University of Denver
Intro to AI; Spring, 2014
Midterm Review

Below are topics that should be understood for the exam. This means that you should be able to define or provide an explanation for a term, provide an example of any algorithm, and know the complexities of approaches discussed in class. The lecture notes and the book should also be reviewed in detail.

Chapter 1

Turing test
AI models (Fig 1.1)
Academic fields that overlap with AI

Chapter 2

Rational Agents
PEAS
Environment properties

Chapter 3

State space formulation
BFS / DFS / IDA* / A*
Heuristics, admissibility & consistency

Chapter 4

Hill climbing
Genetic algorithms
LRTA*

Chapter 5

Minimax & alpha-beta pruning
Evaluation functions
State-of-art techniques for various games

Chapter 6

CSP definition
Constraint graph
Node- / Arc- / Path- / k-consistency
Variable/node ordering
Backtracking Search

Chapter 7

Propositional Logic
Entailment & Models
Model Checking
Inference Rules
CNF
Proof by resolution

Chapter 8

First order logic (FOL)
Models in FOL
Quantifiers
Converting FOL to & from English

Chapter 9

Unification
Reduction to CNF

Selected Example Questions:

Define PEAS metrics for a robot vacuum, a AI controlled train, and a robotic car. What are three classifications of each of these environments?

What is the problem/state-space formulation for pathfinding on a grid? What about path planning for an aircraft?

What is the time/space complexity of BFS / DFS / IDA* / A*?

Assume a 4x4 grid with a search starting at the upper left corner and going toward the lower right corner, label each state with the manhattan distance h-cost. If diagonal moves are allowed is this admissible? What states would be expanded by A*? What states would be on the open list?

In the stable marriage problem each man / women has a preference over partners for marriage. The goal is to find a match where no man/women pair would prefer to be married to each other instead of their respective partners. Show how hill-climbing and a genetic algorithm could be used to solve this problems.

Show a 3-ply branching factor 2 game tree. Label the leaf states with an evaluation and show the minimax value of each state in the whole tree. Indicate which states would be expanded by alpha-beta pruning.

Draw a small map and define the 3-coloring problem CSP. Show the constraint graph and label each edge with constraints. Explain node, arc and path consistency by giving examples of variable assignments for each node in the constraint graph.

Describe the difference between propositional and first-order logic.

Write a statement and another statement that entails that statement.

Convert the following into first order logic, and then CNF. Then, provide a proof by resolution:

> All good boys deserve fudge.
> Fred is a good boy.
>
> Prove: Fred deserves fudge. [Using resolution]

Describe the connection between Modus Ponens and definite clauses.