EAAI:
Educational Advances in Artificial Intelligence

Mehran Sahami

Stanford University

sahami@cs.stanford.edu

Marie desJardins

U. of Maryland, Baltimore County

mariedj@cs.umbc.edu

Zachary Dodds

Harvey Mudd College

dodds@cs.hmc.edu

Todd Neller

Gettysburg College

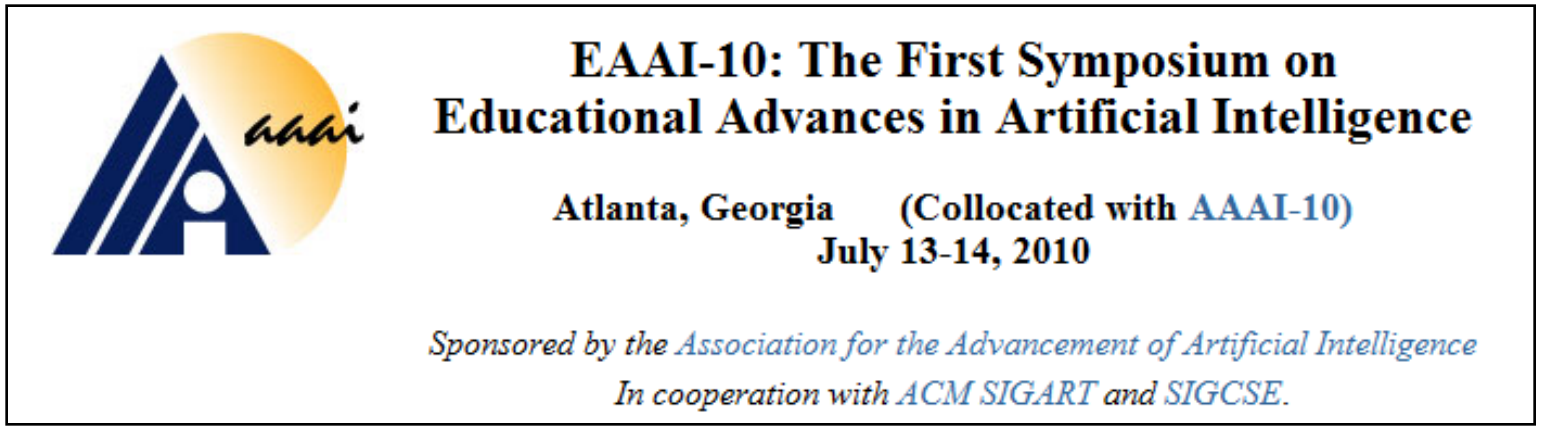
tneller@gettysburg.edu

Outline

- Introduction to EAAI
- Technical Program overview
- Model AI Assignments program
- Mentoring workshop
- Education Robotics program
- EAAI 2011
- Discussion

Introduction to EAAI

- EAAI is new annual symposium sponsored by AAAI (Association for the Advancement of Artificial Intelligence)
  - Run in cooperation with SIGCSE and SIGACT



- Supporters: Google STANFORD COMPUTER SCIENCE NSF
  - Provided general symposium support
  - Funded scholarships for symposium attendees
    - Supports students to see interplay of research and teaching early in their careers

EAAI Goals

- Forum to share approaches to AI-themed educational teaching and research work
  - Includes K-12, introductory CS, and more advanced levels
  - Focus is not on “intelligent tutoring systems”
  - More akin to SIGCSE with an AI theme
    - In the same vein as educational programs at SPLASH/OOPSLA and (previously at) SIGGRAPH
- Promote transition of AI research into the classroom
  - Bridge the gap between research and education
  - Offer educational forum collocated with research conference
- Increase participation/retention of educators of AI-relevant subjects

Organization

- EAAI-10 organizing committee:
  - Mehran Sahami (Chair), *Stanford University*
  - Marie desJardins, *University of Maryland, Baltimore County*
  - Zach Dodds, *Harvey Mudd College*
  - Yolanda Gil, *USC/Information Sciences Institute*
  - Haym Hirsh, *Rutgers University*
  - Todd Neller, *Gettysburg College*
  - Kiri Wagstaff, *Jet Propulsion Laboratory*
- EAAI-11 organizing committee adds:
  - Tom Lauwers, *Carnegie Mellon University*
  - Ingrid Russell, *University of Hartford*
  - Marie desJardins is Chair for EAAI-11

