Sorry Dave, I’m Afraid I Can’t Do That: Explaining Unachievable Robot Tasks Using Natural Language

Vasu Raman*, Constantine Lignos†, Cameron Finucane*, Kenton C.T. Lee†, Mitch Marcus† and Hadas Kress-Gazit*
High-Level Tasks:
Carrying meals to patients
Delivering medical records
Patrolling patient rooms

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Challenges:
Easy to instruct
Does as it is told*

Carry meals from the kitchen to all patient rooms.
Start in the closet. Carry meals from the kitchen to all patient rooms. Don’t go into any public rooms.
Example

Start in the closet. Carry meals from the kitchen to all patient rooms. Don't go into any public rooms.
Approach (Highlights)
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• Natural language pipeline

Parsing ➔ Semantics (VerbNet) ➔ LTL generation
User: What are you doing?
System: I'm currently trying to "Follow the target to 'hall_n'."
User: What are you doing?
System: I'm currently trying to "Follow the target to 'kitchen'."
User: What are you doing?
System: I'm currently trying to "Follow the target to 'hall_c'."
User: What are you doing?
System: I'm currently trying to "Follow the target to 'hall_n'."
Approach (Highlights)

- Natural language pipeline
- Provably correct controller via synthesis (when one exists)
Approach (Highlights)

• Natural language pipeline
• Provably correct controller via synthesis
• Minimal cause of unsynthesizability
  – Unsatisfiable core (using PicoSAT)
  – Explained in natural language
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15:30—18:00 Interactive Presentation (#3), Lichthof

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