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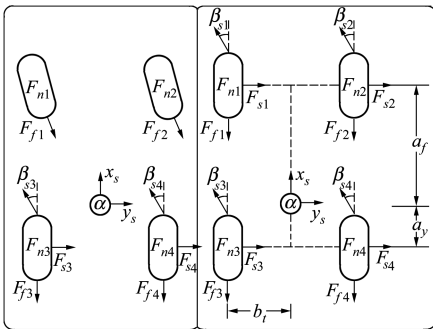
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g Ô | >ÿ %



a) 前轮自由转向 b) 前轮固支

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3 D>5û- C g f 1 T q K h i 2 ( 4 " £ \* \* ' £ B U F ü " Ä ]

$$F_{ni} = K_{\delta_i} \delta t_i + C_{\delta_i} \dot{\delta t}_i \quad \text{æ} = \text{ß} " 0 " \quad \text{x} \quad \%00$$

< Z " K<sub>δi</sub> g D>5û ± 0 v u f 1 T G Ó C<sub>δi</sub> g D>5û ± 0 v u

Khi 2 ( • t<sub>i</sub> 1 δ<sub>t</sub> \ D>5û ± , 4 V F ü 1 , 4 V E L Ó % δ<sub>t</sub> i

E G δ δ t<sub>i</sub> & # K ! E = y ! o ) Ä ] % E G δ ç g ±

' ä . 1 Bæj ã , 2 ( Ä ] D>5û ± , 4 V F ü ä

$$\begin{aligned} \dot{\delta t}_1 &= -H + h - a_f = \vartheta - b_l = \varphi \\ \dot{\delta t}_2 &= -H + h - a_f = \vartheta + b_l = \varphi \\ \dot{\delta t}_3 &= -H + h + a_r = \vartheta - b_l = \varphi \\ \dot{\delta t}_4 &= -H + h + a_r = \vartheta + b_l = \varphi \end{aligned} \quad \%00$$

$$\delta t_i = \frac{U_{\delta_i}}{V_{\delta_i}} \quad \text{æ} = \text{ß} " 0 " \quad \text{x} \quad \%00$$

< Z " H \ Fúð ] ] L• ± C . è t<sub>i</sub> g D>5û , 4 V #

ç g Fúð ± è ] P Ó t g >ÿ t g \$ D TM y % U v  
g N z 1 \* • " 3 D > 5 û • F ü K } c U ! 2 ! Z 0 ] x K ! %

D>5û ] ± ± - È 1 Ô È = • g g å

$$F_{fi} = \mu_f F_{ni} \quad \text{æ} = \text{ß} " 0 " \quad \text{x} \quad \%00$$

$$F_{si} = K_s \beta_{si} F_{ni} \quad \text{æ} = \text{ß} " 0 " \quad \text{x} \quad \%00$$

< Z " μ<sub>f</sub> g D>5û ± ± \$ Ô - • K<sub>s</sub> g D>5û ± ± Ô |

G Ó % TM < % 0 6 U β<sub>si</sub> g < >ÿ Ó # z = / ø " E G e

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t @ # p B p D ö 8 Z ç g ± \$ D TM , . g <

Fü " & » z D>' \ ± ± ò â " E G ö 8 TM < ! o ?

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$$\dot{\beta}_{s\beta} = U_{\beta_{s\beta}} - \%00 + a_{fr} \vartheta \%00 + b_{lr} \vartheta$$

$$\dot{\beta}_{s0} = U_{\beta_{s0}} - \%00 + a_{fr} \vartheta \%00 - b_{lr} \vartheta$$

$$\dot{\beta}_{s\alpha} = U_{\beta_{s\alpha}} - \%00 - a_{fr} \vartheta \%00 + b_{lr} \vartheta$$

$$\dot{\beta}_{s\alpha} = U_{\beta_{s\alpha}} - \%00 - a_{fr} \vartheta \%00 - b_{lr} \vartheta$$