A Bit of History

- Increasing interest in AI-related education
  - 2008 AAAI Spring Symposium on “Using AI to motivate greater participation in Computer Science”
  - FLAIRS (Florida AI Research Society) Education Track
  - Growing use of robotics in introductory courses
- “AI Teaching Forum” held at AAAI 2008
  - Included “Colloquium on AI Education”
    - Day-long symposium of papers on AI and education
  - Panel on AI Education in research conference program
- In 2010, first EAAI held in conjunction with AAAI-10
  - Plan to be held annually, collocated with AAAI
  - EAAI-11 organization is already in full swing

Technical Program overview

- EAAI Technical Program has many facets
  - Invited talks
  - Full-length papers (6 pages)
  - Short papers/extended abstracts (2 pages)
    - Give a short “spotlight” talk and present a poster
  - Model AI Assignments (Todd)
  - Teaching and Mentoring Workshop (Marie)
  - Educational Robotics program (Zach)

Invited Talk and Paper Presentations

- Invited Talk: Mark Guzdial (Georgia Tech)
  - *"Technology for Teaching the Rest of Us"*
- Paper Themes
  - Teaching AI
    - Course-long projects (games, search engines)
    - Using AI to motivate students in computing at the K-6 level
    - Using games to teach AI and robotics
  - Using robotics in teaching CS
    - Using mixed reality (robotics) in teaching CS
    - Robots suitable for teaching computing in K-12 and intro. CS
    - Robotics platforms for teaching more advanced material

Model AI Assignments Session

Focus on Experiential Education

- *"One must learn by doing the thing; for though you think you know it, you have no certainty, until you try."*
  – Sophocles
- *"We can only possess what we experience. Truth to be understood must be lived."*
  – Charlie Peacock

Model AI Assignments Session

Goals:

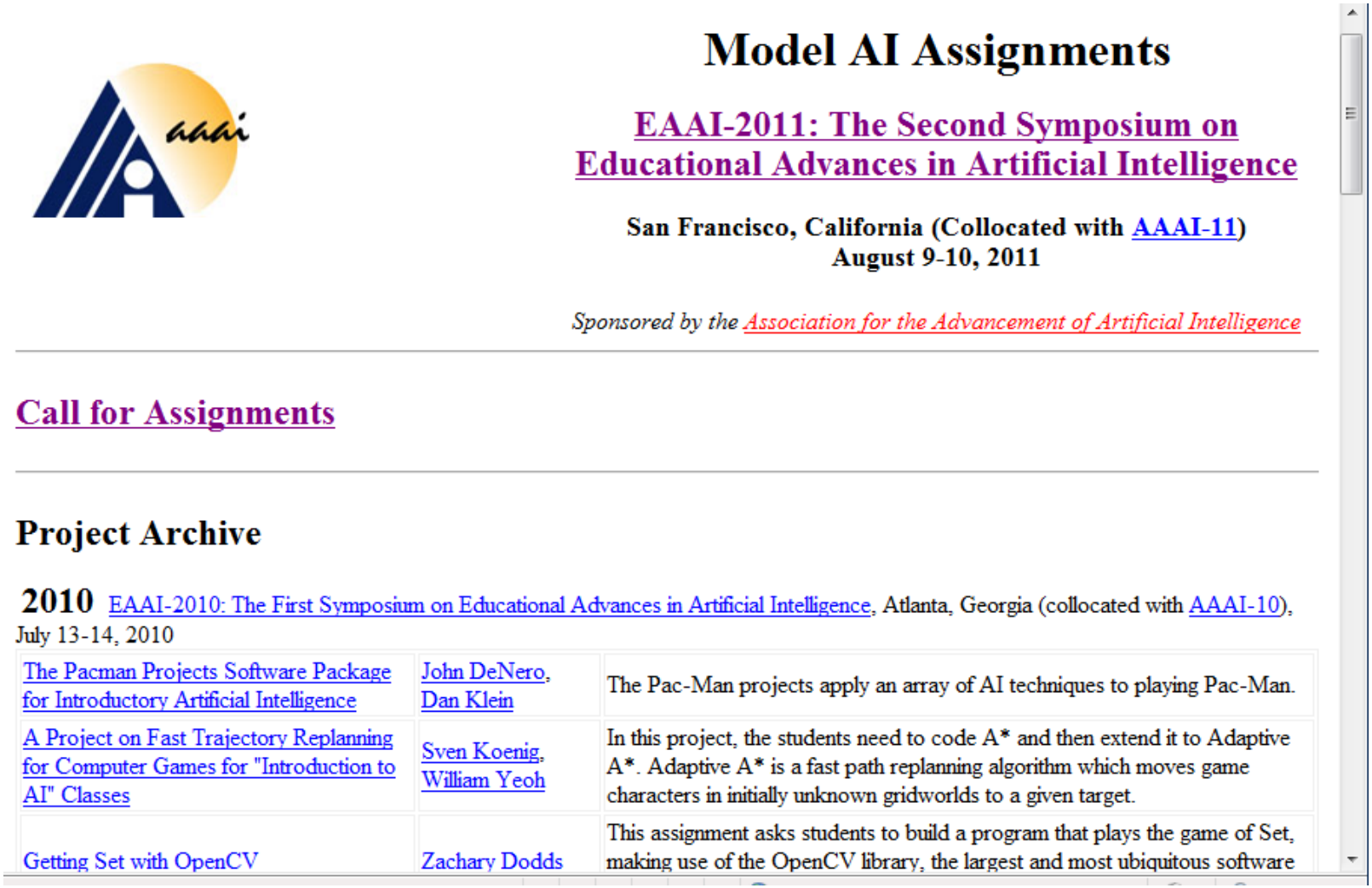
- To build a repository of high-quality AI assignments to serve as cornerstones in experiential education
- To facilitate productive communication of assignment ideas, implementation pragmatics, and future needs of AI educators.

