

Application of Cognitive Agents to NAS Models and Real-Time Simulations

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MITRE Sponsored Research

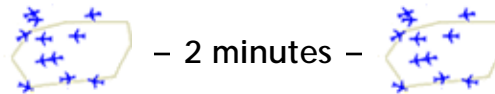


Problem

- **MITRE is commonly asked to determine what impacts new technologies may have on the National Airspace System (NAS).**
- **In order to understand system-wide impacts, it is necessary to understand the effects of a technology on controllers/pilots.**
- **Specifically, what are the effects of new technologies on controller/pilot workload, productivity, and error rates across the NAS?**

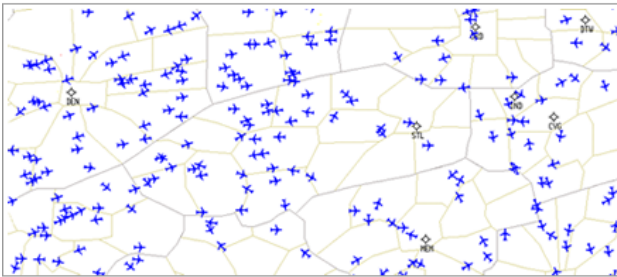
Background

In the past we have implemented a single, static cognitive model that interacts with a constrained environment over a few minutes

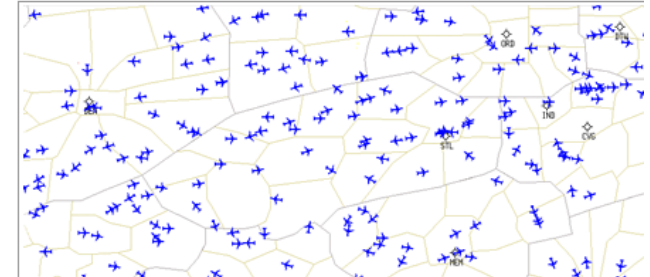


Past Environment

Through this project we are aiming to implement many automated cognitive models that interact with a robust environment (and each other) over several days