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7 W > = y " r β<sub>sβ</sub> = β<sub>s0</sub> = ! + ; D> Ô | >ÿ ; ' \ 0 m ± ±

@ ð Ä æ " , % 9 %

\* ^ » # p B p D ö 8 Z >ÿ \$ D TM y 1 D>5û ± ± Ô |

>ÿ g < F ü " r g € ] ] L• ± ± % \* U È 1 È - = •

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$$F_{bg} = \sum_{i=\beta} \overset{x}{R} F_{fi} - \sum_{i=\beta} \overset{x}{R} F_{si} - \sum_{i=\beta} \overset{x}{R} F_{ni} \dot{U}$$

$$\dot{\delta} \%00_{n\beta} - F_{n0} + F_n - F_{n\alpha} \vartheta_t - \sum_{i=\beta} \overset{x}{R} F_{si} H$$

$$M_{bg} = \sum_{i=\beta} \overset{x}{R} \%00_{n\beta} + F_{n0} a_{lf} - \%00_n + F_{n\alpha} a_{lr} - \sum_{i=\beta} \overset{x}{R} F_{fi} H$$

$$\dot{\delta} - \%00_{f\beta} - F_{f0} + F_f - F_{f\alpha} \vartheta_t$$

ßZæBæj ç ø • Ö È Ö N ,

< ç ø • ö È 0- C g 0 å

$$F_p = \frac{\beta}{\theta} \rho S_p C_p \%00_p \delta_p \vartheta^0 - V_p^0 \vartheta$$

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\ ! æ K T < K<sub>p</sub> g < ç ø • ' " n E L Ó ; ! æ K x K ! ± ± È

+ ÷ V<sub>p</sub> g < ç ø • 1 ± ± ' " n E L Ó % 50 ; ~ ] | 7 W y E L Ó

± ± ž ú " V<sub>p</sub> = • g g

$$\begin{cases} V_{pl} = V_a + d_p r \\ V_{pr} = V_a - d_p r \end{cases} \quad \%00$$

< Z " V<sub>pl</sub> 1 V<sub>pr</sub> 3 X g < ç ø • 1 ± ± ' " n E L Ó t<sub>p</sub>

g < ç ø • ] N g &/ L• ± C . è %

Ç v µ<sub>p</sub> g !æK ÖFü" !æK =•.g g

$$\begin{cases} \delta_{pl} = \delta_p + \mu_p \\ \delta_{pr} = \delta_p - \mu_p \end{cases} \quad \%B\beta o$$

<çø • Ö È Ö =•.g g

$$\mu l = T_l - T_r = \phi S_p C_p K_p^0 \delta_p \mu_p - \phi S_p C_p d_p r \quad \%B\beta o$$

<çø • %U N g ± È 1 È- =•.g g ä

$$F_{bp} = [T_l + T_r \quad ! \quad !] \quad \%B \ o$$

$$M_{bp} = [! \quad ! \quad \mu l d_p] \quad \%B \times o$$

€ µ<sub>p</sub> = ! # "%B\beta o < 0- C g µ l = - φ S<sub>p</sub> C<sub>p</sub> d<sub>p</sub> r "

\*^ » ρ "S<sub>p</sub> "C<sub>p</sub> "d<sub>p</sub> F\* T » ! "ù <çø g @ @ @ \* L g N g S ' MÈC ± | 7Wkhi %

ßžž œ¹ ± #pBpN ,

3 ç g K' ³ D>5û C ± F 3 >óg G € " \* \*

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ç g ± DýÖ % ç g U #pBpDø8 ZK' ³ ] L • 1 <çø

ø • ý È ± È 1 È- "E ] !A Ö È & È- 1 FúÈ ± ±

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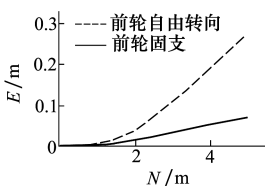
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Öžž #pBp! T 3 ½

