UBS

$t_x = \frac{x - p_x}{v_x}$, v_x

$y = t\, v_y + p_y \qquad x = t\, v_x + p_x \Rightarrow t = \frac{x - p_x}{v_x}$

$y = v_y \cdot \left(\frac{x - p_x}{v_x}\right) + p_y = \frac{v_y}{v_x} \cdot x - \frac{v_y}{v_x} \cdot p_x + p_y$

$y = \frac{v_y}{v_x} \cdot x - \frac{v_y}{v_x} \cdot p_x + p_y = s_1 \cdot x - s_1 \cdot p_x + p_y$

$\frac{v_{y1}}{v_{x1}} \cdot x - \frac{v_{y1}}{v_{x1}} \cdot p_{x1} + p_{y1} = \frac{v_{y2}}{v_{x2}} \cdot x - \frac{v_{y2}}{v_{x2}} \cdot p_{x2} + p_{y2}$

(s_1, s_2)

$x \cdot \left(\frac{v_{y1}}{v_{x1}} - \frac{v_{y2}}{v_{x2}}\right) = \frac{v_{y1}}{v_{x1}} \cdot p_{x1} - \frac{v_{y2}}{v_{x2}} \cdot p_{x2} + p_{y2} - p_{y1}$

$x = \frac{\frac{v_{y1}}{v_{x1}} \cdot p_{x1} - \frac{v_{y2}}{v_{x2}} \cdot p_{x2} + p_{y2} - p_{y1}}{s_1 - s_2}$

$t_x = \frac{x - p_x}{v_x}$ muss ≥ 0

→ others in pdf

UBS

3 Unit + 1 Ray Problem

9 ? ⇒ 9 Eq

(1) $A_{px} = A_{px} + T_A \cdot A_{vx}$
(2) $A_{py} = A_{py} + T_A \cdot A_{vy}$
(3) $A_z = A_{pz} + T_A \cdot A_{vz}$

(4) $T_A = \frac{A_{vx} + A_{px} = T_A \cdot R_{vx} + R_{px}}{A_{vx} - R_{vx}} = \frac{R_{px} - A_{px}}{A_{vx} - R_{vx}}$ (1A)

(5) $R_{vy} = \frac{T_A \cdot A_{vy} + A_{py} - R_{py}}{T_A}$ (1B)

6. Bullet Speed x, y (range $-300 \to +300$) with two Heads A, B

Unknowns: $\underset{v}{t_A}\ \underset{v}{t_B}\ R_{px}\ R_{py} \Rightarrow$ 4 Equations

(1) $T_A \cdot A_{vy} + A_{py} = T_A \cdot R_{vy} + R_{py}$ (1B)

$R_{py} = T_A \cdot A_{vy} + A_{py} - T_A \cdot R_{vy}$

$= T_A (A_{vy} - R_{vy}) + A_{py}$

(2B) $T_B \cdot B_{vy} + B_{py} = T_B \cdot R_{vy} + R_{py}$

$T_B = \frac{R_{py} - B_{py}}{B_{vy} - R_{vy}}$

(2) $T_B \cdot B_{vx} + B_{px} = T_B \cdot R_{vx} + R_{px}$

$R_{px} = T_B (B_{vx} - R_{vx}) + B_{px}$

$T_A = \frac{R_{px} - A_{px}}{A_{vx} - R_{vx}} = \frac{T_B (B_{vx} - R_{vx}) + B_{px} - A_{px}}{A_{vx} - R_{vx}} = \frac{T_B (B_{vx} - R_{vx})}{A_{vx} - R_{vx}} + \frac{B_{px} - A_{px}}{A_{vx} - R_{vx}}$

$= \frac{(R_{py} - B_{py})(B_{vx} - R_{vx})}{(B_{vy} - R_{vy})(A_{vx} - R_{vx})} + \frac{(B_{px} - A_{px})(B_{vy} - R_{vy})}{(A_{vx} - R_{vx})(B_{vy} - R_{vy})}$

$T_A = \frac{(R_{py} - B_{py})(B_{vx} - R_{vx})}{(B_{vy} - R_{vy})(A_{vx} - R_{vx})} + \frac{(B_{px} - A_{px})}{(A_{vx} - R_{vx})}$

$R_{py} = T_A \cdot A_{vy} + A_{py} - T_A \cdot R_{vy}$

$T_A =$

$T_A (B_{vy} - R_{vy})(A_{vx} - R_{vx}) = (R_{py} - B_{py})(B_{vx} - R_{vx}) + (B_{px} - A_{px})(B_{vy} - R_{vy})$

$= (T_A \cdot A_{vy} - T_A \cdot R_{vy} + A_{py} - B_{py})(B_{vx} - R_{vx}) +$

$= T_A \cdot A_{vy}(B_{vx} - R_{vx}) - T_A \cdot R_{vy}(B_{vx} - R_{vx}) + (A_{py} - B_{py})(B_{vx} - R_{vx}) + \ldots$

$T_A (B_{vy} - R_{vy})(A_{vx} - R_{vx}) - T_A \cdot A_{vy}(B_{vx} - R_{vx}) + T_A \cdot R_{vy}(B_{vx} - R_{vx}) = \ldots$

$T_A = \frac{(A_{py} - B_{py})(B_{vx} - R_{vx}) + (B_{px} - A_{px})(B_{vy} - R_{vy})}{(B_{vy} - R_{vy})(A_{vx} - R_{vx}) - A_{vy}(B_{vx} - R_{vx}) + R_{vy}(B_{vx} - R_{vx}) + (B_{vx} - R_{vx})(R_{vy} - A_{vy})}$

$T_A \cdot A_{vz} + A_{pz} = T_A \cdot R_{vz} + R_{pz}$ $\quad R_{pz} = T_A \cdot A_{vz} + A_{pz} - T_A \cdot R_{vz}$

$T_B \cdot B_{vz} + B_{pz} = T_B \cdot R_{vz} + R_{pz}$

$+ T_A \cdot A_{vz} + A_{pz} - T_A \cdot R_{vz}$

$R_{vz} = \frac{T_B \cdot B_{vz} + B_{pz} - T_A \cdot A_{vz} - A_{pz}}{T_B - T_A}$