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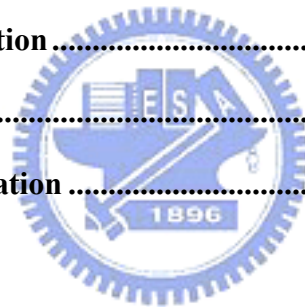
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NOTATIONS

a_x		longitudinal car acceleration
b		setpoint weighting of proportional term in PID control
B		magnetic flux density
c		setpoint weighting of derivative term in PID control
C_{BL}		damping coefficient from release bearing to ball and socket joint
C_c		damping coefficient of virtual spring on worm gear collision
C_{CP}		damping coefficient of clutch disc
C_{DM}		damping coefficient of identity shaft
C_{eng}		damping coefficient of engine
C_G		damping coefficient of worm gear
C_{IG}		damping coefficients on input shaft
C_{OG}		damping coefficients on output shaft of gear box
C_{RG}		damping coefficients on inverse shaft
C_{ss}		damping coefficient of stage springs
C_{SP}		damping coefficient of assist spring
C_{wh}		identity damping coefficient on wheels
C_{WS}		damping coefficient of worm shaft
d_G		pitch diameter of worm gear

d_w		pitch diameter of worm shaft
D_A		aerodynamic drag force
D_{out}		clutch actuator travel
f_r		rolling resistance coefficient
F		force caused by current and magnetism
F_x		longitudinal forward force on car
g		gravity
i		current in conductor
I_{CP}		inertia moment of clutch disc
I_{DM}		identity inertia moment of final shafts
I_{eng}		inertia moment of engine
I_G		inertia moment of worm gear
I_{IG}		inertia moments of input shaft
I_L		inertia moment of linkage arm at mass center
I_{OG}		inertia moments of output shaft of gear box
I_{RG}		inertia moments of inverse shaft
I_{ss}		inertia moment of stage springs
I_{WS}		inertia of worm shaft
J_m		inertia of motor rotor

K		proportional integer in PID controller
K_c		spring coefficient of virtual spring on worm gear collision
K_e		EMF (electromotive force) constant
K_{ss}		stiffness coefficient of stage springs
K_{SP}		stiffness of assist spring
K_t		torque constant on DC motor
l		length of conductor
I_{wh}		identity inertia moment of the total wheels
La		inductance of armature
m_{BL}		simplified mass of release bearing and clutch lever
m_G		mass of worm gear
M_{car}		car mass
M_{SP}		mass of assist spring and fix plate
N		derivative limit constant in PID control
N_w		thread number of worm shaft
p_x		axial pitch of worm shaft
r_{GG}		distance from mass center to axle on worm gear
R_a		resistance of armature
R_{DM}		final gear ratio

R_G	gear box transmission ratio
R_{hx}	hitch forces
R_i	inner radius of clutch disc
R_o	outer radius of clutch disc
R_r	clutch lever ratio
R_x	rolling resistance forces
s_{ins}	pre-deformation of assist spring
S_{LC}	motion of ball and socket joint in X direction
S_{Lx}	displacement of mass center of the linkage arm in x-direction
S_{Ly}	displacement of mass center of the linkage arm in y-direction
T	torque caused by current and magnetism
T_{cf}	torque able to be transfer from clutch
T_d	derivative integer in PID controller
T_{DM}	torque transmitted to the drive wheels
T_{engR}	engine output torque
T_{GD}	torque from output shaft of gear box to output shaft of differential mechanism
T_{Gf}	torque caused by friction on the axle of worm gear
T_i	integral integer in PID controller

T_{IG}		torque transmitted from clutch
T_{IR}		torque transmitted to inverse shaft in gear box
T_l		extra torque loading on motor
T_{LCf}		friction torque on ball and socket joint
T_{LGf}		torque caused by friction on the joint of worm gear
T_{OR}		reacting torque from output shaft to the inverse shaft in gear box
T_{OG}		torque transmitted to differential mechanism
T_{RG}		torque from inverse shaft to output shaft in gear box
T_{syn}		torque generated by synchronizer
V_a		supplied voltage on armature
W		force exerted from worm gear to worm shaft
W_c		reacting force of clutch
W_{car}		car force
W_{Ga}		axial force on worm gear
W_{Gr}		radial force on worm gear
W_{Gt}		tangential force on worm gear
W_{Gx}		axle force in X direction on worm gear
W_{Gy}		axle force in Y direction on worm gear

W_{LCx}	force on ball and socket joint in x-direction
W_{LCy}	force on ball and socket joint in y-direction
W_{LF}	force of assist spring
W_{LGx}	force from linkage to worm gear on x-direction
W_{LGy}	force from linkage to worm gear on y-direction
W_{wa}	axial force on worm shaft
W_{wf}	tangential friction force on worm shaft
W_{wr}	radial force on worm shaft
W_{wt}	tangential force on worm shaft
η_{eng}	transmission efficiency of powertrain
θ_c	overtaking angle of lower or upper limit on worm gear
θ_{DM}	rotation angle of identity shaft
θ_{eng}	engine rotation angle
θ_G	rotation angle of worm gear
θ_{IG}	rotation angle of input shaft
θ_L	rotation angle of linkage arm
θ_m	rotation angle of rotor
θ_{OG}	rotation angle of output shaft of gear box



θ_{RG}		rotation angle of inverse shaft
θ_{ws}		rotation angle of worm shaft
λ		lead angle of worm gear
μ	friction coefficient between worm shaft and worm gear	
μ_{clutch}		clutch disc friction coefficient
μ_{Ga}		friction coefficient on axle of worm gear
μ_{Gj}		friction coefficient on joint of worm gear
μ_{LC}		friction coefficient of ball and socket joint
ξ		damping ratio in control function
ρ		air density
ϕ_n		pressure angle of worm shaft