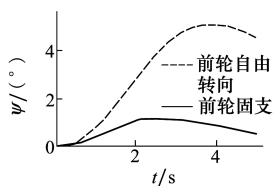
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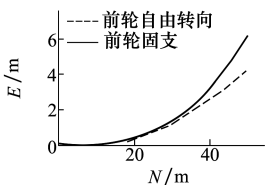
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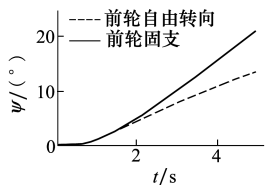
a) 低速时的位置曲线



b) 低速时的偏航角曲线



c) 高速时的位置曲线



d) 高速时的偏航角曲线

+ œ0.ú : 9 0 m ± B±j ã UP { 0.ú ELÓ 8

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\*^ + U b¹ + &o - U { EL#pBp# "z D>7

\*^ DTM 0 m ] 7W> È- ± ± ž ú # Ô \* L ± ± Ô > | .è

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- Ç ± 7W> Khi % ' "U { EL#p=y # z D>7 \*^ DTM

> ± ± 0 mL - > @! > ± ± Ô c È- %\*^ + ú o¹ + > o

- UP EL#pBp# "z D>' \ ± ± 0 m Ô > | .è ú 59

/: T » z D>7 \*^ DTM 0 m %E \ g UP EL# | 7W

>ÿELÓ r & Ô | >ÿ ± ± ž ú µ < "D>5û ý È ± ± Kzi

{ %9 # !A Ö ± ± ž ú " ç g ' (ÝD° T ± ± \$ DTMÿ "

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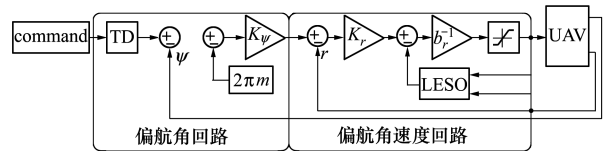
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: 50; ~ \$ DTMÿ 1 >ÿ ± ± ž ú # "7W> Ö È "

æ8 Æg Ri , 1 ± ± <

$$\begin{cases} \dot{\psi} = r \\ \dot{r} = f_r + b_r \mu_p \end{cases} \quad \%B \ o$$

< Z "f<sub>r</sub> g h 1 • Ö " ² > i "x Ö . (ÛT %

@ @ @ Í | 7Wÿ C ± ± D#NDø8 (ÛT %œœ "A (ÛT

6\* 6 u ü > Ô c Dø8 Z ± ± B²A0%

$$\dot{\psi}_{e1} = \dot{\mu}_{e1} - \dot{\psi}_{ij}, \quad \dot{\psi}_{e1} = r_{\psi} \quad \%B \ o$$

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h<sub>1</sub> g \$ " 2 ( • ψ<sub>ij</sub> , g | 7Wÿ 4 ψ<sub>e1</sub> ; g Dø#N

4 %

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- MiT} N "r - \* U3i T ú Nµ

$$r_c = K_{\psi} \mu_{e1} - \dot{\psi} + 0 \quad \%B \ o$$

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$$- < \dot{\psi}_{e1} - \dot{\psi} + 0 \quad \%B \ o$$

œœ @ @ @ Í | 7Wÿ ELÓ C ± ± 3i T - M'ä . > i "x •

%âi o " < Z β<sub>1B</sub> β<sub>10</sub> g² i Ç ĩ •

$$\begin{cases} e_r = \hat{r} - r \\ \dot{\hat{r}} = \mu - \beta_1 e_r + b_r \mu_p \\ \dot{\mu}_r = -\beta_1 e_r \end{cases}$$

