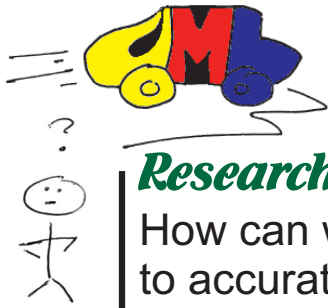


# Unified Modeling Language for Embedded Systems?

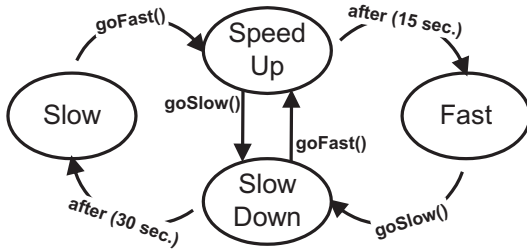


Beth Latronico  
Prof. Phil Koopman

## Research Question:

How can we use the Unified Modeling Language (UML) to accurately model real-time embedded systems?

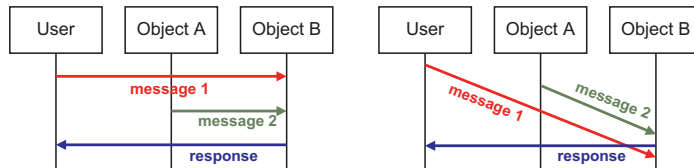
### Uncover Assumptions: Time, State, and Messages



- ▶ Examine latency effects
  - on statechart transitions
  - on order of arrival of messages

*Order may or may not matter  
Can't assume order sent = order received*

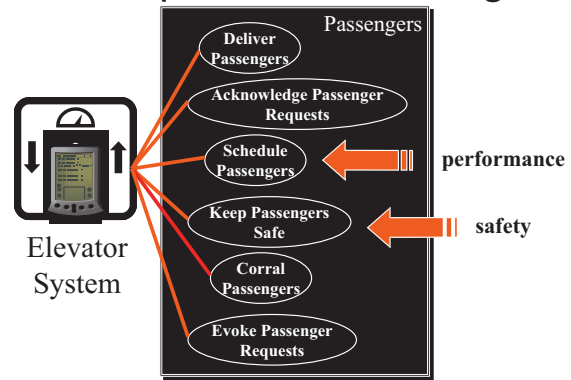
*Statecharts typically assume instantaneous transitions*



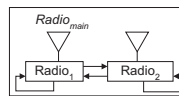
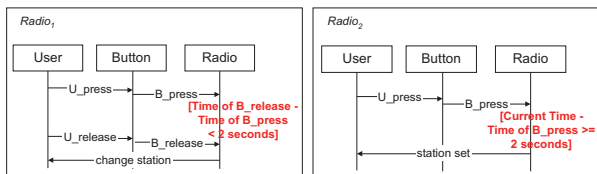
### Develop Methodology: Techniques and Training

- ▶ Continuous improvement of methodology
  - Graduate class to explore new ideas
  - Undergraduate class real-time distributed elevator project, using software simulator

*Process includes requirements, design, implementation, testing, and some graceful degradation*



### Formal Contributions: Specification and Traceability



- ▶ More accurate specification, better traceability between diagrams
  - Formal grammar helps identify potential design mistakes
  - Enhanced traceability between sequence diagrams and statecharts

SD → message duration **response** SD | ε  
 message duration **response** → α B\_release **change\_station**  
 | β **station\_set**

*Paper presented at UML 2001 conference*

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