Database Inputs

Name of Research Effort: CASPER (continuous planning and scheduling environment)

Company/Research Group: Jet Propulsion Laboratory, California Institute of Technology

Domain Application: __X__UAV, __X__UUV, __X__UGV, __X__Surface Ship [Applicability of Technology]

Domain Applied to: Space [Domain the research was originally developed for]

Programs of Record: NASA (Code-R, Code-S)_____.

[Externally Funded Programs that supported the development of this research]

Reviewer Name: ___Smith___ Reviewer Organization:__JPL_____. Review Date: ___Feb 2002___

Basis of Technology Assessment: _____

Confidence in Review: ____H__ (High, Medium, Low) [Your confidence in the maturity assessment]

Funding Source: _____.Start Date _____ End Date _____

Funding Type _____ Funding Level: _____

Funding Program Name:_____.

Funding Source: _____.Start Date _____ End Date _____

Funding Type _____ Funding Level: _____

Funding Program Name:_____.

Funding Source: _____.Start Date _____ End Date _____

Funding Type _____ Funding Level: _____

Funding Program Name:_____.

Technology Area 1: Planning and Decision Systems [see attached tech categories]

Specific Technology 1: Autonomous activity planning in presence of failures & uncertainty

[see attached tech sub-categories]

Current TRL Level:__4__.(1-10), Current ACL Level :____.(1-10), Date: _____.

[see attached TRL lists and ACLs]

Method of Demonstrating Current Technical Maturity __Software simulation demo on TechSAT-21 flight testbed_____.

[More specifics on the method being used to demonstrate maturity. See examples in SW TRL doc.]

Anticipated TRL Level:__7__.(1-10), Anticipated ACL Level :____.(1-10), Date: _____2004____.

[where you expect the tech to be when the project or projects supporting it our complete]

Anticipated Method for Demonstrating Technical Maturity __NMP ST7 Flight validation_____.

[More specifics on the method being used to demonstrate maturity. See examples in SW TRL doc.]

Technology Area 1: _____.

[see attached tech categories]

Specific Technology 1: _____.

[see attached tech sub categories]

Current TRL Level:_____.(1-10), Current ACL Level :_____.(1-10), Date: _____.

[see attached TRL lists and ACLs]

Method of Demonstrating Current Technical Maturity _____.

[More specifics on the method being used to demonstrate maturity. See examples in SW TRL doc.]

Anticipated TRL Level:_____.(1-10), Anticipated ACL Level :_____.(1-10), Date: _____.

[where you expect the tech to be when the project or projects supporting it our complete]

Anticipated Method for Demonstrating Technical Maturity _____.

[More specifics on the method being used to demonstrate maturity. See examples in SW TRL doc.]

Technology Area 1: _____.

[see attached tech categories]

Specific Technology 1: _____.

[see attached tech sub categories]

Current TRL Level:_____.(1-10), Current ACL Level :_____.(1-10), Date: _____.

[see attached TRL lists and ACLs]

Method of Demonstrating Current Technical Maturity _____.

[More specifics on the method being used to demonstrate maturity. See examples in SW TRL doc.]

Anticipated TRL Level:_____.(1-10), Anticipated ACL Level :_____.(1-10), Date: _____.

[where you expect the tech to be when the project or projects supporting it our complete]

Anticipated Method for Demonstrating Technical Maturity _____.

[More specifics on the method being used to demonstrate maturity. See examples in SW TRL doc.]

Milestone1 _____ Demo ____ Date _____

Description_____

[Key milestones only and a checkmark or "x" if the milestone includes a demonstration]

Milestone1 _____ Demo ____ Date _____

Description_____

[Key milestones only and a checkmark or "x" if the milestone includes a demonstration]

Milestone1 _____ Demo ____ Date _____

Description_____

[Key milestones only and a checkmark or "x" if the milestone includes a demonstration]

Milestone1 _____ Demo ____ Date _____

Description_____

[Key milestones only and a checkmark or "x" if the milestone includes a demonstration]

Milestone1 _____ Demo ____ Date _____

Description_____

[Key milestones only and a checkmark or "x" if the milestone includes a demonstration]

Summary Description of Project of Research CASPER (Continuous Activity Scheduling Planning Execution and Replanning) uses iterative repair to support continuous modification and updating of a current working plan in light of changing operating context. Rather than considering planning a batch process in which a planner is presented with goals and an initial state, the planner has a current goal set, a plan, a current state, and a model of the expected future state. At any time an incremental update to the goals or current state may update the current state of the plan and thereby invoke the planner process. This update may be an unexpected event or simply time progressing forward. The planner is then responsible for maintaining a consistent, satisficing plan with the most current information. This current plan and projection is the planner's estimation as to what it expects to happen in the world if things go as expected. However, since things rarely go exactly as expected, the planner stands ready to continually modify the plan. Current iterative repair planning techniques enable incremental changes to the goals and the initial state or plan and then iteratively resolve any conflicts in the plan. After each update, its effects will be propagated through the current projections, conflicts identified, and the plan updated (e.g., plan repair algorithms invoked). CASPER is being used in a range of projects including autonomous spacecraft, autonomous rovers, ground communications station automation, and uninhabited aerial vehicles.

Keywords: Continuous Planning, Iterative Repair, Scheduling

Comments: Making the planner more timely in its responses has a number of benefits: (a) The planner can be more responsive to unexpected (i.e., unmodelable) changes in the environment that would manifest themselves as updates on the execution status of activities as well as monitored state and resource values; (b) the planner can reduce reliance on predictive models (e.g., inevitable modeling errors), since it will be updating its plans continually; and (c) fault protection and execution layers need to worry about controlling the spacecraft over a shorter time horizon (as the planner will replan within a shorter time span).

Key Metrics:_____.

[How do you measure the benefit derived from your technology]

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