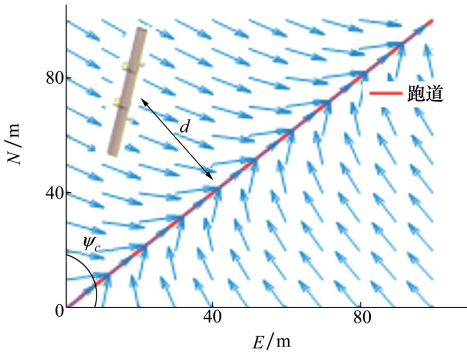
① 7Wÿ ELÓ C ±±U nμ Ü7

$$\begin{cases} \mu_p^3 = K_r \mu_p - r_o - \mu \dot{\theta}^{-\beta} \\ \mu_p = U \mu_p^3 - 0! \mu + 0! \mu_o \end{cases}$$

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$$K_d = \tilde{K}_d / V \quad \%00o$$

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$$\psi_{ij} = \psi_i - \psi_j - \frac{0}{\mu \tilde{K}_d} d / V + 0 n \quad \%0o$$

úž† , ,L 3 ½

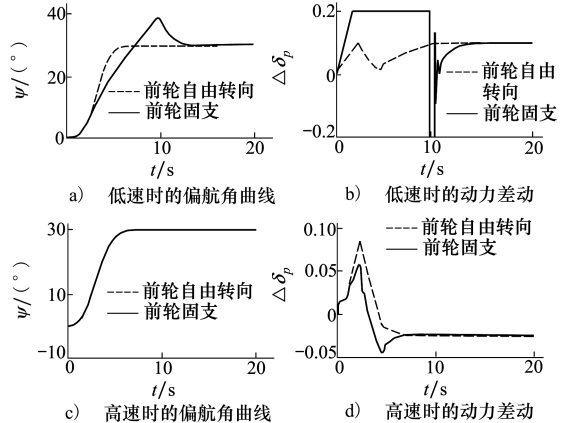
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 ±± T(Ü7 , %

| 7Wÿ Öc • i • æ6 rψ = !. B'h1 = !. ! B"Kψ  
 = B"Kr = B! β1B = B! ! β10 = !! %! 3i D•E& CW  
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úž† | 7Wÿ Öc •

+ O!@i| 7Wÿ Öc • U β ] ð 1 B! ] ð ±± 0  
 .ú ELÓ 8 &! z D>7 \*^D™ 1 z D' \ 0 m±±Öc  
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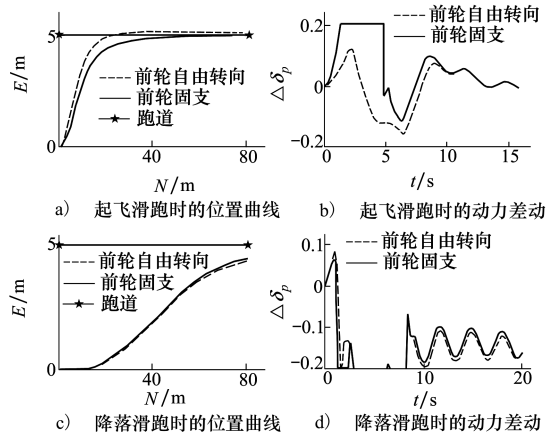
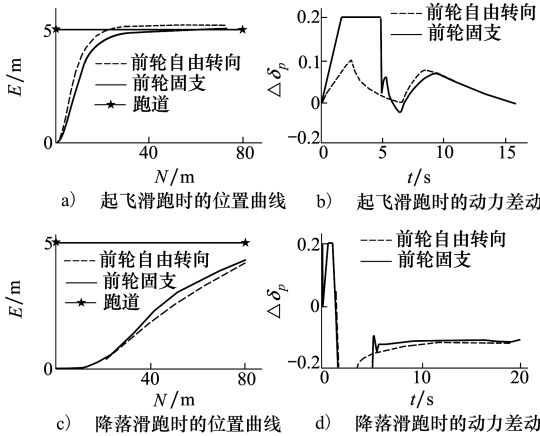
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úž†, ! 3i D•E& CW

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