CS 582
Modeling and Simulation II

Course Introduction

Mikel D. Petty, Ph.D.

Center for Modeling, Simulation, and Analysis

Presentation outline

- Instructor introduction
- Course motivation and content
- Course preview
- Course logistics
- Assignments and grading
- Semester schedule

Instructor introduction

Basic information

- Mikel D. Petty, Ph.D.
- UAH research duties
  - Director; Center for Modeling, Simulation, and Analysis
  - UAH research center; ~15 people total, 5 Ph.D.s
  - Modeling and simulation; systems engineering
- UAH faculty appointments
  - Associate Professor, Computer Science
  - Research Professor, ISEEM
- Contact information
  - Telephone 256-824-4368
  - Email pettym@uah.edu

Background

- Education
  - Ph.D. Computer Science,
    University of Central Florida, 1997
  - M.S. Computer Science,
    University of Central Florida, 1988
  - B.S. Computer Science,
    California State University Sacramento, 1980
- Research
  - Modeling & simulation
  - Applications of theoretical computer science
  - > 175 research papers published
  - > $15 million total research funding received

- Research employment 1990-present
  - University of Alabama in Huntsville (CMSA, Director)
  - Old Dominion University (VMASC, Chief Scientist)
  - University of Central Florida (IST, Researcher)
- Software development employment 1980-1990
  - University of Central Florida (database administrator)
  - General Mills Restaurants (programmer)
  - University of Texas at El Paso (systems analyst)
  - California State University Sacramento (programmer)

Course motivation and content

The emergence of M&S as a discipline

"Science used to be composed of two endeavors, theory and experiment. Now it has a third component: computer simulation, which links the other two."

Dr. Rita Colwell, Director, National Science Foundation, May 12 1999

Motivation for this course

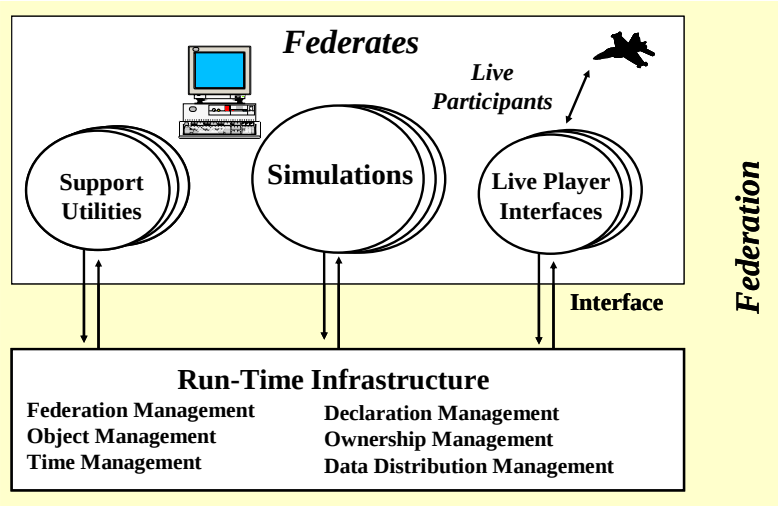
- Learning objectives
  - Distributed simulation, in general
  - High Level Architecture, in particular
  - Experience in collaborative software development
  - Exposure to virtual environments
- Motivation
  - Distributed simulation and HLA skills sought after
  - Non-academic real world software development performed in team context
  - Virtual environments increasingly pervasive