2 days



Future Environment

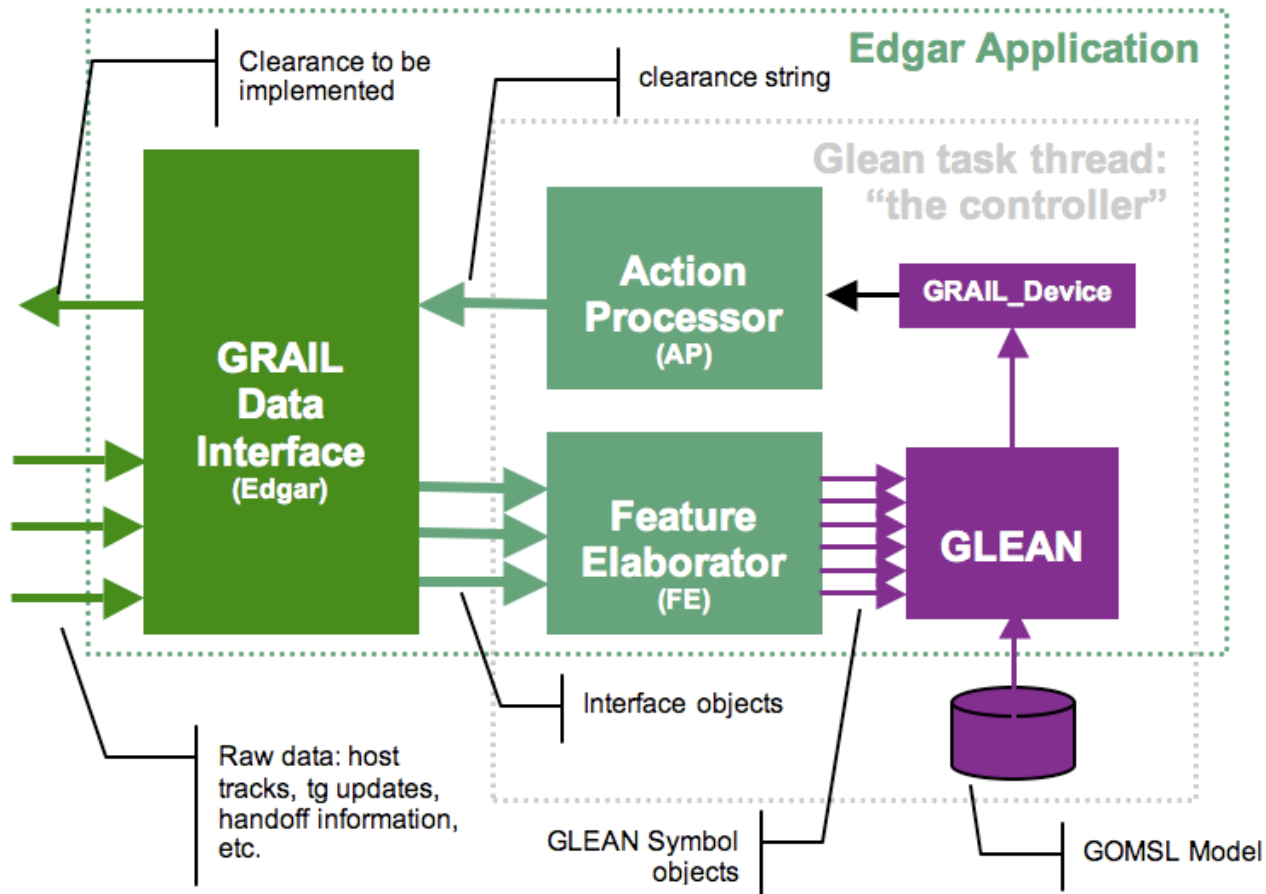
Objective

- **Our objective is to create a library of autonomous cognitive models that can be implemented within NAS models or real-time simulations**
 - **During Fiscal Year 2007 we will complete an autonomous cognitive model that can accomplish roughly 95% of common en route air traffic controller tasks**

Activities

- **Task Analysis & Controller Interviews**
- **Model Building**
- **Infrastructure Development**
- **Human-in-the-Loop (HITL) Study of Controller Memory**
- **Model Validation Activity**

