MindModeling@Home: A Volunteer Computing Resource for Cognitive Modeling

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Performance and Learning Models (PALM) Team

6.1 (basic)
- Orientation and navigation in virtual environments
- Modeling the effects of fatigue on cognition
- Large scale cognitive modeling

6.2 (applied)
- Distributed and high performance computing
- Natural language and synthetic teammates
- Performance tracking and prediction

Dr. Jerry Ball, Dr. Scott Douglass, Mary Frieman, Dr. Kevin Gluck, Dr. Glenn Gunzelmann, Dr. Tim Halverson, Jack Harris, Dr. Tiffany Jastrzembski, Michael Krusmark, Dr. Don Lyon, Tom Mielke, Rayka Mohebbi, Rick Moore, Dr. Chris Myers, Monica Nguyen
Performance and Learning Models (PALM) Team Cont.,

Scientific Goal

Improved models of human perceptual, cognitive, and motor processes in complex, dynamic environments

DoD Application

Computational Replicates

- Synthetic teammates
- Pedagogical agents
- Performance optimization analysis tools
Exploring the Parameter Space
# Fatigue Research Model (SASTNM_7)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Start</th>
<th>End</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Fatigue Parameter</td>
<td>0.4</td>
<td>1</td>
<td>0.1</td>
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<tr>
<td>Procedural Fatigue Decrement</td>
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<td>0.04</td>
<td>0.01</td>
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<tr>
<td>Declarative Fatigue Parameter</td>
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<td>0.1</td>
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<tr>
<td>Declarative Fatigue Decrement</td>
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<td>0.05</td>
<td>0.01</td>
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<tr>
<td>Retrieval Threshold</td>
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<td>1</td>
<td>0.5</td>
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<tr>
<td>Utility Threshold</td>
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<td>1.8</td>
<td>0.1</td>
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<tr>
<td>Initial Utility</td>
<td>1.5</td>
<td>2.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

\[6 \times 4 \times 10 \times 5 \times 4 \times 11 \times 10 = 1,524,600 \text{ Parameter Combinations}\]

\[100,524,600 \text{ Model Runs!}\]
High Computational Demands
Growth in HPC Use

The chart shows the growth in processor hours from 2006 to 2009. The y-axis represents processor hours, ranging from 0 to 2,500,000. The x-axis represents fiscal years from 2006 to 2009.

- In 2006, the processor hours were very low.
- In 2007, there was a slight increase in processor hours.
- In 2008, there was a significant increase in processor hours.
- In 2009, the processor hours reached the highest level shown on the chart.

The chart indicates a steady increase in the use of HPC (High-Performance Computing) over the fiscal years shown.
Challenges in HPC Use

• Scheduling Tasks
• Time allocations
• Transferring completed data
• Limited amount of processing hours
• Secure access
Volunteer Computing

- Berkeley Open Infrastructure for Network Computing (BOINC)
  - Scheduling / Work flow process management
  - File Distribution (Lisp VM / Model / Cognitive Architecture)
  - Data Management and Validation
  - Multi-core utilization (Client)
Distributed computing in which owners donate their computing resources (i.e. storage, processing power) to one or more projects

Tommy, 6/17/2009
173,000+ Active Users, 638 TeraFLOPS

47,000+ Active Users, 94+ TeraFLOPS

Rosetta@home
Protein Folding, Design, and Docking

Folding@home
distributed computing

04 Active Servers, 380,000+ Active CPU’s, 4,476 Native TeraFLOPS
MindModeling@Home (Beta)

MindModeling@Home (Beta) is a research project that uses volunteer computing for the advancement of cognitive science. The research focuses on utilizing computational cognitive process modeling to better understand the human mind. We need your help to improve on the scientific foundations that explain the mechanisms and processes that enable and moderate human performance and learning. Please join us in our efforts! MindModeling@Home is not for profit.

MindModeling@Home (Beta) is based at the Cognitive Engineering Research Institute in Mesa, AZ.

User of the day

To maintain one’s ideals in ignorance is easy.

Lisa Hagen...

News

Status Update
June 5 2009 01:13:20
After many hours of configurations, builds, and reboots, the new Mind Modeling database is finally up! We're still configuring all our authentication and networking scripts, so please be patient as we wrap up the final stages of the installation. If you notice any abnormalities or inconsistencies with your account, please let me know and I will resolve the matter immediately.

-Tom

Server Updates
May 23 2009 01:13:20
Hi folks, MindModeling.org will be experiencing updates over the next couple days which may result in the server being shut down for extended periods of time. Please be patient and we will provide as much information as possible in regards to the status of the site.

-Tom

MySQL Reboot
May 18 2009 03:02:08
There was a quick disconnect this afternoon between our database server and MySQL. The system is rebooting the data right now, and everything should appear normal again in just a few hours.

-Tom

Supported Volunteer Cognitive Applications

Join MindModeling@Home (Beta)

- Read our rules and policies
- Download BOINC
- When prompted, enter http://MindModeling.org/beta/
- If you have any problems, get help here.

About

- MindModeling Wiki
- Cognitive Science Society
- Cognitive Science Wiki
- FAQ

Returning participants

- Your account - view stats, modify preferences
- Teams - create or join a team
- Certificate

Community

- Participant profiles
- Message boards
- Questions and answers
- Statistics

Current Jobs

<table>
<thead>
<tr>
<th>Job</th>
<th>Status</th>
<th>Complete</th>
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<tbody>
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<td>SASTNM.11.2</td>
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<tr>
<td>SASTNM.9.7</td>
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Complete Jobs

<table>
<thead>
<tr>
<th>Job</th>
<th>Status</th>
<th>Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV2NM_addMB2</td>
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<tr>
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<tr>
<td>SASTNM.10</td>
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<td>SAST.Reduced2</td>
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<tr>
<td>SAST.Reduced4</td>
<td>100.00%</td>
<td>16,222,342</td>
</tr>
</tbody>
</table>
MindModeling@Home

- MindModeling@Home: Meta-Computing project spanning diverse resources to create an integrated cognitive research environment
  - 37,000,000+ parameter combinations searched
  - Centralized Web Submission system for models
  - Support for Mac, Windows, and Linux clients
  - On Average, 600-800 active users
  - 82 Countries
MindModeling Portal
The future of MindModeling@Home
MindModeling@Home as a Volunteer Computing Resource for Cognitive Modeling

- Processing power comparable to HPC’s
- Job submissions not restricted to secure access
- Fast turn-around time for models
- Capability of supporting distributed computing for a diverse range of applications
- Web-based submission system
Thank you,
Any Questions?
MindModeling Meta-Computing Infrastructure