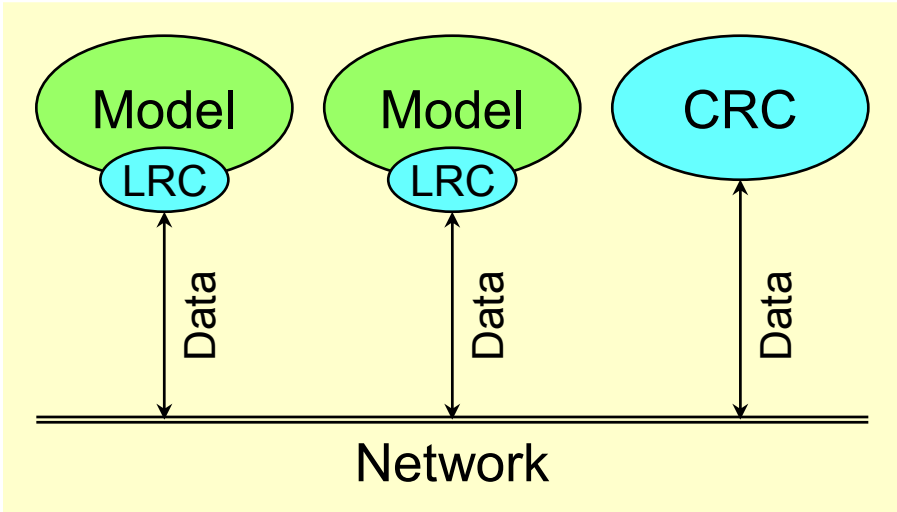
Unconventional course

- Project oriented
  - Lectures and guest lectures: ~1/3 of class sessions
  - Remaining class sessions: team activities
  - Firm deadlines because of external participation
- Team oriented
  - Students work in development teams
  - Different skills → different roles
  - Significant contributions expected from all

