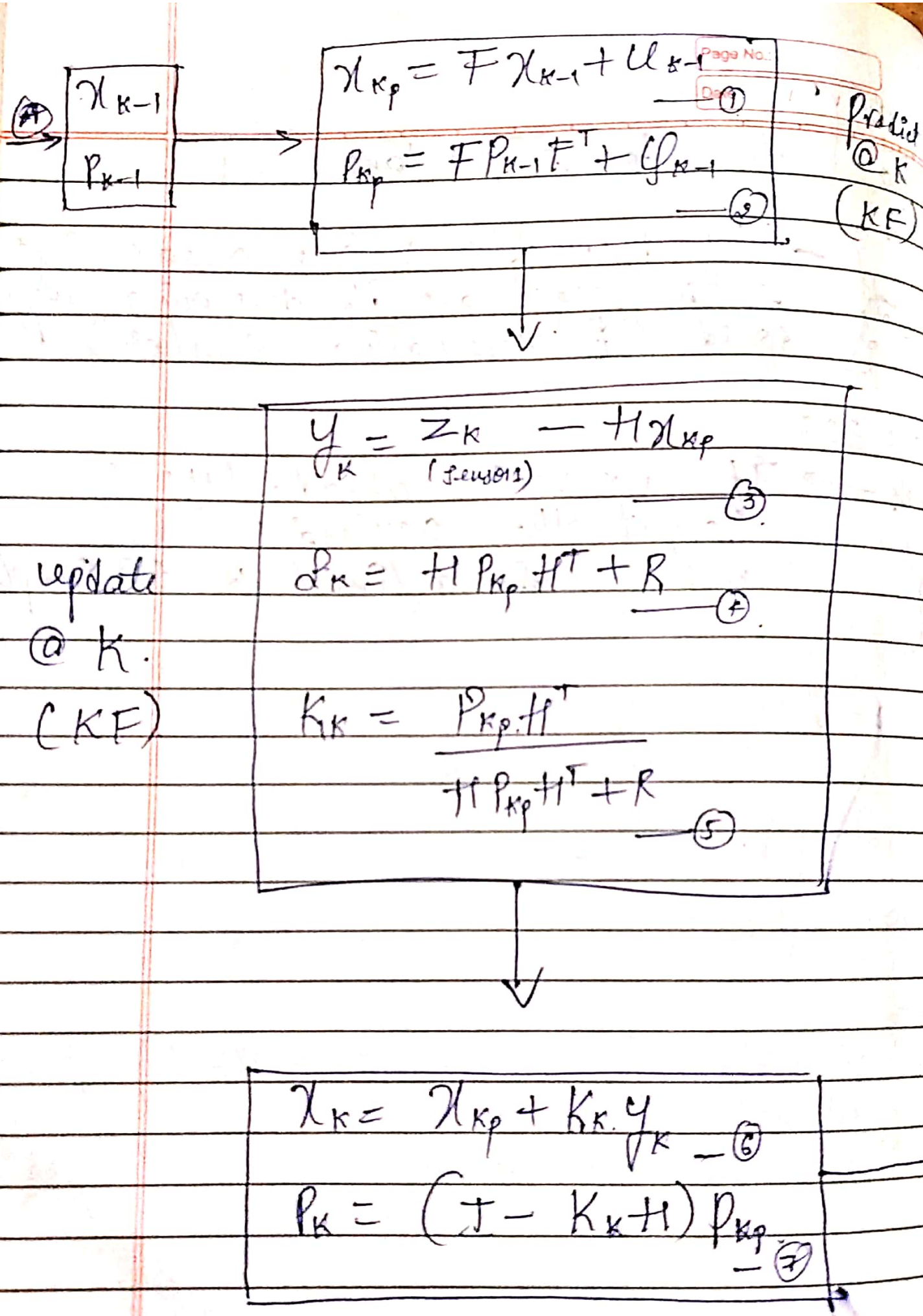

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$x(n) * x(n-\theta)$

$x(n) * y(n)$

$\frac{\partial x}{\partial y}$

$$x_{K+1} = x_{(K+1)_p} + K_{K+1} \cdot y_{K+1} \quad \text{(A)} \rightarrow$$

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$$P_{K+1} = (I - K_{K+1} H_k) P_{(K+1)p} \quad \text{(13)}$$

(14)

$$y_{K+1} = \underset{\text{(sensors)}}{Z_{K+1}} - H_k x_{(K+1)_p} \quad \text{(10)}$$

Update @ K+1 (KF)

$$S_{K+1} = H_k P_{(K+1)p} H_k^T + R_k \quad \text{(11)}$$

$$K_{K+1} = \frac{P_{(K+1)p} \cdot H_k^T}{H_k P_{(K+1)p} H_k^T + R_k} \quad \text{(12)}$$

$$x_{(K+1)_p} = F \cdot x_K + U_K \quad \text{(8)}$$

$$P_{(K+1)p} = F P_K F^T + Q_K \quad \text{(9)}$$

predict @ K+1 (KF)

