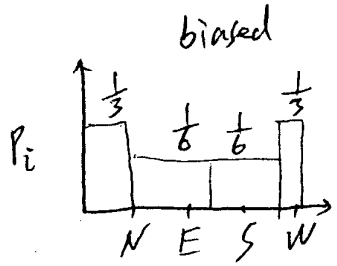
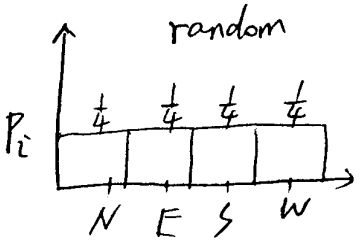
Course 565/665 Lecturer Prof. Cavagnero
Day 2.17.04 Date 9:55 am
Notes Taken By Jiang Hong Total Number of Pages ____

(ex) — try to prove that flat distribution have maximal S.
{demonstrate?}





case 1: $S/k = -1 \ln 1 = 0$ ($S = S_N/N$)

case 2: $S/k = -(\frac{1}{2}\ln\frac{1}{2})\times 2 = 0.69$

case 3: $S/k = -(2\times\frac{1}{3}\ln\frac{1}{3} + 2\times\frac{1}{6}\ln\frac{1}{6}) = 1.33$

case 4: $S/k = 1.39$

$S \propto$ degrees of disorder (or randomness)
i.e. flat distributions have maximum entropy.

Recipy for randomness: $\frac{S}{k} = \ln t$ (t: # of possible outcomes/categories)

S here: entropy per trial for a random distribution

$W \propto S$
(multiplicity of a system

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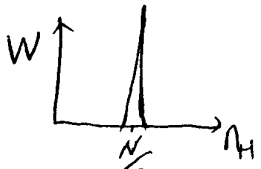
W_{max} only if distribution of events is random.

(may just for isolated system?)

(ex). Head - Tail. — coil Hip.



(ex). "S" can be calculated for anything!

A). S of Sock color

$n_w = 10$ $n_{br} = 1$ $n_{bl} = 1$ $N = 13$

$$\frac{S}{k} = -\sum_{i=1}^{3} P_i \ln P_i = -\left(\frac{10}{13}\ln\frac{10}{13} + \frac{1}{13}\ln\frac{1}{13} + \frac{2}{13}\ln\frac{2}{13}\right) = 0.68$$

$S = 0.68$

$S_{random} = 1.1$ (assume $k = 1$)

B). S of eye color

$n_{brown} = 3$
$n_{black} = 4$
$n_{green} = 3$
$n_{blue} = 3$
$N = 13$

$$S = -\sum P_i \ln P_i = -\left(\frac{3}{13}\ln\frac{3}{13} + \frac{4}{13}\ln\frac{4}{13} + \frac{3}{13}\ln\frac{3}{13} + \frac{3}{13}\ln\frac{3}{13}\right)$$

2 of 2