Means: “Nifty Assignments” session model, yet

- Focusing on AI assignments at all levels, and
- Allowing ample presentation and discussion time.
- (Thanks to Nick Parlante and Julie Zelenski!)

Model AI Assignments Repository

http://modelai.gettysburg.edu



Model AI Assignments

EAAI-2011: The Second Symposium on Educational Advances in Artificial Intelligence

San Francisco, California (Collocated with AAAI-11)
August 9-10, 2011

Sponsored by the Association for the Advancement of Artificial Intelligence

Call for Assignments

Project Archive

2010 EAAI-2010: The First Symposium on Educational Advances in Artificial Intelligence, Atlanta, Georgia (collocated with AAAI-10), July 13-14, 2010

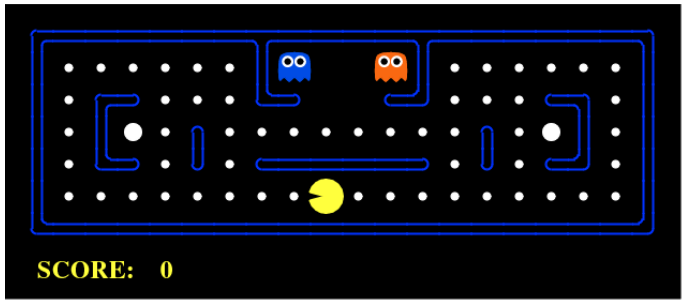
The Pacman Projects Software Package for Introductory Artificial Intelligence	John DeNero, Dan Klein	The Pac-Man projects apply an array of AI techniques to playing Pac-Man.
A Project on Fast Trajectory Replanning for Computer Games for "Introduction to AI" Classes	Sven Koenig, William Yeoh	In this project, the students need to code A* and then extend it to Adaptive A*. Adaptive A* is a fast path replanning algorithm which moves game characters in initially unknown gridworlds to a given target.
Getting Set with OpenCV	Zachary Dodds	This assignment asks students to build a program that plays the game of Set, making use of the OpenCV library, the largest and most ubiquitous software

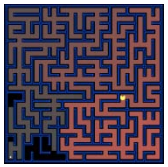
Model AI Assignment Example 1

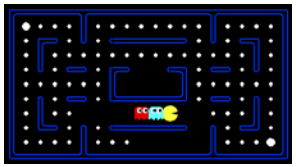
The Pac-Man Projects – John DeNero, Dan Klein

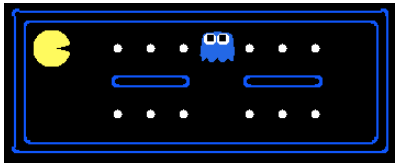
Pac-Man domain for:

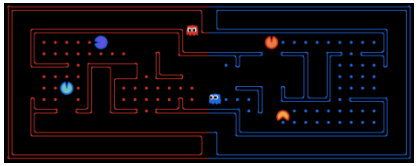
- Search
- Multi-Agent Search
- Reinforcement Learning
- Probabilistic Tracking
- Multi-Player Contest











