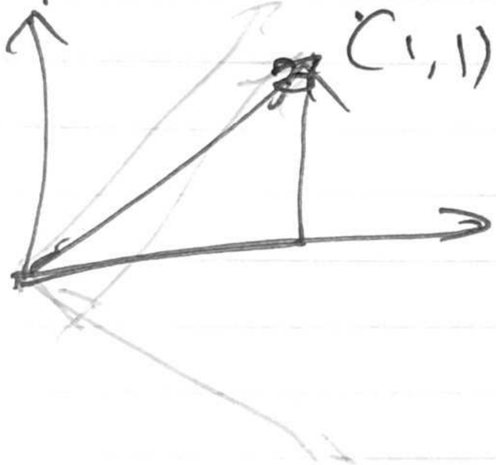
C4 2/10/20 P1

PS2 DIFFERENT BASIS SETS



$$H = \frac{1}{\sqrt{2}}\begin{vmatrix}1 & 1\\ 1 & -1\end{vmatrix}\begin{pmatrix}1\\1\end{pmatrix} = \frac{1}{\sqrt{2}}\begin{pmatrix}2\\0\end{pmatrix}$$

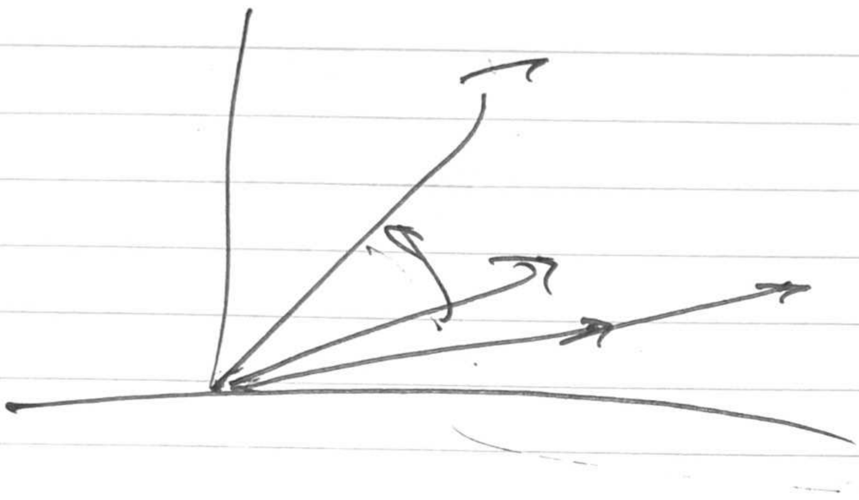
TRANSITION MATRIX

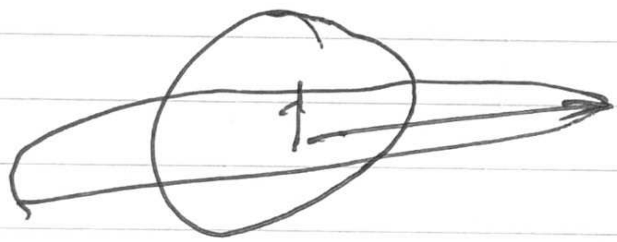
VECTOR SPACE sV_1+V_2

$+$ $\left.\begin{array}{l}\text{INNER}\\ \text{DOT}\end{array}\right\}$ PRODUCT

$$\left\langle \begin{pmatrix}1+2i\\3+4i\end{pmatrix}, \begin{pmatrix}5+6i\\7+8i\end{pmatrix}\right\rangle$$

$$(1-2i)(5+6i)+(3-4i)(7+8i)$$





EIGENVECTORS : AXES
VALUES : HOW LENGTH SCALE.

HERMETIAN $\begin{bmatrix} 1 & 3-4i \\ 3+4i & 2 \end{bmatrix}$

UNITARY: ROTATION
PRESERVES DISTANCE.

p91 3.2.2.

PROBABILITY OF STATE TRANSITION IS NORM SQUARED OF LABEL ON ARC.

$L = \frac{1}{\sqrt{2}}$ $P = \frac{1}{2}$

EX 3.3.1

FOR DETERMINISTIC DOUBLY STOCASTIC MATRIX

$\sum_i a_{ij} = 1$ ETC.

FOR QUANTUM $\sum_n |a_{nj}| = 1$

$\begin{pmatrix} \cos\theta \\ \sin\theta \\ 0 \end{pmatrix}$ $\begin{pmatrix} \cos^2\theta \\ \sin^2\theta \\ 0 \end{pmatrix}$ NORM.

$\Sigma = 1$

WEIGHT $\frac{1}{\sqrt{2}}$ $p = \frac{1}{2}$

$-\frac{1}{\sqrt{2}}$ $p = \frac{1}{2}$

EX 3.3.2

$T=0$ $\rho = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$ T_1 $\rho = \begin{pmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \\ 0 \end{pmatrix}$

$T=2$ ~~GOES TO 0 $\frac{1}{\sqrt{2}}\frac{1}{\sqrt{2}} = \frac{1}{2}$~~

$T=2$ STATE IS $\begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$

QUANTUM THING

$$p(1\to 3)\ \left(\frac{-1+i}{\sqrt{6}}\right)\left(\frac{-1-i}{\sqrt{6}}\right)=\frac{1}{3}$$

WEAT END

Q_3 = WEIGHT ON STATE 3

$$\frac{1}{\sqrt{2}}\left(\frac{-1+i}{\sqrt{6}}\right)=\frac{-1+i}{\sqrt{12}}$$

$$P(\text{STATE } 3)=\left(\frac{-1+i}{\sqrt{12}}\right)\left(\frac{-1-i}{\sqrt{12}}\right)=\frac{1}{6}$$

THAT'S SAME AS BEFORE.

NOW DO P(STATE 5)

$$q_5=\frac{1}{\sqrt{2}}\left(\frac{1-i}{\sqrt{6}}\right)+\frac{1}{\sqrt{2}}\left(\frac{-1+i}{\sqrt{6}}\right)=0$$

DESTRUCTIVE INTERFERENCE

IN DETERMINISTIC CASE $P\Rightarrow 0$

SEC 3.4 ASSEMBLING SYSTEMS

WE HAVE 2 SEPARATE 1 QBIT SYSTEMS

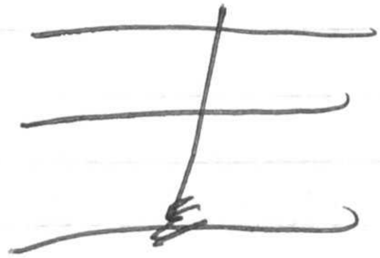
NOW CONSIDER THEM TOGETHER AS ONE SYSTEM

NO INTERACTIONS YET. SIMPLE.

THIS MOTIVATES TENSOR PRODUCT.

BLOCH SPHERE

$$M\begin{pmatrix}1\\0\end{pmatrix} \to \begin{pmatrix}a\\b\end{pmatrix}$$



INFORMALLY HOW SEARCH WORKS:

N QBITS $\rightarrow 2^N$ STATES

EACH STATE IS A POSSIBLE SOLUTION. INITIAL WEIGHTS

$$\begin{pmatrix} \frac{1}{\sqrt{N}} \\ \frac{1}{\sqrt{N}} \\ \vdots \\ \vdots \end{pmatrix}$$

APPLY OPERATOR THAT WILL CHANGE WEIGHT OF EACH STATE DEPENDING ON IF IT'S CORRECT ANSWER.

REPEAT EXPERIMENT, MEASURING AT DIFFERENT BASES. GET PROBABILISTIC SENSE OF SOLUTION.