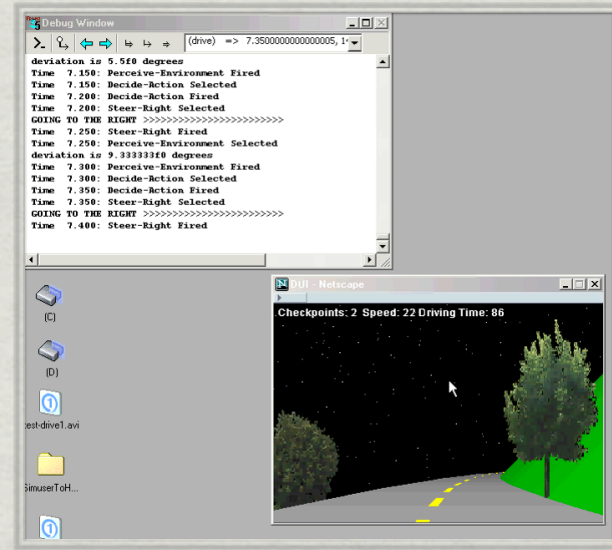
Interaction: Bitmap based interaction

- ✳ Provides models access to simulations and thus knowledge

 Ritter, F. E., Baxter, G. D., Jones, G., & Young, R. M. (2000). Supporting cognitive models as users. *ACM Transactions on Computer-Human Interaction*, 7(2), 141-173


pb270194.mov

 Ritter, F. E., Kukreja, U., & St. Amant, R. (2007). Including a model of visual processing with a cognitive architecture to model a simple teleoperation task. *Journal of Cognitive Engineering and Decision Making*, 1(2), 121-147.



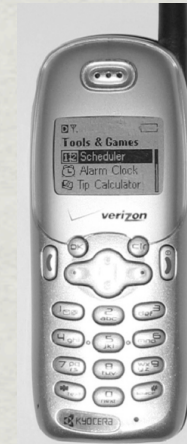
Interaction: SegMan

- ✳ Lets models test interfaces and theories
- ✳ could save 30 years/day

 St. Amant, R., Horton, T. E., & Ritter, F. E. (2007). Model-based evaluation of expert cell phone menu interaction. ACM Transactions on Computer-Human Interaction, 14(1), 24 pages.

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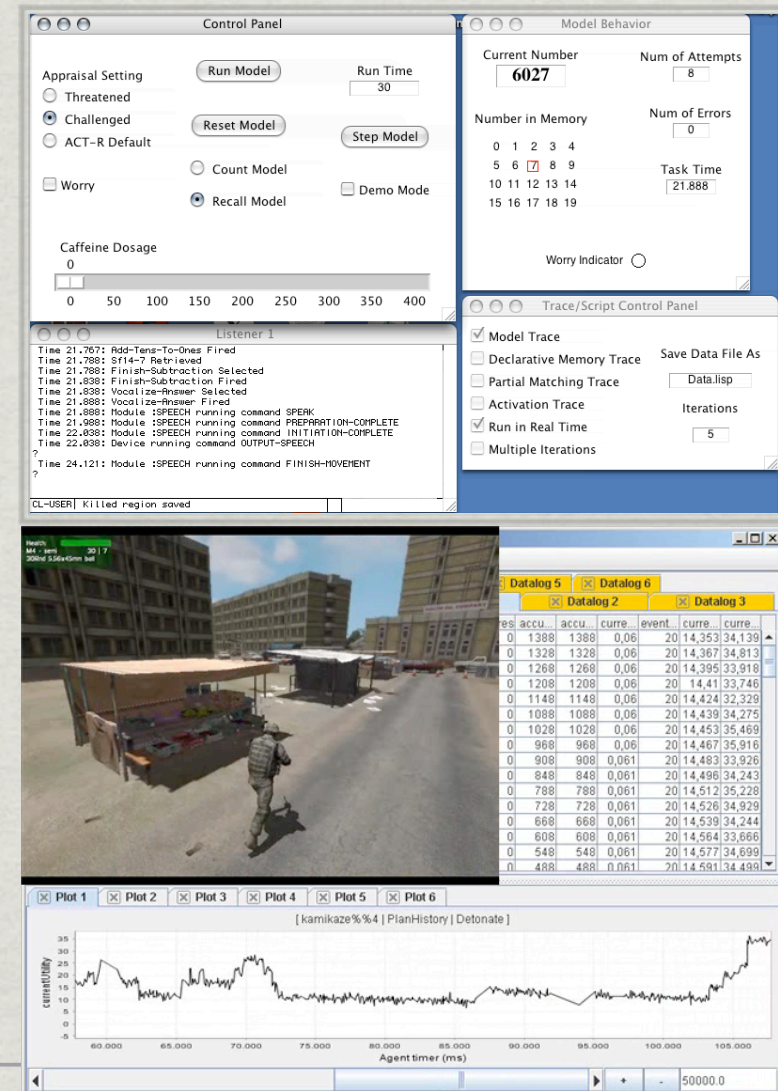


Moderators: Challenge and threatened

✱ Model of challenged and threatened behavior

📖 Ritter, F. E., Reifers, A. L., Klein, L. C., & Schoelles, M. J. (2007). Lessons from defining theories of stress for architectures. In W. Gray (Ed.), Integrated models of cognitive systems (pp. 254-262). New York, NY: Oxford University Press. challenge-no-worry5nov04.mov