Model AI Assignment Example 2

Fast Trajectory Replanning – Sven Koenig, William Yeoh

- Gridworld with local sensing of obstacles
- Implementation, analysis of A*
- Extension to Adaptive A*

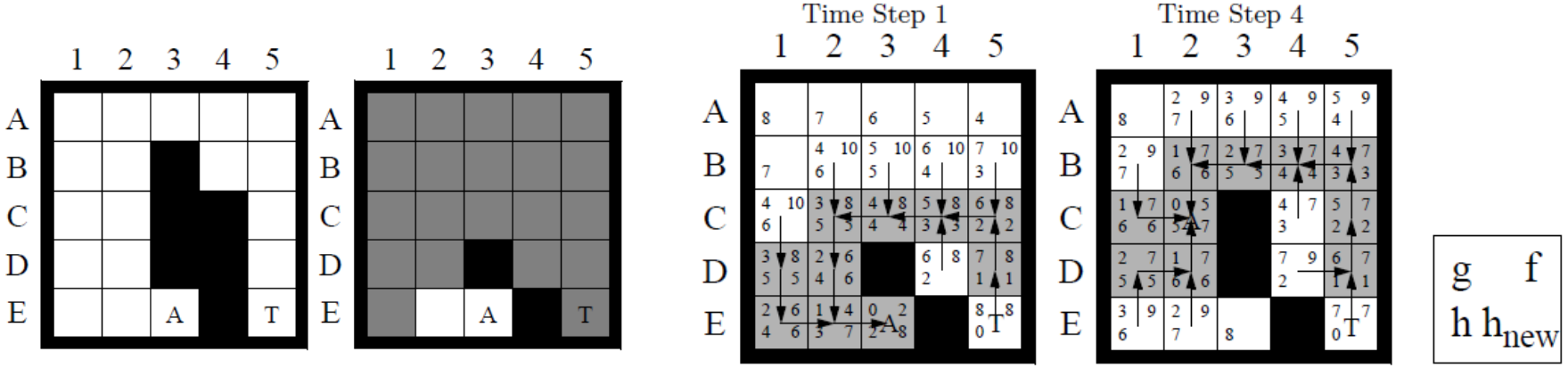


Figure 7: Adaptive A*

Model AI Assignment Ideas

If you could share one AI assignment, which would it be?

Intro AI audience: What is your optimal assignment to ground a single core topic in experience?

K-12/CS1/CS2 audience: Which AI assignment experiences best communicate the techniques, potentials, and challenges of the discipline? Which single assignment would you offer to attract the next generation of AI practitioners?

Emerging topics: When a new algorithm has high impact in a research area, there is a need to introduce the algorithm not only to students, but to all AI researchers as well. Which emerging topic(s) are most in need of excellent tutorial assignment materials?

Mentoring workshop

- Audience: New, experienced, and potential teachers

- Goals:
  - Share experiences
  - Increase classroom engagement
  - Add to teachers' "toolkits" for handling challenges
  - Build personal connections

Workshop events

- Invited talk: “Classroom engagement”
- Breakout sessions: “Creating classroom engagement”
- Breakout presentations
- Panel: “Challenges in the classroom

Breakout format

- Self-organize into small groups
- Focus on a particular topic in AI
- Brainstorm ways to create an engaging classroom activity on that topic
- Present your idea back to to the group
- Turn in a short writeup of your idea to be posted in an archive

Panel format

- Remarks on particular challenges faced and solutions suggested by the panelists

- Sample challenges:
  - Preventing and dealing with academic integrity violations
  - Balancing teaching with research and service
  - Classroom management and handling problem students
  - Increasing class attendance
  - Updating an existing syllabus and curriculum
  - Designing assignments/exams for gradability

