



## Introduction & Overview

### Artificial Intelligence for Interactive Media and Games

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IMGD 400X (B 09)

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## What this course is *not* about

- It is not about **artificial intelligence**
  - “real” AI practitioners would find everything we are going to talk about very boring
    - take CS 4341 if you want to learn about AI
  - in games, pretty much *everything* except graphics (sound) and networking is called the “AI”
    - even game physics often lumped into “AI”
    - game AI mostly about controlling non-player characters
    - but sometimes operates more broadly, e.g.,
      - > civilization games
      - > interactive story generation



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## Academic AI vs. Game AI (From Buckland Introduction)

- Academic (Research) AI
  - “strong”: tries to mimic human thought processes
    - branch of cognitive science
    - e.g., modeling memory, learning, emotion
  - “weak”: focuses on solving real-world problems
    - e.g., computer vision not same as human vision
    - more optimal solution is usually more desirable
- Game AI
  - much more stringent time/memory resource limitations (though increasing)
  - *bad* if “too smart”, i.e., player must be able to have fun and win



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## The Illusion of Intelligence (From Buckland Introduction)

“If the player believes the agent he’s playing against is intelligent, then it is intelligent.”

- Lots of “cheap tricks” which have nothing to do with academic AI, e.g.,
  - simply increasing number of hits to kill
  - adding player-responsive utterances/actions, such as “Who’s there?” or head tracking
- Illusion is also easy to destroy, e.g.,
  - running into walls, stuck in corners
  - seeing through walls (and other kinds of “cheating”)



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## Game AI and the Illusion of Intelligence

### **Conclusion:**

The use of AI in games (like many other aspects of game design) requires a **careful balancing**, which ultimately needs to be verified by **play testing**.

## What this course is *not* about

- It is not about using **game engines**
  - you did plenty of that in IMGD 3000/4000
  - you are going to do “hard core” C++ programming
    - directly on top of standard system libraries
  
- It is not about fancy **graphics**
  - focus on the game AI programming techniques
  - text-only game
  - two simple 2D top-down games
    - programmed directly on top of window system

## What this course is not

- It is not a chance to expand your game **portfolio**
  - that's what IMGD 4000 and your MQP are for
  - you won't have the stress of doing homework programming assignments and trying to develop a final game project at the same time
  
- It is not another chance to practice your **group skills**
  - you've had a lot of those already
  - group skills are very important, but not a replacement for really excellent individual programming skills

## The Goals of this Course

1. To develop **deep, practical** knowledge of current AI game programming techniques
  - concrete algorithms and data structures you can use in your first development job
  - applying best software engineering practices
  
2. To make you aware of **future trends** in applying AI to game programming

*This is a senior level course and I will expect a high level of participation and effort!*

## How are we going to achieve these goals?

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### 1. Deep, practical knowledge

- **read** and **discuss** lots of good AI code
  - **Buckland's** “industrial strength” source code
  - you will probably end up keeping this code to cut & paste into future projects
  - you will be expected to read a portion of Buckland's code **before** each class and will be called on in class to discuss what you have read
- **write** and **explain** lots of your own AI code
  - programming assignments (of varying sizes) will be due almost every Weds and Sun night
  - you will be called on in class to explain some of your code

## Text Books

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- **Required:** (*dog-eared, highlighted*)  
Mat Buckland, Programming Game AI by Example, Wordware, 2005.
- *On reserve at the library for reference:*  
Ian Millington, Artificial Intelligence for Games, Morgan Kaufmann, 2006.

## About Buckland's Code

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- What do I mean by “industrial strength” code ?
  - *not too good*
    - you are not going to see carefully polished textbook code in the real world
    - due to time pressures in industry
    - due to extreme performance requirements
  - *not too bad*
    - Buckland is a very experienced C++ developer
    - good comments
  - thinking about how his code could be improved (both in structure and function) is a good learning experience

## How are we going to achieve these goals?

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1. Deep, practical knowledge (cont'd)
  - *execute* and *critique* lots of AI code
    - we're going to have two “tournaments” in which your AI code competes against Buckland's and your classmates' code (for bonus grade points!)
    - design discussions before each tournament regarding how to improve on Buckland's AI design
    - *post mortem* after each tournament to figure out what distinguished winners and losers

## How are we going to achieve these goals?

### 2. Future AI awareness

- six lectures on future AI topics, e.g.,
  - highlights of AI in Interactive Digital Entertainment conference, Oct. 2010
  - believable characters
  - machine learning for games
  - interactive story generation
- evolving AI middleware
  - each pair of students will be assigned an “AI engine” to research
  - and will give a 5 minute presentation in class (near end of term)