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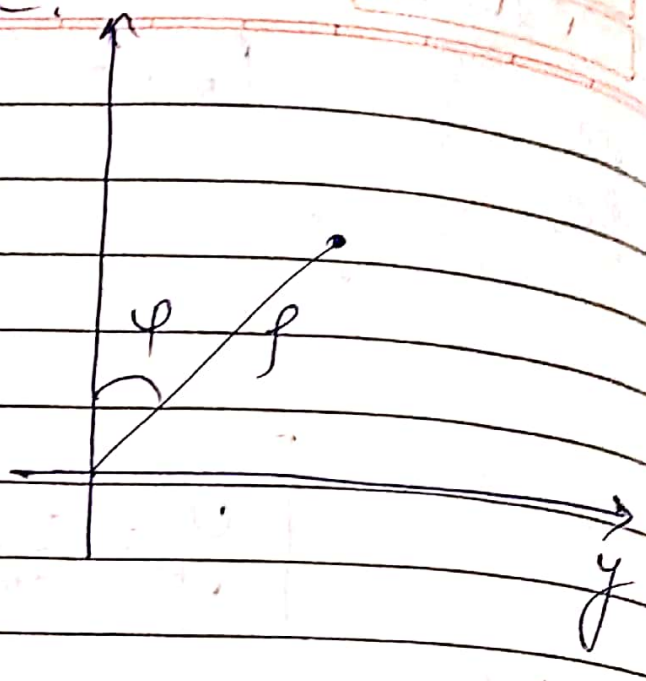
$$P_{x_R} = \rho \cdot \cos(\varphi)$$

$$P_{y_R} = \rho \cdot \sin(\varphi)$$

$$V_{x_R} = \dot{\rho} \cdot \cos(\varphi)$$

$$V_{y_R} = \dot{\rho} \cdot \sin(\varphi)$$



(10) $$y_{k+1} = Z_{k+1} - H_R x_{(k+1)p}$$

(4×1) Sensor 2

$$= \begin{pmatrix} P_{x_R} \\ P_{y_R} \\ V_{x_R} \\ V_{y_R} \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} P_x \\ P_y \\ V_x \\ V_y \end{pmatrix}$$

4×1 4×4 (4×1)

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(11) $S_{k+1} = H_R P_{(k+1)p} H_R^T + R_R$

$(4\times4) = (4\times4)(4\times4)(4\times4) + (4\times4)$

$$R_R = \begin{pmatrix} \sigma_p^2 & 0 & 0 \\ 0 & \sigma_\psi^2 & 0 \\ 0 & 0 & \sigma_p^2 \end{pmatrix}_{(3\times3)}$$

$$= \begin{pmatrix} 0.09 & 0 & 0 \\ 0 & 0.0009 & 0 \\ 0 & 0 & 0.09 \end{pmatrix}_{(3\times3)}$$

(12) $K_{k+1} = \dfrac{P_{(k+1)p} H_R^T}{S_{k+1}}$

(4×4)

$= \dfrac{(4\times4)(4\times4)}{(4\times4)}$

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(13) $x_{k+1} = x_{(k+1)p} + K_{k+1} \cdot y_{k+1}$

$(4\times1) = (4\times1) + (4\times4)\ (4\times1)$

(14) $P_{k+1} = (I - K_{k+1} H_k)\ P_{(k+1)p}$

(4×4)

$= I\ P_{(k+1)p} - K_{k+1} H_k P_{(k+1)p}$

$= (4\times4)\ (4\times4) - (4\times4)\ (4\times4)\ (4\times4)$

$$I = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

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$\rho = 0.09$

$\psi = 0.0009$

$\rho' = 0.09$

$P_x = \rho \cdot \cos\psi = 0.09 \times \cos(0.0009)$

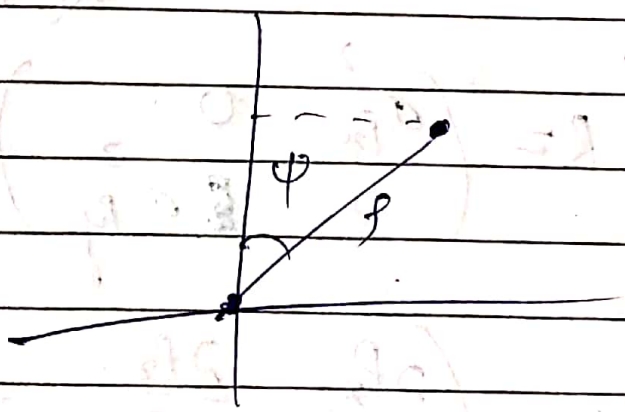
$= 0.08999$

$P_y = \rho \cdot \sin\psi = 8.09999 \times 10^{-5} = 0.000080$

$V_x = \rho' \cdot \cos\psi = 0.08999$

$V_y = \rho' \cdot \sin\psi = 8.09999 \times 10^{-5}$

$= 0.000080$



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