SBIR/STTR

Context-Augmented Robotic Interaction Layer (CARIL), Phase II

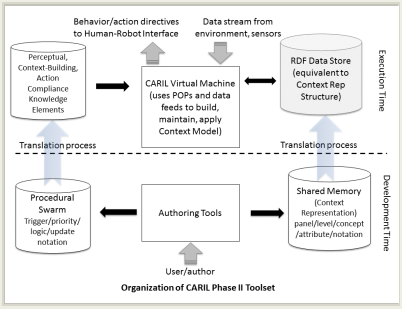
Completed Technology Project (2015 - 2017)

Project Introduction

CHI Systems and the Institute for Human Machine Cognition have teamed to create a human-robot interaction system that leverages cognitive representations of shared context as a basis for a fundamentally new approach to human-robotic interaction. This approach centers on a framework for representing context, and for using context to enable robot adaptive decision-making and behavior. The framework is called CARIL (the Context-Augmented Robotic Interaction Layer). Context is an important part of human-human interaction. Unfortunately, context is often overlooked when designing robotic systems. The challenge is to translate high-level concepts, such as teamwork and collaboration, into specific requirements that can be implemented within control algorithms, interface elements, and behaviors. During Phase I, CHI Systems developed a proof-of-concept CARIL implementation and applied it to a notional simulated robot in a simple station model. This simulation demonstrated CARIL's feasibility by demonstrating how it gave the simulated robot a capability to reason about its context to avoid spatial interference with astronaut activities and tasks.

Anticipated Benefits

Potential NASA Commercial Applications: CARIL allows a robot to have "action compliance" – an ability to adapt its behavior to that of human astronauts around it, by using a human-like model of context. Action Compliance, the behavioral analog of physical-interaction force compliance concept, is an enabling capability. Its post-applications are to the Robonaut-2 program at Johnson Space Center, the Free-flying robot (SPHERES) program at Ames Research Center, and as an embeddable, enabling technology, to all future robotic or robotic programs or future missions requiring robots or robotic vehicles.



Context-Augmented Robotic Interaction Layer (CARIL) Phase II, Phase II

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

SBIR/STTR

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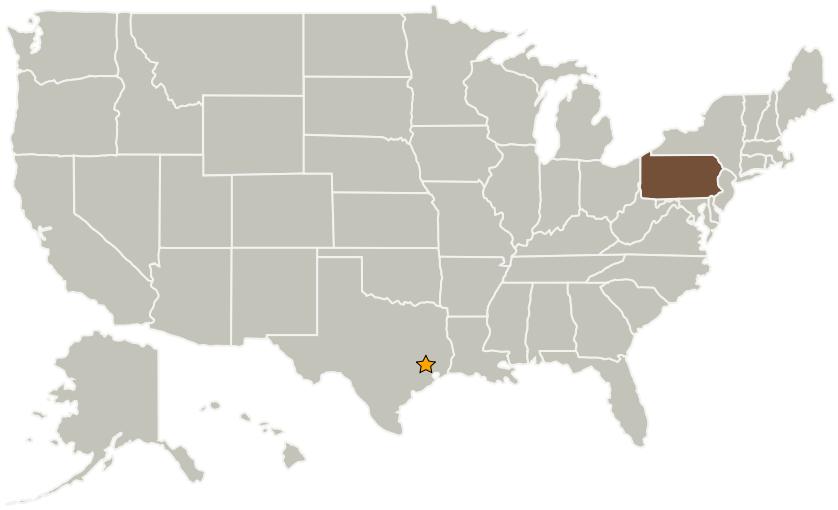
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, TX
CHI Systems, Inc.	Supporting Organization	Industry	Plymouth Meeting, PA

Primary U.S. Work Locations
Pennsylvania

Images

Briefing Chart
Context-Augmented Robotic Interaction Layer (CARIL) Phase II Briefing Chart

Project Management

Program Director:

Therese Griebel

Program Manager:

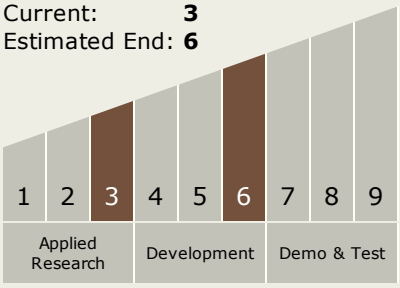
Carlos Torrez

Principal Investigators:

Wayne W Zachary
Taylor W Carpenter

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **6**



Technology Areas

Primary:

- Human Health, Life Support, and Habitation Systems (TA 6)
  - Human Health and Performance (TA 6.3)
    - Human Factors (TA 6.3.4)

Other/Cross-cutting:

- Robotics and Autonomous Systems (TA 4)

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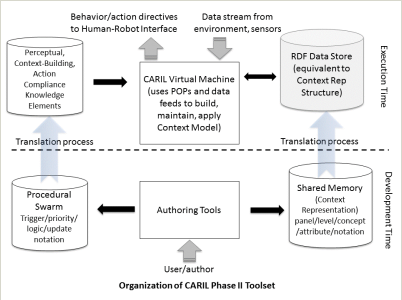

Briefing Chart Image
Context-Augmented Robotic Interaction Layer (CARIL) Phase II, Phase II

Technology Areas *(cont.)*

- Human-System Interaction (TA 4.4)
  - Distributed Collaboration and Coordination (TA 4.4.5)