<b>1</b>	Tue, Oct 27		Intro/Overview/Admin	
	Wed, Oct 28			1 - Hello West World [3%]
	Thu, Oct 29	Chapter 2	State Machines	
	Fri, Oct 30	Chapter 2	Event Messages	
	Sun, Nov 1			2 - Bar Fly [5%]
<b>2</b>	Mon, Nov 2	Chapter 4	Simple Soccer Anatomy	
	Tue, Nov 3	Chapter 4	Simple Soccer Anatomy	
	Wed, Nov 4			3 - Tank States [5%]
	Thu, Nov 5	Chapter 4	Simple Soccer Anatomy	
	Fri, Nov 6		<b>Futures:</b> AIIDE Conference Highlights	
	Sun, Nov 8			4 - My Team [3%]
<b>3</b>	Mon, Nov 9		<b>Brainstorming:</b> Simple Soccer Strategy	
	Tue, Nov 10	Chapter 6	LUA Scripting	
	Wed, Nov 11			5 - Team Design [3%]
	Thu, Nov 12	Chapter 6	LUA Scripting	
	Fri, Nov 13		<b>Futures:</b> Neuroevolution of Combat Bots	
	Sun, Nov 15			6 - Scripting [5%]
<b>4</b>	Mon, Nov 16	Chapter 7	Raven Anatomy	
	Tue, Nov 17	Chapter 7	Raven Anatomy	
	Wed, Nov 18			7 - Tournament Team [10%]
	Thu, Nov 19		<b>Futures:</b> AI and Animation	
	Fri, Nov 20		<b>Soccer Tournament</b> (IMGD Lab)	
	Sun, Nov 22			8 - My Bot [3%]

<b>5</b>	Mon, Nov 23		<b>Futures:</b> Natural Language and Dialog	
	Tue, Nov 24		<b>Futures:</b> Natural Language and Dialog	
	Wed, Nov 25		Thanksgiving Break	
<b>6</b>	Mon, Nov 30	Chapter 9	Goal-Driven Behavior	
	Tues, Dec 1	Chapter 9	Goal-Driven Behavior	
	Weds, Dec 2			9- Steal Health [5%]
	Thu, Dec 3	Chapter 9	Goal-Driven Behavior	
	Fri, Dec 4		<b>Brainstorming:</b> Raven Bot Strategy	
	Sun, Dec 6			10 - Bot Design [3%]
<b>7</b>	Mon, Dec 7	Chapter 10	Fuzzy Logic	
	Tue, Dec 8	Chapter 10	Fuzzy Logic	
	Wed, Dec 9			11 - Game Brains [5%]
	Thu, Dec 10		<b>Presentations:</b> Game Brains	
	Fri, Dec 11		<b>Futures:</b> Interactive Story Generation / Course Eval	
	Sun, Dec 13			12 - Tournament Bot [10%]
<b>8</b>	Mon, Dec 14		<b>Futures:</b> Planning in F.E.A.R.	
	Tue, Dec 15		<b>Raven Tournament</b> (IMGD Lab)	
	Thu, Dec 17		<b>Final Exam</b> [30%]	

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*Subject to change!*

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## Book Chapters Not Covered in Class

### Ch 1 A Math and Physics Primer

- should already be well known to tech students

### Ch 3 ... Autonomously Moving Game Agents

- steering behaviors (including “flocking”)
- already covered in IMGD 3000/4000

### Ch 5 The Secret Life of Graphs

- basic graph data structures and algorithms
- covered in basic computer science courses

### Ch 8 Practical Path Planning

- navigation meshes, etc.
- already covered in IMGD 3000/4000

*You are responsible for this material as it is used  
in the code of other chapters !*



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## Grading

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- Programming homework **55 %**
  - 5 small @ 3 pts
  - 4 medium @ 5 pts
  - 2 large @ 10 pts
  - *late penalty: 1 day = 25%, 2 day = 50%, >2 day = no credit*
- Class preparation/participation **10 %**
  - **everyone** will be called upon in class
  - you need to read chapter before class to be prepared
- AI middleware research & presentation (*in pairs*) **5 %**
- Final exam **30 %**
- Plus tournament bonus points



## Logistics

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- Teaching assistant – Paulo de Barros (pgb)
  - TA office hours (FL A22): Tues 10-11am, Fri 2-3pm
- My office hours (FL B25b): Mon 1-2pm, Thu 3-4pm
- Home page <http://www.cs.wpi.edu/~rich/courses/imgd400x>
  - lecture notes will be posted after lecture
  - homework details posted one or two homeworks ahead
- Homework submission
  - via <https://turnin.cs.wpi.edu:8088>
  - due midnight of due date (late submission time logged, site closes 48 hours after due date)



## Communication

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- my.WPI forum for general and homework questions
  - recommend subscribe option for all 13 forums
  - post all course/homework questions here
  - *do not send me email directly* with questions unless personal/confidential
  - Paulo and I will read at least once per day, but do not expect answers (from Paulo or me) at 11:00pm on due date!
  
- Email list: imgd400x-all
  - only for urgent announcements

## Academic Honesty

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- You are encouraged to talk about programming assignments with classmates, even to help each other debug code. However, cutting and pasting someone else's code or emailing your code to someone else crosses the line.
- Cheating is a serious offense, punishable by an automatic NR for the course.
- Institute policy on academic honesty will be followed in all cases.

## First Homework due Weds. midnight!

1. Read [Chapter 2](#) in preparation for Thurs/Fri classes
2. Download source code from course home page
  - compile and run it in Visual Studio 9 (2008)
  - VS 9 on IMGD Lab machines and free WPI download
  - code has been tested and will be supported in this development environment only
  - see details on course home page (click on first homework in syllabus table, "Hello West World")

## Questions?