Lec. 05

2013년 3월 12일 화요일

오후 2:04

Review

single-source single-destination

- data compression
- data transmission

Two performance meters

- compression rate vs. error rate
- transmission rate vs. error rate

Zero-error data compression

$$\min_{\mathcal{C}} L(\mathcal{C}) \quad \text{subject to } \mathcal{C} \text{ is UD.}$$

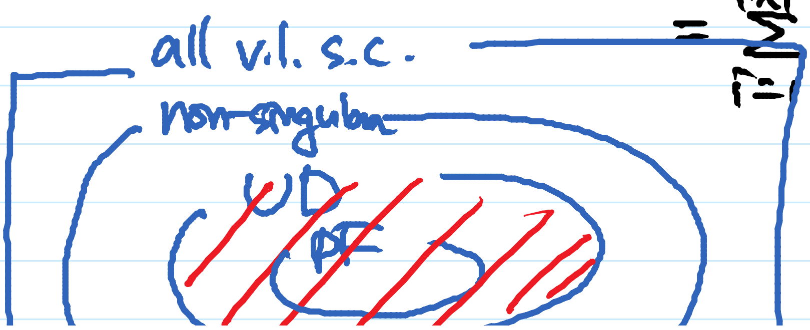
x	$Pr(X=x)$
1	p_1
2	p_2
$\vdots$	$\vdots$
$\lvert\mathcal{X}\rvert$	$p_{\lvert\mathcal{X}\rvert}$

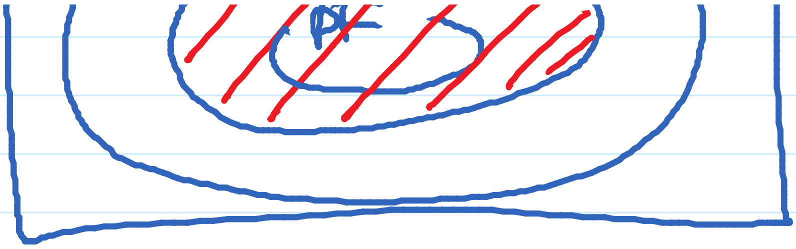
x	$C(x)$	$l(x)$
1	c_1	l_1
2	c_2	l_2
$\vdots$	$\vdots$	$\vdots$
$\lvert\mathcal{X}\rvert$	$c_{\lvert\mathcal{X}\rvert}$	$l_{\lvert\mathcal{X}\rvert}$

variable-length source code

\mathcal caligraphic.

$$L(\mathcal{C}) = E\{l(X)\} = \sum_{i=1}^{\lvert\mathcal{X}\rvert} p_i l_i$$





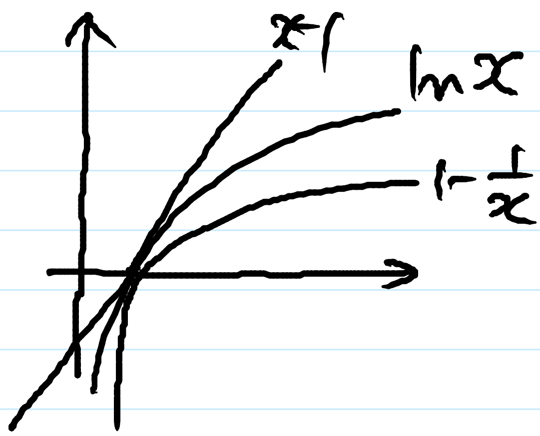
lower bound $\le \min_{\in BUD} L(\mathcal{C}) \le$ upper bound

cf) bounds $\begin{cases} \text{upper} \\ \text{lower} \end{cases}$

bounds $\begin{cases} \text{loose} \\ \text{tight} \end{cases}$

$$H_D(X) \le \min_{\in BUD} L(\mathcal{C}) < H_D(X) + 1$$

- Entropy lower Bound
  - If $\mathcal{C}$ is UD, then $\sum_{i=1}^{|\mathcal{X}|} D^{-l_i} \le 1$
    a D-ary
    Kraft's inequality
  - If $\mathcal{C}$ is UD, then $H_D(X) \le L(\mathcal{C})$
  - $1-\frac{1}{x} \underset{\text{iff } x=1}{\le} \ln x \underset{\text{iff } x=1}{\le} x-1$



- Upper bound

Tree Representation of a (v.r.) source code
(PF)

graph < edge, vertex
tree < node, branch

Visualize! ⇒ Too good to be true.

Definition < existence, uniqueness.

Optimal solution < fully characterize, find an optimal solution

2013년 3월 14일 목요일

오후 1:54

Summary

- Tree representation of a PF code
- Given a set of D-ary UD codes w/ $(l_1, l_2, \cdots, l_m)$ s.t. $\sum_{i=1}^{m} D^{-l_i} \le 1$,

  we can always find a PF code.