Course preview

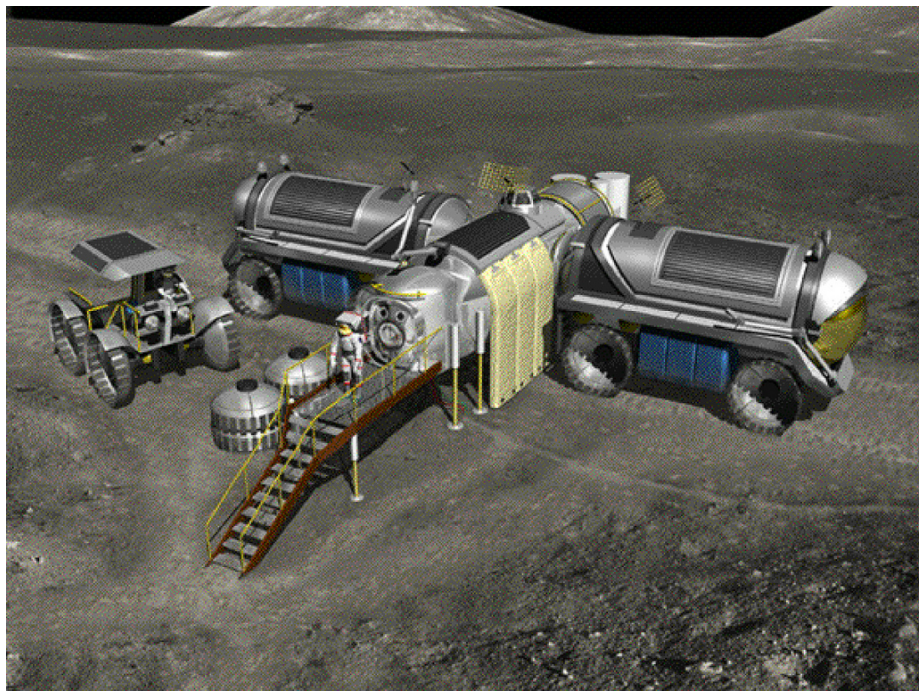
Distributed simulation



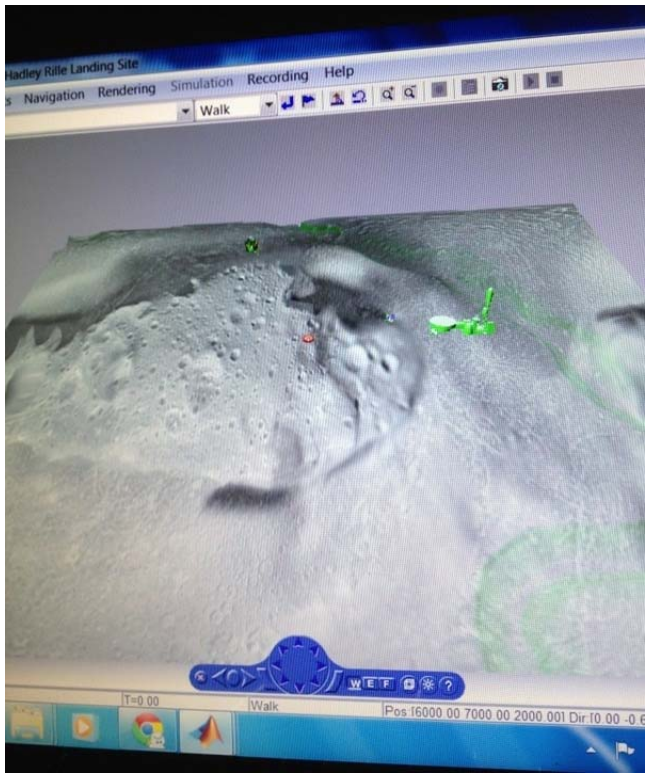


Simulation Exploration Experience concept

- Lunar exploration scenario
- UAHuntsville federates in scenario
- Other university federates in scenario



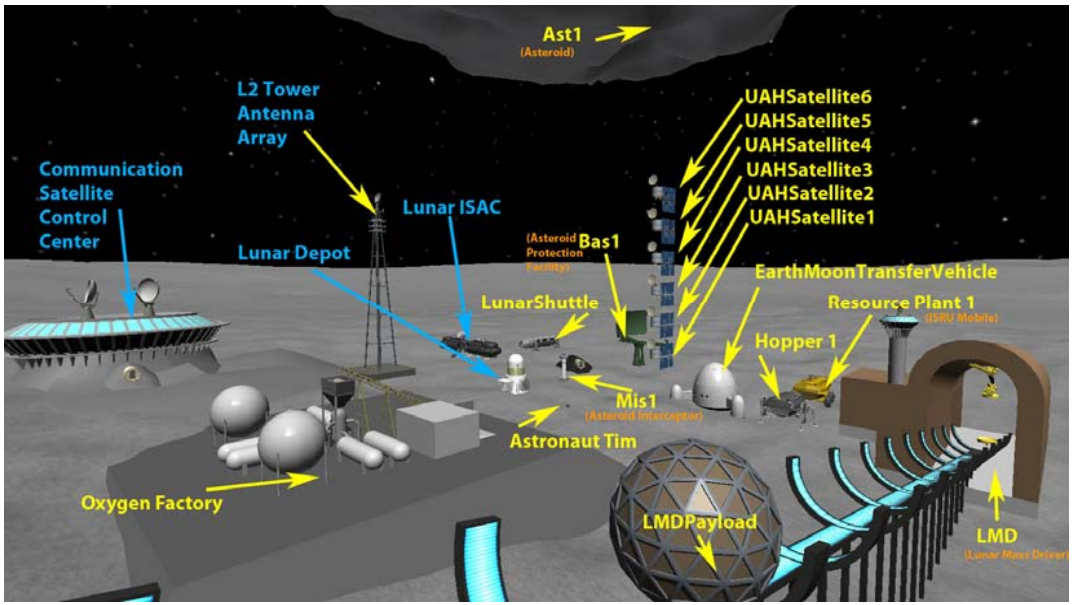
SISO Smackdown 2012, Orlando FL



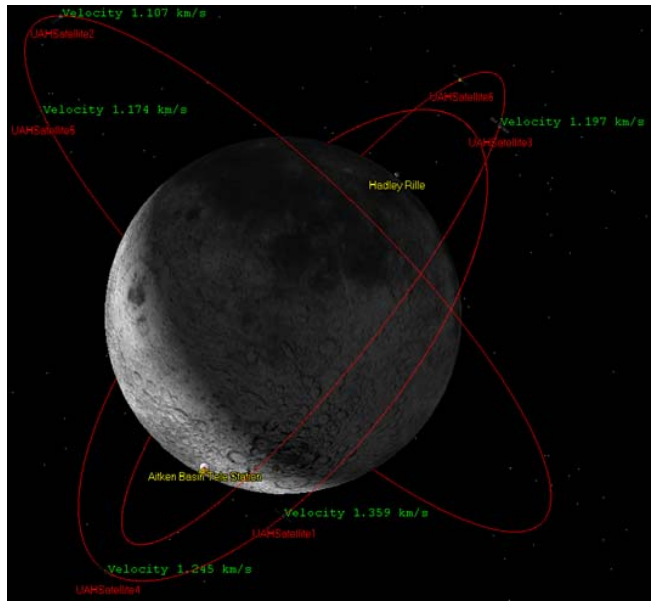
- UAHuntsville team won two awards at event
- UAHuntsville recognized by AL state legislature