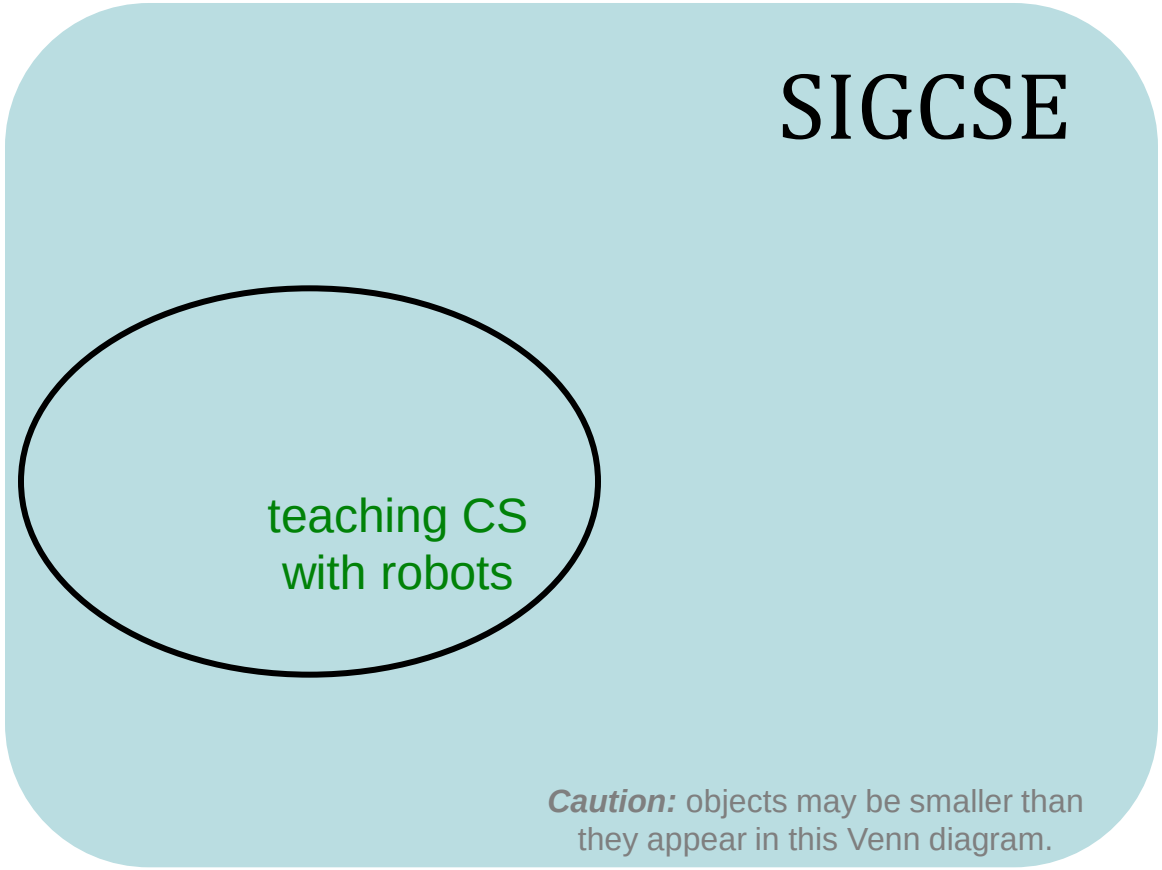
Active engagement ideas

- Minute papers: write for 1 minute on “how would you explain this concept to your parents?”
- Role play, Case study
- Debate: assign students different algorithms/methods to research, then let them debate the merits in front of class
- Think/Pair/Share: students take 2-3 mins to discuss with a partner, then share findings with the class
- Pictionary: give students a random keyword;
  they draw on the board to get their team to guess it
- Build a model: use toothpicks, gumdrops, other supplies?

