SuspensionSim

Mechanical Simulation Corporation

SuspensionSim is a software tool designed to provide engineers with a highly developed set of features optimized for suspension design and analysis. It is the only single purpose suspension software on the market that models both kinematics and compliance.

Designed by suspension expert Joe Knable— SuspensionSim provides a complete set of tools to model any type of suspension for any vehicle—from golf carts to sports cars to off-road military vehicles. Although templates for the most common suspension configurations are provided with the software, you can design and model virtually any suspension geometry using simple building tools.

Unlike complex, general purpose design tools that have steep learning curves and require expert users, Suspension-Sim provides a logical and intuitive work flow that will make you productive in a few hours.

Unique features such as kinematic and compliance modeling, 3D visualization, suspension design factors, and the ability to export directly into CarSim and TruckSim make SuspensionSim the modeling program of choice for obtaining accurate force and displacement measurements for suspensions under a wide range of load conditions.



Load & Displacement Condition	×									
Loads and Displacements Conditions										
C Ride	Apply Point (Wc) Wheel Center(SYM)									
C Roll	Fix Fix									
C Steering Input	X 0 N C X 0 N-mm C									
C Lat. Force @ TCP - In Phase	Y 200 N C YY 0 N-mm C									
C Lat. Force @ TCP - Out of Phase	Z 100 N T ZZ 0 N-mm T									
C Longitudinal @ TCP										
C Align. Torque @ TCP - In Phase	Number of Steps in Cycle: 4 Steps									
C Align. Torque @ TCP - Out of Phase	Apply Forces									
Custom Force	In Phase C Out of Phase									
C Advance User Defined	Tire Contact Patch Vertical Constraint									
	Solution Options									
Rack and Pinion	Increment Fixed Forces									
C Recirculating Ball										
	Solve Cancel									

POWERFUL, EASY-TO-USE TOOL FOR DESIGNING AND EVALUATING CAR AND TRUCK SUSPENSIONS



Intuitive workflow

Design

Designing a new suspension is a simple process:

- define the physical bodies in the suspension
- enter the coordinates of each joint or mounting point
- specify the physical properties of each body in the suspension
- connect the bodies together to form an assembly
- assign graphic elements to each suspension component using predefined parametric models that are provided with the software.

Solve

SuspensionSim provides a wide range of load and displacement conditions allowing you to study your design's kinematic and compliant behavior in an exhaustive list of real world conditions. You can even apply user defined forces to any point on the suspension.

Analyze

After the model has been solved, you can view and graph forces and displacements at any point on the suspension. More importantly, more than 50 suspension design factors (SDFs) that quantify the suspension's overall performance are calculated every run. SDFs include: camber roll coefficient, roll steer, lateral camber compliance, and tractive force windup. Additionally, you can view an interactive 3D animation of the suspension as it travels through its range of motion to view bounce, roll, and steer from any perspective.

Export

Jounce and steer tables generated by SuspensionSim can be directly exported to the world-leading CarSim and TruckSim vehicle simulation programs allowing you to evaluate how the suspension performs on real vehicles driving on complex three-dimensional roads.

SuspensionSim Reporting Tools

Position: Z 300.00	•	Export	Print										
SDF	Left	Right	Averac File Edit Format Dat	a Set								<u>ال</u>	
Aligning Torque Compliance	-8.274E-0	Load Output	- X-Avis										
Anti Lift	29.466	- Load Case	Roll Center - Vertical	^	80-				т	Wi	neel Bo	Junce	
Anti-Dive/Squat	0.000	Y 150.00 N Z 75.00 N	Roll Center Height Roll Steer						d	eg	mm	21	
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Brake Coef Steer	0.000	Joint Name	LOC Spring Load Steering Ratio		Ē		×			0.08633	60.	.000	
Bump Stop Displacement	0.000	Strut to body	Toe	~	Q 40-	- /				0.06412	50. 40.	000	
Bump Stop Load	0.000		Up Y-Axis		rav	×				0.03727	30.	.000	
Camber	-0.03029		K W/C Lateral Stiffness W/C Long, Displacement	ł 🔼	L 20- ()	- <u>+</u>				0.02952	20.	.000	
Camber - Roll Coeff.	78.608		Upper Str W/C Longitudinal Stiffne	\$\$	L CC	t				0.02410	10.	.000	
Camber Rate	-0.02015		Upper W/C Pitch Rate		on	0.05	0 0.10	0.150		0.01742	-10.	.000	
Caster	0.000		Knu W/C Vertical Stiffness W/C Yaw Stiffness		-20-	- [0.01520	-20.	.000	
Caster - Roll Coeff.	-13.364	-	Wheel Bounce Travel	~	ee					0.01356	-40.	.000	
Caster Rate	-0.01259		TLF · Average		5 -40-	-				0.00988	-50.	.000	
Damper Displacement	-0.06890	Trailing Link to Parky	Cleft			4			•	0.008261	-60	••••	
Damper Lever Ratio	1.058	Hanning Link to body			-60-	+							
Dive/Squat	49.457		TI From			A							
KP FV Offset @Grd(Scrub Radius	0.000		Grid		-80-								
Kingpin FV Offset @ W/C	0.000		TL at Kn 🗖 Legends			Toe deg							
Kingpin Inclination	0.000		K		L								
Kingpin SV Offset @ W/C	0.000		I railing Link	G	1/1	-2.8	1-68	-5417	-34.9	1 14/45		-	
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Lateral Camber Compliance	-6.348E-0		Knuckle/Strut(SYM)	G	-11.4	-4.8	4.8	-557.2	33.3	1,531.0			
Lateral Force - Steer	2.420E-0		TL at Knuckle(SYM)	L	-4.6	11.6	-4.6	87.4	593.7	-1,515.1	-		
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		Front lateral link to knuckle	FL outboard point	L	-9.2	80.0	-22.1	705.6	332.5	-1,432.6			
			Front Lateral Link	G	-9.7	79.2	-24.6	672.2 722 E	283.0 -240 F	-1,459.1	-		
			Knuckle/Strut/SYM	G	5.4	-62.5	-10.7	687.8	-287.5	-1,477.5	~		
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Supplied Rear Suspensions Templates

- 5 link independent
- Hotchkiss
- Live 3 bar with Watt
- Live 4 bar with Panhard
- Live 4 bar
- Live 4 bar with Watt
- Semi-trailing arm
- Tri-Link with strut
- Twist axle with Panhard
- Push/Pull Rod (Formula SAE)

Supplied Front Suspensions Templates

- Kingpin Carrier Double Wishbone
- Multi-link
- SLA
- SLA spring on LCA front rack
- SLA spring on LCA front rr
- SLA with coil over parallel steer
- Strut
- Strut with coil over front.
- Push/Pull Rod (Formula SAE)

Load Conditions

- Ride
- Roll
- Steering Input
- Lateral force at tire contact patch (TCP) in phase
- Lateral force at TCP out of phase
- Longitudinal force at TCP
- Aligning torque at TCP in phase
- Aligning torque at TCP out of phase
- Custom Force
- Advanced user defined conditions

Export Formats

- CarSim
- TruckSim
- Excel



Suspension Components

- Ball Joint
- Ball link
- Bump stop
- Bushing
- Constraint
- Non-linear beam
- Rack/steering gear
- Simple rectangular beam
- Simple round beam
- Slider
- Slider
 Spring
- Spring
- Tie-rod
- Weld
- Leaf spring
- Stabilizer bar



Bike<mark>Sim</mark> CarSim

TruckSim SuspensionSim

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