SEE lunar exploration scenario

SEE = Simulation Education Experience

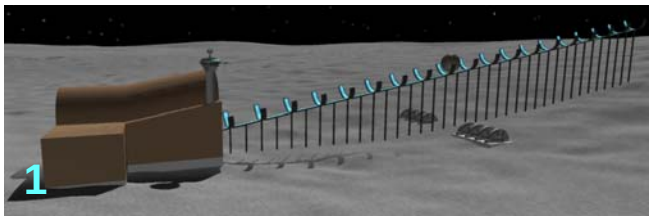


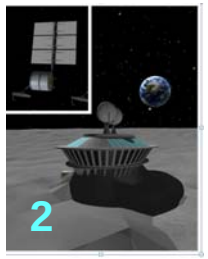
Exploration operations on the lunar surface

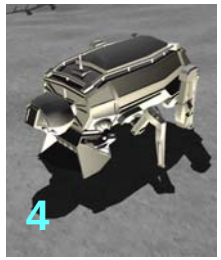


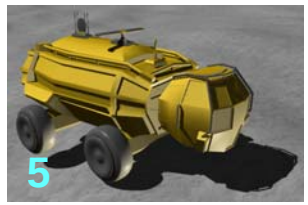
Communications satellites in lunar orbit

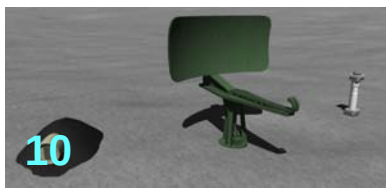
2013 international participation university