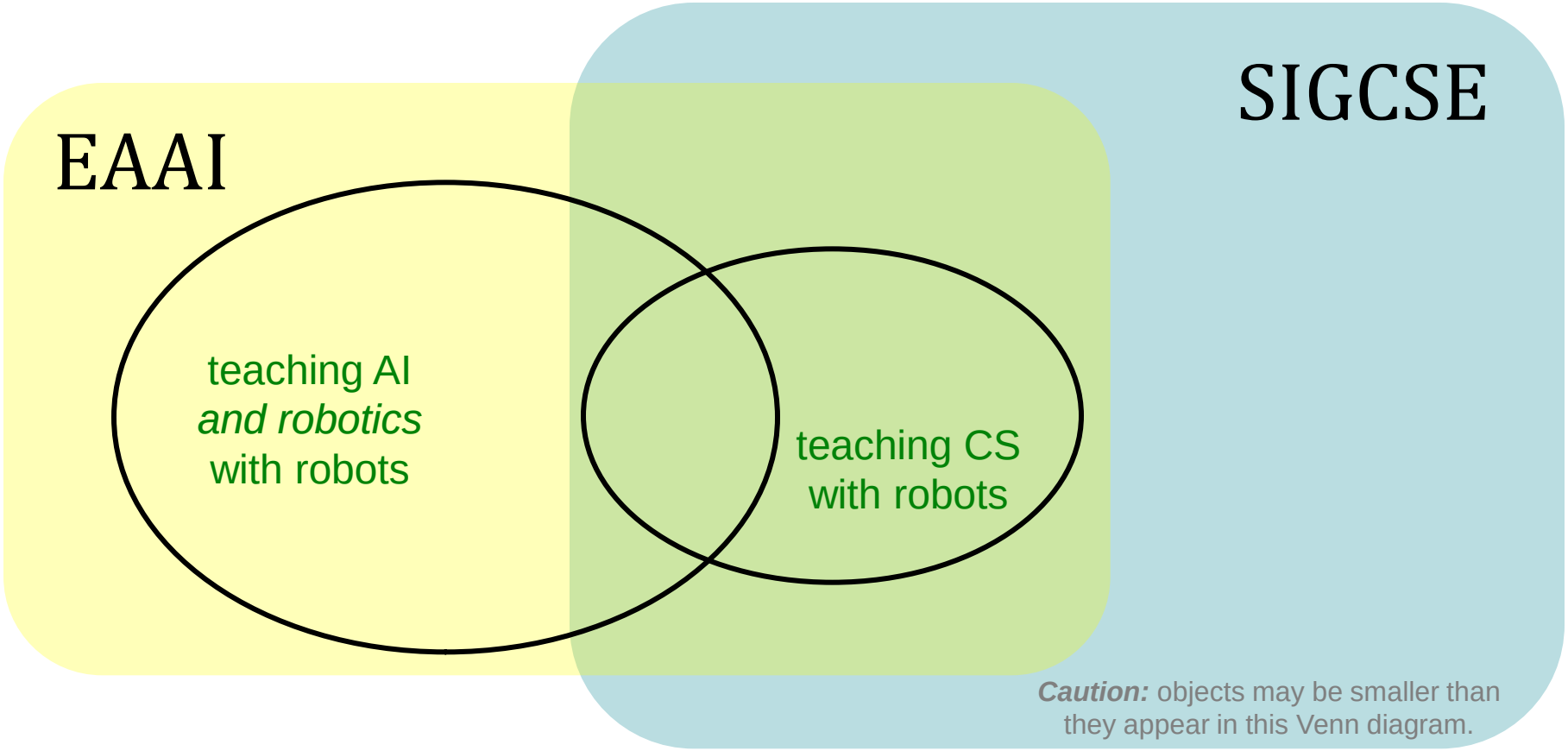
Workshop: Lessons learned

- Breakouts:
  - There is never enough time ☺
  - Participants suggested choosing one or two groups to “test-teach” their idea back to the workshop participants
  - Possibly run the workshop in two sessions to leave time for planning between the “creation” and “presentation” segments
- Invited talk / Panel:
  - Participants very much appreciated hearing ideas from experienced teachers
- Overall:
  - Members of the community were very eager for more conversation and sharing of ideas about teaching, education, and mentoring

