

CS 1622: Final Review

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Semantic Analysis

- Scope
 - Static vs Dynamic
- Tracking Static Scope
- Environments
- Symbol Tables
 - Data Structures
 - Hashtables
 - Trees

IR & Control Flow

- Three-address Code
- Quadruples
- Triples
- Static Single Assignment (SSA) basic idea
- Control flow graphs and basic blocks

Code Generation

- Arrays
 - Row major order
 - Column major order
- Boolean Expressions
- Control Flow

Register Allocation

- What are we trying to do? Why?
- Liveness calculation
 - Defs and Uses
- Interference Graph
- K-Coloring Algorithm
 - **Build**
 - **Simplify**
 - Spill
 - **Select**
- Coalescing/Spill Coalescing
- Precolored nodes
- Calling Convention

Objects

- Record types
- Data (single) inheritance
- Methods
- Static data
- This
- Instanceof

Garbage Collection

- Manual Allocation and memory leaks

- How to define garbage
- Reachability

Algorithms:

- Reference Counting
- Mark and Sweep
- Stop and Copy (Semispace)
- Generational

Optimization

- What is it?
- Why is it a bad name?
- Dataflow optimizations
 - Constant propagation
 - Copy propagation
 - Common Subexpression Elimination
 - Dead code elimination
- Loop optimizations
 - Loop unrolling
 - Strength reduction
- Method Optimizations
 - Inlining
 - Tail recursion elimination
- Adaptive Optimization