

hw06

BY ZIHAN ZHOU

1 work of convolve

1.1 list

a,b is length of list

$$W_{\text{con}'}(a, b) = W_{\text{add}}(b) + W_{\text{scale}}(b) + W_{\text{con}'}(a - 1, b) + c_0$$

$$W_{\text{con}'}(0, b) = k_o$$

trivial to show work of add and scale are $O(n)$.

$$W_{\text{con}'}(a, b) = k b + W(a - 1, b) + c_o$$

$$W_{\text{con}'}(a, b) = O(a \times b)$$

work of convolve is convolve' with chop, chop is $O(a + b)$ so in sum

$$W_{\text{con}} = O(a b)$$

1.2 sparse

a,b is length of list

$$W_{\text{con}}(a, b) = W_{\text{add}}(b) + W_{\text{scale}}(b) + W_{\text{map}}(b) + W_{\text{con}}(a - 1, b)$$

$$W_{\text{con}}(0, b) = W_{\text{chop}}(a + b) + k_o$$

$$W_{\text{con}}(a, b) = O(a b)$$

1.3 fun

add and scale are $O(k)$

$$W_{\text{con}}(a, b) = W_{\text{add}}(b) + W_{\text{scale}}(b) + W_{\text{con}}(a - 1, b)$$

$$W_{\text{con}}(0, b) = k_o$$

$$W_{\text{con}}(a, b) = O(a)$$

2 work of mult

for the function here because reduce combine and map are all for list, and not for infvec, so i have to keep calling toList and toVec, which consumes a lot, in the computation, i will assume using the infvec version of map reduce and combine.

$$W_{\text{vProd}}((a, c), n) = \min(a, n) \times W_{\text{vec.scale}}(c) \times \min(a, n) \times W_{\text{vec.add}}(c) = \begin{cases} O\{a c n\} & \text{listVec} \\ O(a n) & \text{funVec} \end{cases}$$

the first min (a,n) is for combineS, then each elem apply scale, secon min for reduce each elems apply add.

$$W_{\text{mult}}((a, b), (c, d)) = c \times W_{\text{vprod}}((a, b), d) = \begin{cases} O(a c^2 n) & \text{listvec} \\ O\{a c n\} & \text{funvec} \end{cases}$$