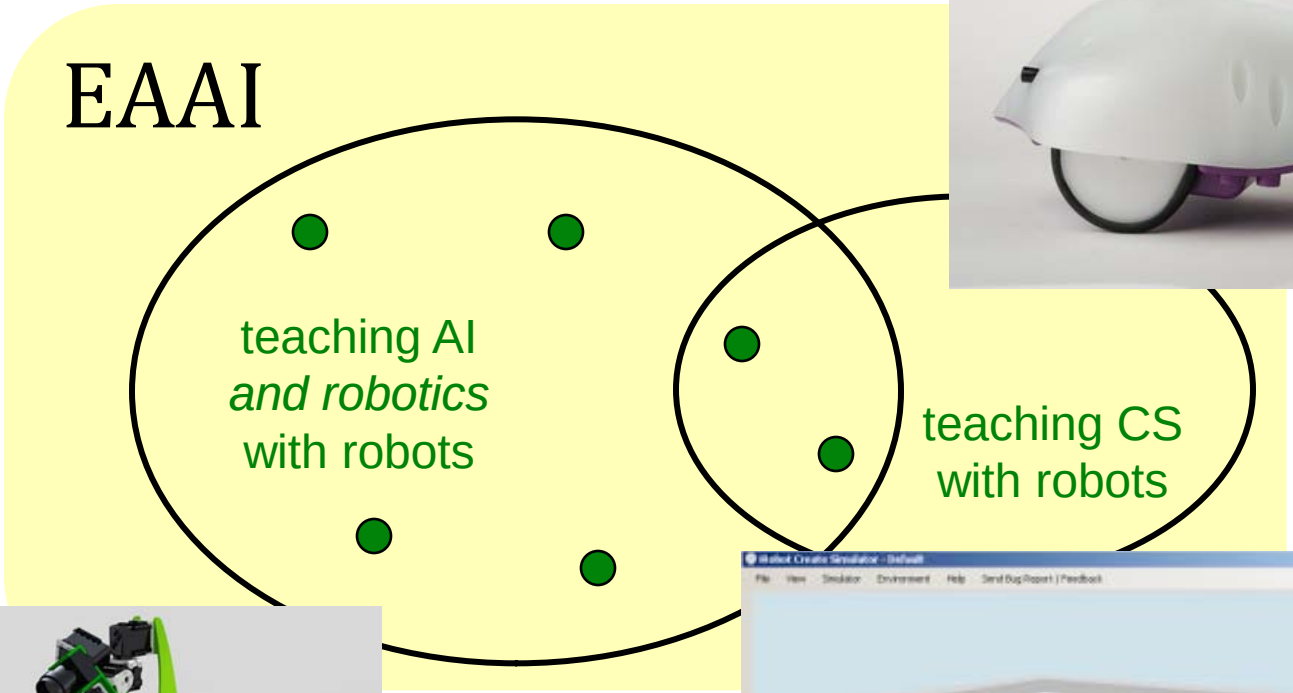
Robotics education program



Robotics education program

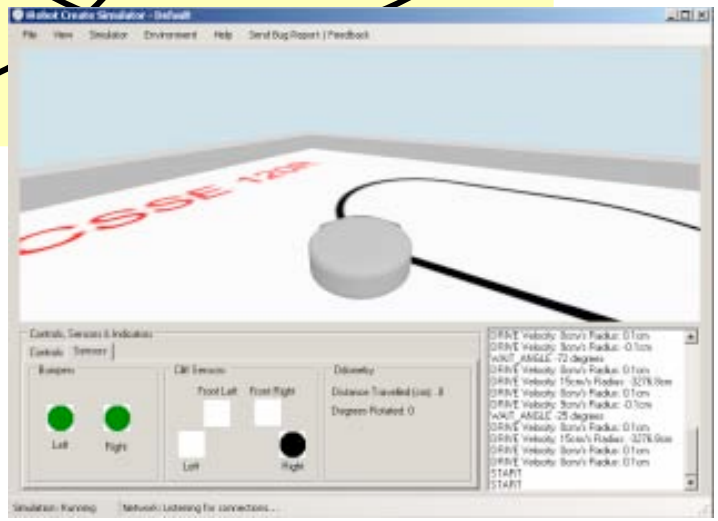


Examples



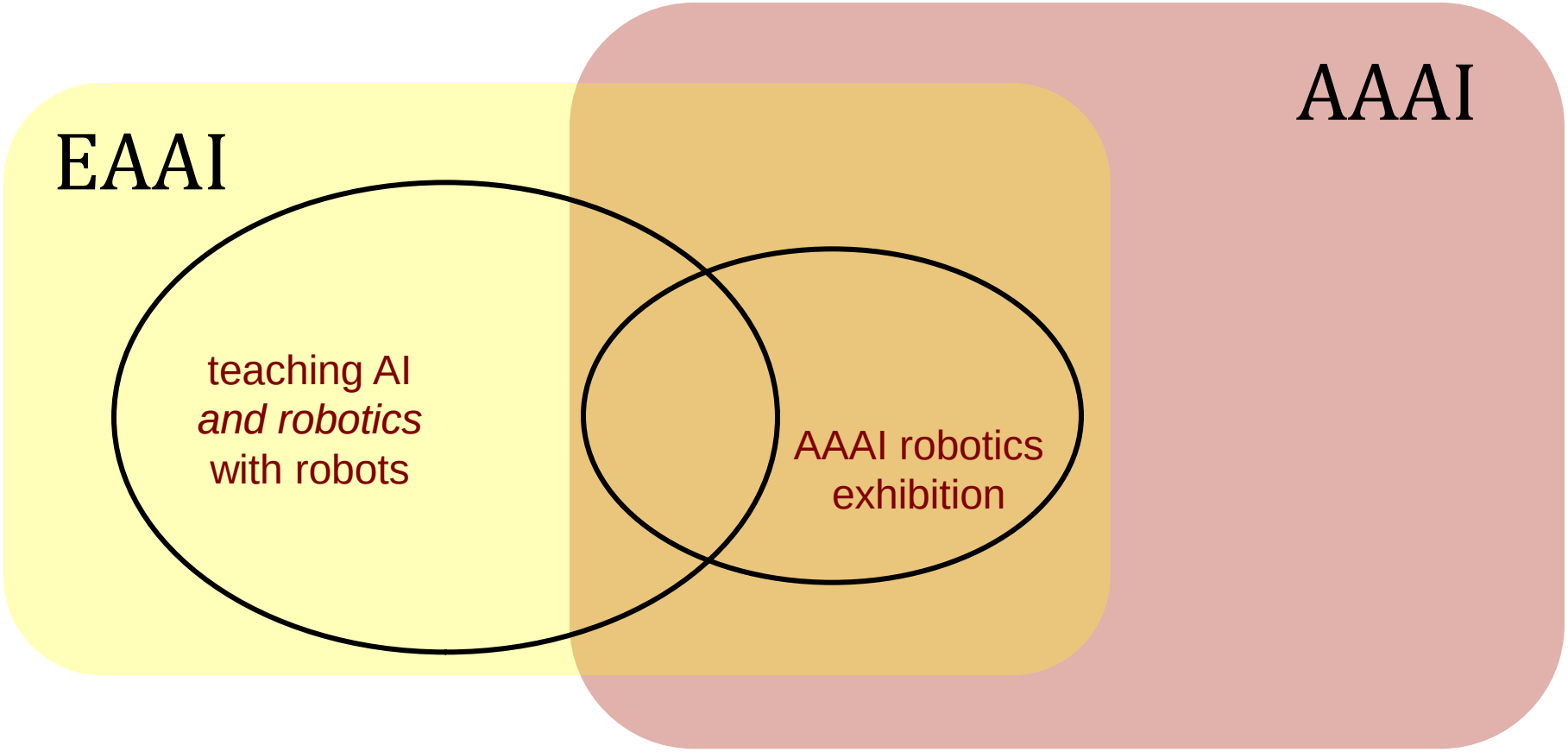
Lauwers et al.

Touretsky et al.



Boutell, et al.

Robotics education program

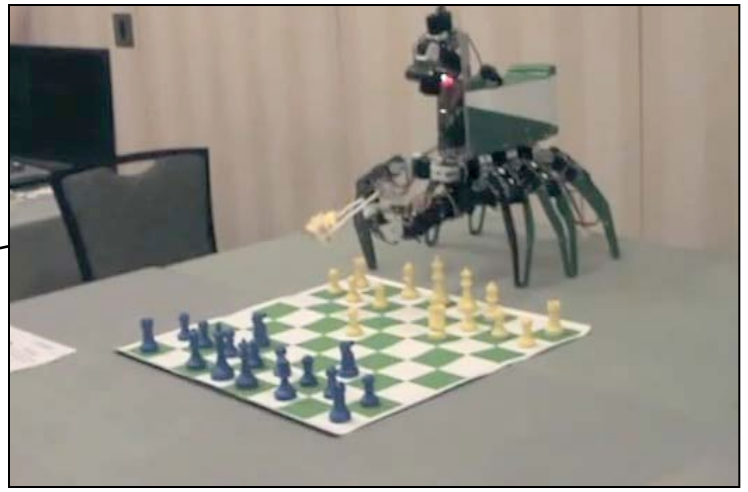


Reaching out to existing venues and communities

AAAI Robotics Exhibition

Research tracks

- Robot chess challenge
- Humanoid obstacle course
- Learning by demonstration



Education track

- student projects
- students?!

Too much... ?

Feedback and challenges

... AI material was better received

... calls to avoid duplication of robotics material

more careful distinctions ~ stay welcoming to all

EAAI 2011

- Collocated with AAAI-11: August 9-10 in San Francisco, CA
- Keynote speaker: Illah Nourbakhsh (CMU Robotics Inst.)
  - Head of the CREATE Laboratory (educational tools and communities of practice)
  - http://www.communityrobotics.org/
- Possible education-related speaker at main AAAI conference
- Sponsorship from NSF and Google (so far)
- New:
  - More opportunities for networking (group lunch)
  - Educational demos in conference demo session
- Challenges:
  - Fewer papers submitted than in 2010
  - Maintaining momentum and sustaining enthusiasm

Website:

http://eaai.stanford.edu

Discussion