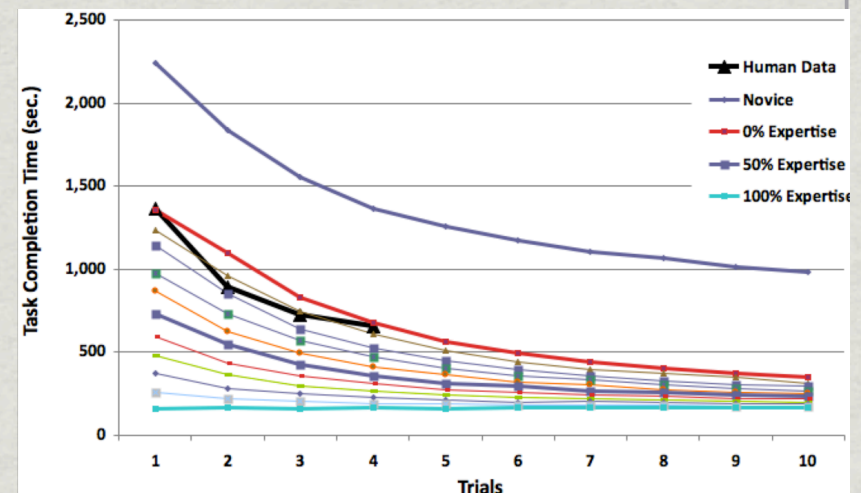
📖 Evertsz, R., Pedrotti, M., Busetta, P., Acar, H., & Ritter, F. E. (2009). Populating VBS2 with realistic virtual actors. In Proceedings of the 18th Conference on Behavior Representation in Modeling and Simulation, 09-BRIMS-04. civilian_fear.mov



Resources for Usability: High-level Languages like Herbal

- 📖 A review of high-level languages
- 📖 Modeling differences in expertise
- ✳️ 20 min. non-repetitive task
- ✳️ 9 rules+540 facts/543 rules per model, 10K total learned rules
- ✳️ N=40 human subjects

[📖] Ritter, F. E., Haynes, S. R., Cohen, M. A., Howes, A. John, B. Best, B., Lebiere, C., Jones, R. M., Crossman, J. Lewis, R. L., St. Amant, R., McBride, S. P., Urbas, L. Leuchter, S., Vera, A. (2006). High-level behavior representation languages revisited. In *Proceedings of ICCM - 2006- Seventh International Conference on Cognitive Modeling*, 404-407. Edizioni Goliardiche: Trieste, Italy.





[📖] Paik, J., Kim, J. W., Ritter, F. E., Morgan, J. H., Haynes, S. R., & Cohen, M. A. (2010). Building large learning models with Herbal. In D. D. Salvucci & G. Gunzelmann (Eds.), *Proceedings of ICCM - 2010-Tenth International Conference on Cognitive Modeling* (pp. 187-191).


Resources:

Modelling Methodology

- ✱ Noted as needed

 Ritter (1993),  Ritter et al. (2003), Booher & Minniger (2003)

- ✱ Basic psychology of interest

(Anderson, CP&I;  Ritter, Churchill, & Baxter, *The ABCS*, accepted, Springer)

- ✱ *How to run studies*

 (Ritter, Kim, Morgan, & Carlson, accepted, Sage)

- ✱ How to test models

- ✱ Grant (1962) Testing the null hypothesis and the strategy and tactics of investigating theoretical models. *Psych Rev*, 69(1), 54-61.

- ✱ Gluck & Pew (2005)

- ✱ Cognitive science special issue (Busemeyer, Gluck, & Bello, 2008)

- ✱ Number of times to run models (Ritter et al., in press)

Non-Conclusions

Not (My) Issues for your Challenge

- * Language
- * Simple network statistics
- * Where do networks statistics come from?
- * How does physiology support cognition?
- * Multiple-levels of representation
- * Individual differences
- * The domains I used, including Driving
- * Terrorism

- * People are purple - Frank Ritter, US/UK OOS Programme Agreement Workshop, April 2006.
- * The point is insights
- * Reuse

Conclusions

Issues for your Challenge Project

- * Encourage the Community of practice that arises (will arise) (Newell, 1990, p. 503)
 - * bringing more in
 - * teaching them (method and teaching materials)
 - * helping them prosper
- * Learning, forgetting, and the rest of the hard, traditional cognitive bits
- * Social aspects of cognition, including networks
- * Moderated aspects of behavior and of will
- * Explanations (Newell, 1990, p. 503)
 - * We need some good jokes as a way to present our stories 😊
 - * Require source code and data (Thimbleby, 2004 "Give your computer's IQ a boost," Review of Journal of Machine Learning Research. *Times Higher Education Supplement*, No. 1588, p. 1526.
 - * We need good diagrams, displays, and scenarios to explain our models
 - * We need good movies to explain our models
- * We need models easy to use and reuse (Newell, 1990, p. 503)
 - * These seem to be architecture, which is surprising
 - * These seem to be general software
 - * ACT-R/PM does not go far enough, we will have to have something like SegMan
- * Resources we have: theories, models, conferences, books, FAQs, datasets, architectures, XML