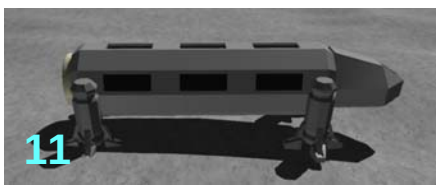


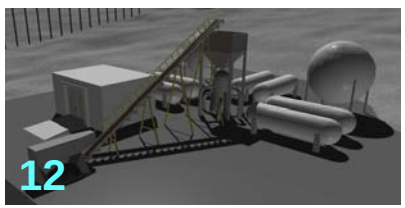






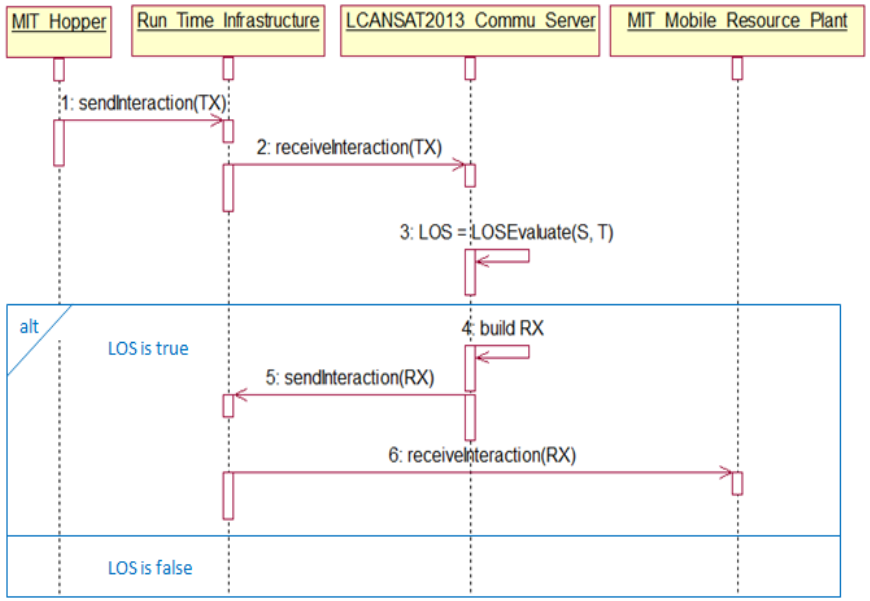






1 Lunar mass driver, UAHuntsville
2 Comm sat control center, UAHuntsville
3 Astronaut Tim, MIT
4 Scouting hopper, MIT
5 Mobile resource plant, MIT
6 Cargo rover, Nebraska
7 Earth-Moon transfer vehicle, NASA
8 L2 outpost, Munich
9 L2 tower array, Munich
10 Deep space radar, Genoa
11 Lunar regolith hauler, Penn State
12 Lunar fabrication facility, Brunel/Exeter

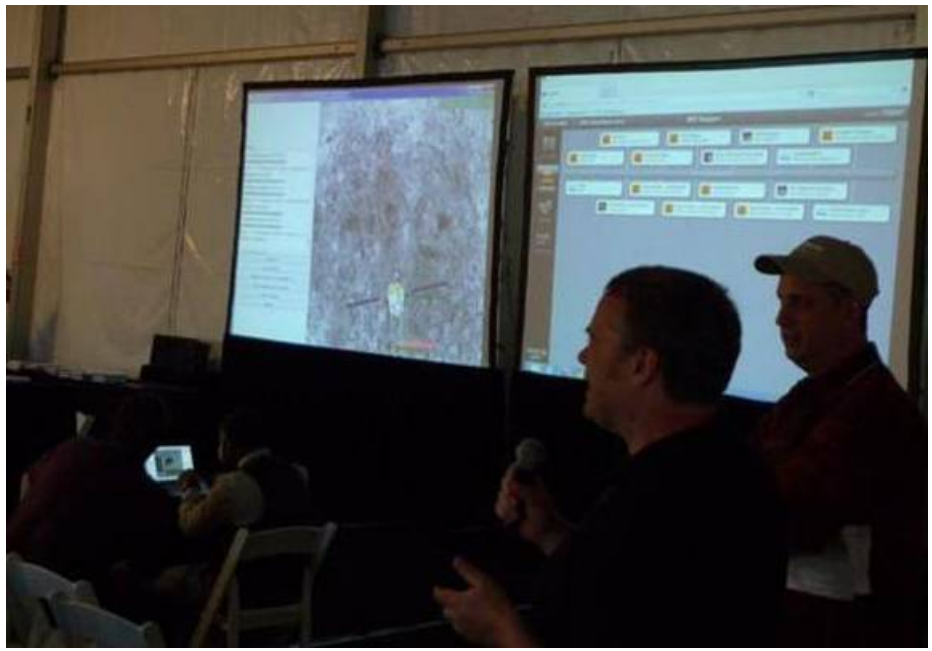
Class structure team: software development



SEE demo event: SpringSim 2014, Tampa FL

2012 team (subset), Orlando FL

2012 audience, Orlando FL



2013 demonstration, San Diego CA

Course logistics

Class sessions, weeks 1–3

- Days and time
  - Monday and Wednesday, 5:30pm – 6:50pm
  - Conventional lectures on DS and HLA
  - Lectures will generally start and stop punctually
  - If arriving late or departing early, please do so quietly
- Location
  - UAH, Technology Hall N308
- In-class questions
  - Welcome anytime during lecture
  - Please don't be hesitant
  - Interrupt me if necessary

Class sessions, thereafter

- Days and time
  - Monday and Wednesday, 5:30pm – 6:50pm
  - Primarily team development activities
  - Occasional guest and special topic lectures
- Location
  - UAH, Shelby Center 157
  - Conference area
  - Connected lab space

