USER INTERFACE ISSUES IN SUPPORTING HUMAN - COMPUTER INTEGRATED SCHEDULING

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OUTLINE

- Introduction
- Background
- Issues
- OMP Interface
- Acknowledgements
CHARACTERISTICS OF AN OMP SCHEDULE DOMAIN

Resource Allocation Problem

- Over-Subscribed
- Large Numbers of Complex Requests
- Changes in Tasking
- Changes in Environment

WHAT IS A SCHEDULE?

Request
- Task
- Activity
- Set of Steps
- Frame

Antenna
- Resource
- Timeline
- Chronology
- Temporal Data Base of Steps, Usage, & Direction

Broadcast Frame
- Data
  - Filled in Broadcast Template
- Pool of Tactics Actions
- Activity Tree

Timeline
- Broadcast 508
- Broadcast 632
- Direction 53
- Chronogram C-12

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OMP ARCHITECTURE

Knowledge Bases
- Task Expansions
- Resource Descriptions

Input Updates

Scheduler

Control Process

Feedback

Heuristics
- Control Heuristics
- Dispatch Heuristics
- Assessment Heuristics

Data Bases
- Tasking
- Configuration

Events

Inputs

OMP Schedule

Chronologies

Control Loop

Feedback

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Picture of OMP Interface
ISSUES
OMP Interface Designed as Developmental Interface for Automated Scheduling System

- Information Underload: Strip Charts
- Information Overload: Histograms, Filtered Gantt
- Modifying Tasks: Edit Window
- Events: Command Window
- Assessment of Schedule: Statistics Display
- Development/Modification of Heuristics: Animated Windows, Chronologies, Parameter Setting

Example: Information Overload
When deleting tasks, show only the lower priority tasks which form the deletion pool

Before Filter: Tasks are indiscernible

After Filter: Show only those tasks pertinent to scheduling action
USER INTERFACE DIMENSIONS

Two major considerations in specifying a user interface:

- Functional Distribution
- Type of User

Functional Distribution
Example: Operations Mission Planner

Automated Functions
- Develop Schedule
- Assess Schedule
- Modify Schedule

Human Functions
- ID New Heuristics
- Direct Manipulation of Schedule
- Provide Guidance
- "Verify" Schedule
- Monitor Schedule Execution
- ID Problems During Scheduling

Process
Monitor
Create

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Types of Users
Different Types of Users Require Different Support from the Interface

**Human Scheduler**
- Adjust Scheduling Process
- Interpret Results of Scheduling Algorithms
- Modify Heuristics
- Perform Statistical Analysis
- Define New Heuristics

**Schedule End-User**
- Focus Scheduler
- Define Performance Limits
- Request Sequential Activities Lists
- Set Preferences

**Both**
- Manipulate Tasks
- Manipulate Resources
- Input New Tasking
- Receive Output Schedules

INTERPRETING USER INTERACTION
Need to interpret user interaction in the development of a schedule somewhere in the middle of the continuum

User Modification to Schedule is ABSOLUTE

Scheduler Can IGNORE Any User Change to Schedule
Example:
Interpreting User Interaction Using DYNAMIC OVERLAYS

- Task-A User Moves task to new location
  - Overlay Created indicating User Preference for this Location

- Task-A Several scheduling actions later, scheduler moves task back to resolve a conflict
  - Overlay Updated, increasing User Preference for this Location

- Task-A User Moves task back to same location
  - Scheduler considers moving task, but doesn't

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REACTIVE SCHEDULING

User Request → Scheduler → Schedule

User Request + Δ → Scheduler → Schedule

User Request → Scheduler → Schedule → Domain Model + Δ → User Request + Δ

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REACTIVE SCHEDULING CONT

User Request → Scheduler → Schedule

Domain Model → Detailed Domain Analysis

User Review

Schedule Change Request

Old Schedule

User Request → Scheduler → Schedule + Δ

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TRANSITIONING THE INTERFACE

OMP is in the process of identifying how to transition from an automated/developmental interface to an integrated/operational interface.

<table>
<thead>
<tr>
<th>Automated</th>
<th>H-C Integrated</th>
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<tbody>
<tr>
<td>Development:</td>
<td></td>
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<tr>
<td>OMP</td>
<td>Develop heuristics which can be interactive with the user. Provide feedback to the user on how his actions are affecting the schedule (INTERACTIVE DEBUGGING)</td>
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<td>Assist an end-user of the SCHEDULE in the process of input/output for the scheduler (BLACK BOX OPERATIONS)</td>
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132
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