Highlight

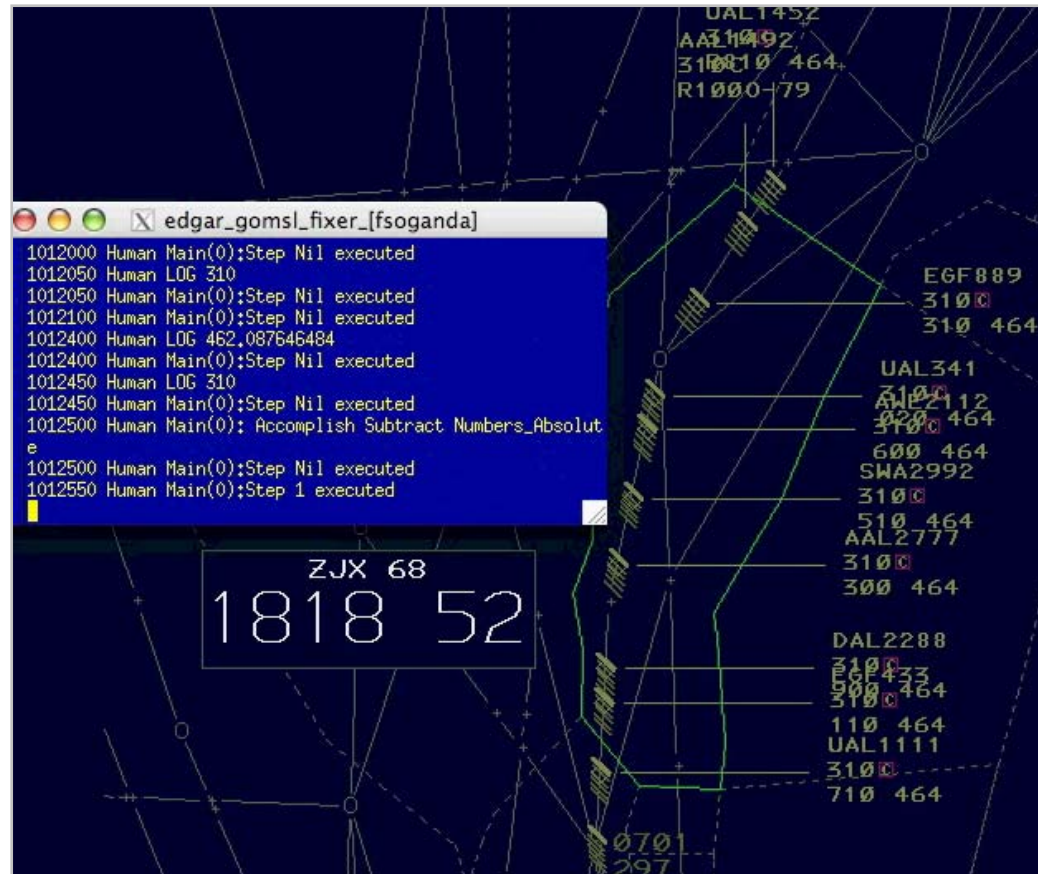


Framework for communications between cognitive models and simulation environment

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Demonstration



Live Demonstration Shows Cognitive Model Controlling Traffic in a Low-Complexity Sector

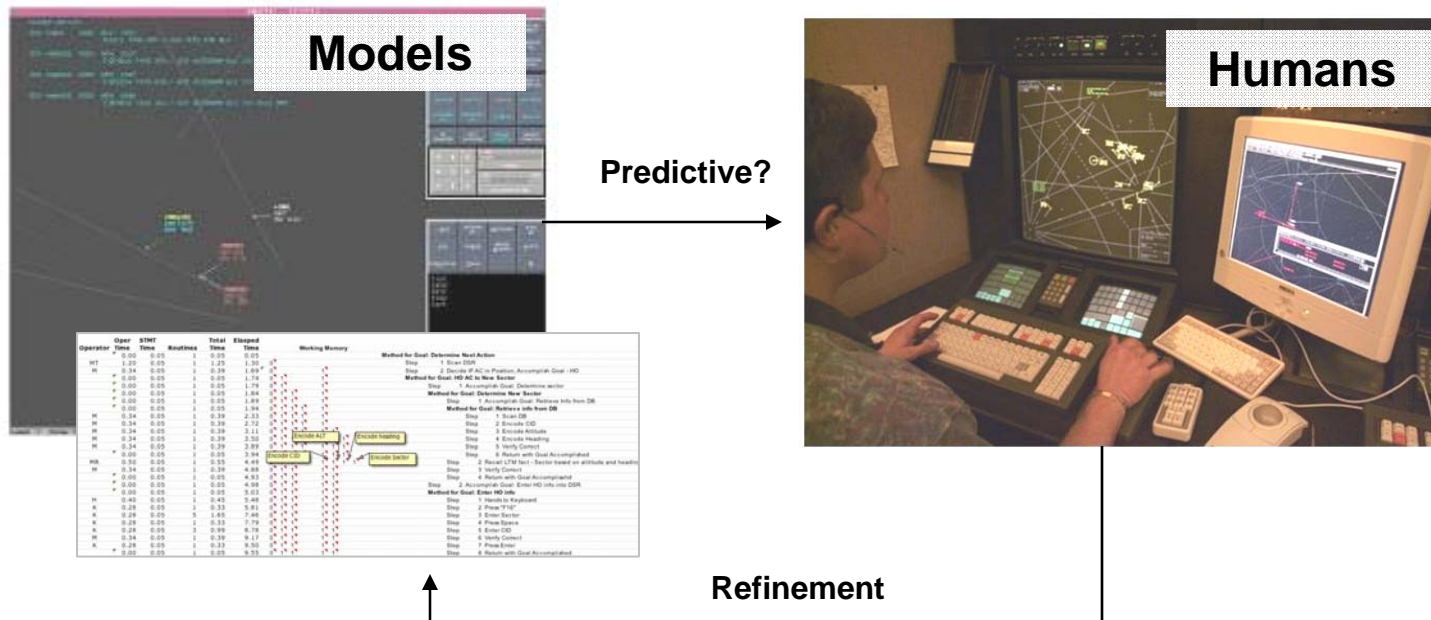
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Impacts

- **Embedded cognitive models will allow for macro-level system results that are based on, among other things, micro-level cognitive data of a type typically only gained in HITL evaluations**
- **This information can then be used to predict, for example, if controller workload is reduced using automation to a point where productivity increases allow controllers to handle additional aircraft or even additional sectors**
- **Within real-time environments, cognitive agents can facilitate HITL evaluations, acting as pilots, controllers, or traffic managers**

Future Plans



Validation and refinement through comparison of model performance to human performance