CS221 Fall 2015 Homework 3

SUNet ID: lguan
Name: Leying Guan

By turning in this assignment, I agree by the Stanford honor code and declare that all of this is my own work.

Problem 1

(a) It won't work if buy picking a sub-optimal for earlier word, we could decrease cost dramatically later because our goal is to find the global optimal. Here is a concrete example: rainyday.

Suppose we have the following unigram cost dictionary:

{day: 1, rain:2, rainy:3}

the word "rain"'s cost is 2 but "rainy"'s cost is 3. The greedy algorithm will give us "rain yday" but the optimal solution is "rainy day".

(b) Code

Problem 2

(a) The fundamental reason is the same as problem 1– local optimal is not equal to global optimal in this case, and here is a example I give:

possible files:{ht:(hat, hot, hate); dg:(dog, dag) }

bigramcost dictionay: {my hat: 1 ; may hot:10; hot dog:1; hate dog:2 }

input:my ht dg

The greedy algorithm will give us "my hat dog" while the global optimal is "my hot dog".

(b) Code

Problem 3

(a) The states consist of sets of two elements: (location, previou word) where location indicates where should the next search start and previou word is the word right before this successors' seach.

The actions consist of choices we take for next move, which is the new word we consider.

The costs consist of bigramCost(previous word, new word).

The initial state is (0, start of sentence) which means we are at the begining of the sentence and ready to start.

The end state is (n, last word) where n is the length of input string.

(b) Code

(c) Define $u_b(w) = \min_{w'} b(w', w)$, then this unigram cost is consistent because $\forall s$, we have

$$\begin{aligned} Cost(s, a) &= \min_{v_1,\ldots,v_K} \sum_{k=2}^{K} b(v_1, v_k) \\ &\leq \min_{v_1,\ldots,v_K} \sum_{k=1}^{K} u_b(v_k) \\ &= Cost'(s, a) \end{aligned}$$

By definition, h is a consistent heuristic.