Office hours and off-line questions

- Office hours
  - Monday and Wednesday, 3:00pm – 5:00pm
  - Technology Hall, N300G (inside CS office)
  - Other days and times: Available by appointment
  - Other days and times: Shelby Center 144 (inside 129)
- Remote
  - Email: pettym@uah.edu
  - Phone: 256-824-4368
  - Please allow time for response

Course web site

- URL http://www.uah.edu/cmsa/academics/cs582-spring-2014
- Lecture slides
  - Posted before class
  - Download and print before class session
- Other materials
  - Official syllabus (syllabus prevails over these slides)
  - Handouts and supplements
- Distribution
  - Download and print as needed for this course
  - Do not copy, repost, or redistribute

Project information

Resources available for 2014

- Dedicated lab: Shelby Center 157
- Commercial HLA software tools: Pitch and MÄK
- SEE web site
- HLA federate development tutorial document
- Prior UAHuntsville Smackdown/SEE team members
  - Daniel O'Neil
  - Justin Brown
- 2013 UAHuntsville Smackdown federates software
- Travel expenses for students to SEE demo event, 2014 Spring Simulation Multiconference, Tampa FL, April 13–16, up to 4 persons

Deliverables

- Statement of work: "what"
  - Maintain 2013 federate(s) as is?
  - Enhance 2013 federate(s)?
  - Implement new federate(s)?
- Project plan: "who" and "when"
- 2013 federation subset running at UAHuntsville?
- 2014 federates
- Participation in 2014 SEE demo event
- Technical report

Possible student team structure

- Developers (4-5 persons)
  - Design and implement 2014 SEE federates
  - Test integration of 2014 federates internally and externally
  - Document federate design and implementation
- Modelers (2-3 persons)
  - Develop physics-based mathematical models of scenario objects, e.g., satellites, rovers, …
  - Communication model implementation to developers
  - Document models
  - Develop validation approach for models
- Team leader (1 person)
  - Develop project plan: tasks, assignments, schedule
  - Monitor progress against schedule, respond to delays
  - Lead interaction with SEE planners, other teams
  - Lead preparation of deliverable final report

Key dates

- First lecture: Jan 8
- Integration testing starts: TBD
- Spring "Break": Mar 24-28
- SEE demonstration event: Apr 14-16
- Last lecture: Apr 23
- Final exam: Apr 28
- Technical report due: Apr 28

Assignments and grading

Semester grades

- SEE contribution 40%
- Technical report contribution 25%
- Mid-term exam 10%
- Final exam 15%
- Student peer assessment 10%
- ≥ 90% A, ≥ 80% B, ≥ 70% C, ≥ 60% D, …

Examinations

- Content
  - Material from lectures and handouts
  - Mid-term: material covered prior to exam
  - Final: material covered after mid-term
- Format
  - Closed; slides, notes, books, not allowed during exam
  - Multiple choice questions

Missed exams

- For planned absences: exam may be taken early by prior arrangement
- For unplanned absences: make-up exams may or may not be granted, justification required
- Make-up exams will be different

Semester schedule

Semester schedule

- Class sessions
  - Lectures and/or guest lectures: weeks 1 to ~3
  - Team development sessions: weeks ~4 to 14
  - SEE, no class sessions: week 15
  - Lectures and/or guest lectures: week 16
- Exam dates
  - Mid-term: TBD, 1 week notice, normal class session
  - Final: Monday, Apr 28, 6:30pm – 9:00pm
- Other dates
  - MLK holiday: Jan 20
  - Spring Break: Mar 24-28

Getting started

- Review contents of SEE2014 web site
  http://exploresimulation.com/
- Read documents posted on course web site
  http://www.uah.edu/cmsa/academics/cs582-spring-2014
- Read Pitch HLA tutorial
  http://www.pitch.se/hlatutorial

Expectations and final thoughts

- Students expected to be able to …
  - Design and execute challenging project
  - Organize their own tasks
  - Comply with fixed deadline
  - Overcome obstacles independently
  - Expend necessary time and effort
- Final thoughts
  - Unconventional course
  - Everything subject to change
  - Learning (and grade) directly proportional to effort

End

Center for Modeling, Simulation, and Analysis