

Mention that abstract observation discussion at precision measurement level, but attainable approx, since high corr \rightarrow near linear.

Complementarity "really" equivalent to result that subsystems have no independent states. (^{more general} Indurability of quantum phen. implied by this)

- after interaction system state depends on app state -- can choose any basis for app system, then define the state of other. In this sense choice of Apparatus state defines system states (after interaction)

Mention: no objections to a prob. theory, so long as dep on observation to accv,

concept of incomplete description from a complete one. Have complete desc., represented by certain type of mathematical object (Ψ), go to incomplete one by taking equivalence classes of these objects, ($\Psi_{[]}$) giving names to these equiv classes. Can then sometimes deduce in some sense approx laws for equiv classes. Example: wave functions under relation "classically indist"! (not really equiv ^{level} though.)

Example: n-particles ionized in Geiger counter.

Inreversibility as a subjective phenomenon

defines measurement + "good" meas. as correlations involving interacting

Model viewpoint

approx. meas

Class. mechanics

necessity of considering all elements equally valid - interference

Basic singularity of Viewpoint. Wavenature basis (-time slits etc.)

Causality in Quantum laws. Only not causality between successive configurations when we attempt to describe these configurations in classical terms.
 (essential content of complementarity)

Our view, however, forbids any such attempt from beginning, since wave mechanics taken as basic description of all phenomena - hence no need for complementarity (i.e., implicitly contained already in theory)

i.e. relative coordinates separated out, and

$$\Psi = \cancel{\Psi_{cm}} \Psi_H(x, y, z)$$

$$x = m_1 x_1 + m_2 x_2$$

$$\Psi_{cm}(x, y, z) \Psi_H(x_1, y_1, z_1) \quad \text{at fixed time } t$$

\uparrow
 mass like
free particle
 mass $M = m_1 + m_2$

where	$x = x_1 - x_2$
	$y = y_1 - y_2$
	$z = z_1 - z_2$

$$x, y, z, x_1, y_1, z_1 \quad \text{solved for } x_1, x_2$$

$$\text{i.e. } \Psi_1(x, y, z) \Psi_2(x, y, z)$$

$$\begin{matrix} y_1 \\ z_1 \end{matrix}$$

$$\Rightarrow \Psi = \Psi_{cm}(x, y, z) \Psi_H(x_1, x_2, y_1, y_2, z_1, z_2)$$

Theorem 1: $\sup_{\alpha} \alpha = \alpha_p$ = field set by P

$$E\{n(p; B|e) = H = E \sum x_a \ln \frac{1}{P(A)}\}$$

Theorem 2: if $B \supseteq C$ then H exists

H = supremum

and $H \geq 0$

and furthermore $H=0$ if and only if $P(A|B)=P(A|C)$

for every $A \in \mathcal{A}$

App. to Stock Processes:
(Stat. Stock Proc.)

$$(\Omega, \mathcal{B}(\Omega))$$

transf ($T\Omega = \Omega$)

$$P\{\tau A\} = P\{\tau A\}$$

$$\mathcal{I}_{n+1} = T\mathcal{I}_n$$

$$\mathcal{I} = \bigcup_n \mathcal{I}_n$$

before ran.v. X_n

X_n measurable \mathcal{I}_n

\bar{X}_∞ sample space of all X_n

$$X_n = \mathcal{I}_n \cap \bar{X}_\infty$$

$$\text{Def: } H(x) = H\left\{\mathcal{I}; \bar{X}_n | X_{n-1}\right\}$$

(shannon not)

info rate of the stock proc.

$$\exp I_B^a - I_B = \{\alpha, \beta\}$$

$$\exp(\ln p_B^\alpha) - \exp(\ln p_C^\alpha)$$

$$\frac{\exp(\ln p_B^\alpha)}{\exp(\ln p_C^\alpha)}$$

$$\boxed{\{\alpha, \beta\} - I_B - \{\alpha, \gamma\} + I_C} = H(B/C)$$

{A, B, C}

$$\begin{aligned} H(C/I) &= \{\alpha, \gamma\} - I_C - \{\alpha, \delta\} + I_D \\ &= H(B/I) \quad \text{u.u.} \end{aligned}$$

s.t.
for
transf

$$H(x, y) = H\left\{\mathcal{I}; X_n, Y_n | X_{n-1}, Y_{n-1}\right\}$$

Then: if $y = f(x)$ then $H(y) \leq H(x)$

event A.
prob p_i

Info. Functional:

$$H = \sum p_i \ln \frac{1}{p_i}$$

given maps of events \Rightarrow Binary sequences

$H \leq$ Expected sequence length (for a particular map) $< H+1$
(ie \exists such a map!)

Ω measure space

$A_i \subseteq \Omega$

P = partition of Ω

define random variable $H_p(\omega)$

$$= \sum_{A \in P} \chi_A(\omega) \ln \frac{1}{P(A)}$$

↑ char. function

then $H = \text{Exp}[H_p]$

$$H(p; B | e) = \sum_{A \in P} \chi_A \ln \frac{P\{A|B\}}{P\{A|e\}}$$

$P\{A|B\}$
 $P\{A|e\}$
R info rel to
measure
always
ants

defn $H\{\alpha; B | C\} = \lim_{\text{disj sets}} E\{H(p; B | e)\}$

note: $H\{\alpha; B | C\} + H\{\alpha; C | D\} = H\{\alpha, B | D\}$