Final Exam Study Guide

1 Balanced BSTs (Chapter 19)

- Rotations
  - Single Rotations
  - Double Rotations
  - Inner vs. Outer cases
- AVL Trees
  - Recursive Definition
  - Insertion
- Red-Black Trees
  - Definition
  - Top-Down insertion
  - Top-Down deletion
- AA trees
  - Definition
  - Split and Skew

2 Spatial Data Structures

- Regular Grids
- Quadtrees
- KD-trees
  - basic structure
  - findMin/findMax
  - nearest neighbor search
    - Storing partial results - best so far
    - pruning - reduce search space by eliminating subtrees
    - traversal order - visit most promising subtrees first
  - building a balanced tree
- BSP-trees

3 Transformations

- Translation
- Scale
- Rotation
- Shear
- Linearity
- Composing transformations
- OpenGL matrix stack
- gluLookAt()

4 Lighting/Shading

- Diffuse/Lambertion
- Specular
- Ambient
- Flat vs. Smooth
- Directional vs. Point Light

5 Heaps (Chapter 21)

- Heap order property
- Storage (in an array)
- Insertion/Deletion
- Heapify/BuildHeap

6 Hash Tables (Chapter 20)

- Hash Functions
- Collisions and Collision Handling
  - Linear Probing

  - Quadratic Probing (including what is required to ensure that items can always be inserted)
  - Separate Chaining

7 Graphs (Chapter 14)

- Definitions
  - Vertices/nodes
  - Edges/arcs
  - Directed vs. Undirected
  - Directed acyclic graph
  - path
  - path length
  - edge cost/weight
  - simple path
- Representation
  - Adjacency Matrix
  - Adjacency List
- Algorithms
  - Breadth First Search
  - Depth First Search
  - Topological Sort
  - Single-Source Shortest paths
    - Unweighted, positive weighted (Dijkstra's Algorithm), negative weighted
  - Strongly Connected Components
  - Minimum Spanning Trees (Kruskal's and Prim's algorithms)

8 Old Stuff

8.1 LinkedList (Chapter 17)

- insert/delete, updating references

8.2 Algorithm Analysis (Chapter 5)

- Definitions of O, Ω, Θ, o, ω, θ
- finding running times of algorithms

8.3 Recursion (Chapter 7)

- Basic recursion concepts
- Base case
- Inductive hypothesis
- Divide and Conquer Approach
- Pitfalls
- Dynamic Programming

8.4 Sorting (Chapter 8)

- BubbleSort
- InsertionSort
- MergeSort
- QuickSort

8.5 Stacks and Queues (Chapter 16)

- Implementation with Arrays and LinkedLists
- advantages and disadvantages

8.6 Trees (Chapter 18)

- Structure and definitions
- depth, height, size, parent, child, ancestor, descendent, leaf, path, path length
- traversals (inorder, preorder, postorder, level-order)

8.7 Binary Search Trees (Chapter 19)

- Definition
- insertion/removal
- best-case/worst-case running times