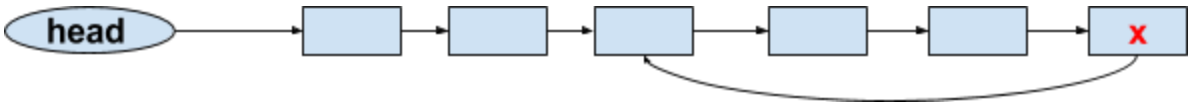
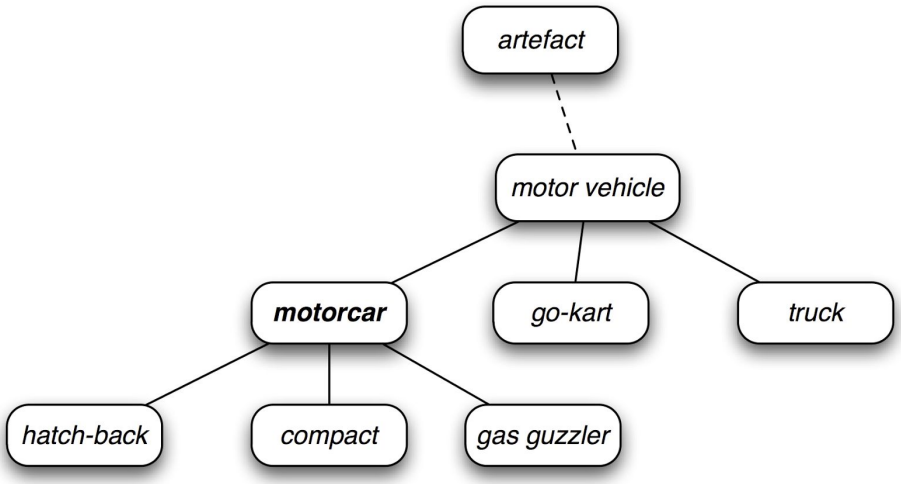
CS3110: Assignment 2
May 15 2017

1. Design a stack that has a min() method (in addition to push and pop) that can retrieve the minimum in O(1) time. (25)

2. Given a Linked List, provide an algorithm that can detect whether the linked list has a loop, and find the node that starts it (node x in the following picture).
What is the complexity of your algorithm? (25)



3. The following image is a snapshot of a very tiny part of WordNet (the original tree is many times bigger than this). The nodes of the tree have a -**is-a** relationship with their parent. (*hatch-back* is a *motorcar*). Design an algorithm that given a tree T and two nodes (u,v), finds the first type that can describe both, that is, the **closest** node to *a* and *b* that "*a is-a v"* and "*b is-a v". For example, given compact and truck, it should return "motor vehicle"*
What is the complexity of the algorithm? (25)



4. Design an algorithm that given a graph and two nodes (*a* and *b*), returns a path from *a* to *b*, or null if no such path exists. (25)