universal mechanism

多体系统动力学仿真

UM 软件强基训练系列教程 (05)

四川同算科技有限公司

2022年6月

《UM软件强基训练系列教程》面向具有 UM 软件使 用基础的用户,作为对《UM 软件入门系列教程》和《UM 培训教程》的补充和强化,教程中使用的部分例子取自 UM 软件自带的模型。

希望读者重视基础, 勤加练习, 多多思考, 相信通过 每一次练习都能有所收获。

本例模型路径: C:\Users\Public\Documents\UM Software Lab\Universal Mechanism\9\SAMPLES\Mechanisms\ds

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1 UM Input 建模过程

1.1 建立几何模型

SceneImage: 由两个 Cone、两个 Plate 和四个 Box 组成,颜色为红色。

Conel Parameters: R2=R1=0.02 (m), h=0.02 (m).

GE Position:沿Z轴移动-0.01 (m)。

			Name: SceneImage 🔊 🛨 🕒	J
Name: SceneIm	age 🖋 🕂 🖣		Comments/Text attribute C	7
Comments/Text	attribute C			_
			Description GO position	
L			Cone	
Description GO	position			
Cone				
		-	Comments/Text attribute C	
Type: 💧 Co	ne 🗸 🛨 🕒			
Comments/Tex	t attribute C		Parameters Colors GE position Material	
			Translation	
	-		x:	
Parameters C	Colors GE position Materia		y: C	1
Radius (R2):	0.02	C	z: -0.01	i
Radius (R1):	0.02	C	Rotation	1
Height (b):	0.02	C		1
-Number of poi	ote			1
Rottom circles	20	+/		-
bottom crue.	20	<u>/+</u>	×	1
Generatrix:	2	<u>7</u>	Shift after rotation	1
Angles: 0.00	10.00	•	x:	1
		<u></u>	y:	
Closing:	(none)	\sim	z: C	
				-





Plate1 Parameters: Points: (0, 0, 0), (0, 0.1, 0.01), (0, 0.01, 0.1),

Radius=0 (m), Width=0.018 (m).

GE Position: 先绕 Y 轴旋转 90 (°), 再绕 X 轴旋转 135 (°)。

	Name: SceneImage 🖋 🕂 📑 🗑
	Comments/Text attribute C
	Description GO position
Name: SceneImage 🖋 🕂 🖬 🛍	Cone Plate
	Type: 🌮 Plate 🗸 🕂 🚺
Comments/Text attribute C	Comments/Text attribute C
Description GO position	
Cone Plate	Parameters Colors GE position Material
	Translation
Type: 🌮 Plate 🗸 🛨 🛅	x:
Comments/Text attribute C	y:
	z: C
	Rotation
Parameters Colors GE position Material	Y ~ 90 C
Points	V V 135 C
	A 1 155
C 0.1 C 0.01 C	
C 0.01 C 0.1 C	Shift after rotation
	x:C
Radius: 0 C	y: C
Width: 0.018	Z: C

复制 Cone1, 生成 Cone2。

Cone2 GE Position:保持沿 Z 轴移动量不变,添加沿 Y 轴移动-0.8 (m)。 复制 Plate1,生成 Plate2。

Plate2 GE Position:保持绕 Y 轴和 X 轴的旋转角度不变,添加沿 Y 轴移动-0.8 (m)。





Box1 Parameters: A=0.2 (m), B=0.02 (m), C=0.02 (m).

GE Position: 沿X轴、Y轴和Z轴分别移动-0.1(m)、0.82(m)和-0.03(m)。

	Name: SceneImage 🖋 🕂 🗎
	Comments/Text attribute C
Name: SceneImage 🖋 🕂 📑 🛅	Description GO position
Comments/Text attribute C	Cone Plate Cone Box
	Type: 🔗 Regioner 🖌 🛨 🖪 🛱
Description GO position	
Cone Plate Cone Box	Comments/Text attribute C
Туре: 🥃 Вох 🗸 🕂 💽	Parameters Colors GE position Material
Comments/Text attribute C	x: -0.1
	y: 0.82
Parameters Colors GE position Material	z: -0.03
A: 0.2	Rotation
B: 0.02	✓
C: 0.02	~ <u>C</u>
	~ <u>C</u>
	Shift after rotation
	x:C
	y:C
	z:C

复制 3 次 Box1, 生成 Box2、Box3、Box4。

Box2 GE Position: 沿Y 轴移动修改为 0.78 (m),其余不变。

Box3 GE Position:沿X轴移动修改为-0.8 (m),其余不变。

Box4 GE Position:沿X轴、Y轴移动分别修改为-0.8 (m)和 0.78 (m),其

余不变。





在任意 GE 的 Colors 页面,设置颜色为红色,再点击 Assign to all GE,这样 SceneImage 中所有图形元素都为红色。

		Description GC) position			
		Cone Plate	e Cone	Plate Bo	A P KC	
		Type: 💧 C	one ~	+ 🕩	Û	
		Comments/Te	xt attribute C	_		
		Parameters	Colors GE posit	tion Material		
		Hide	Assign to all	GE		
		Diffuse	Emissive	2		
		Specular	Ambien	t		
	1 1		·			
			_			
			T			
\checkmark						
			-			





Crank:由1个Link和1个Cone组成,颜色为紫色。

Link Parameters: Points: (0, 0, 0), (0, 0.3, 0), Radius=0.01 (m), Width=0.02 (m).

GE Position: 先沿 Z 轴移动 0.02 (m), 绕 Y 轴转动 90 (°), 再绕 X 轴转

动 90 (°)。

,			Description GO position	
escription GO	position		Link	
ink			Type: 🔗 Link 🗸 🕂 🖣	
vpe: 🖉 lin	× × + [• m	Comments/Text attribute C	
Comments/Tex	t attribute C			
			Parameters Colors GE position Materi	al
arameters o	olors GE position Mate	erial	Translation	
Points			X:	
C		C	y:	
C	0.3	C	2: U.UZ	
adius:	0.01	C	Y ~ 90	0
		1.0		10
Vidth:	0.02	C	X 🗸 90	
Vidth: Additional ro Cone Par GE	0.02 tation cameters: R2=R Position: 沿 X 车	 .1=0.01 (m) 油移动 0.3 (x ~ 90 , h=0.02 (m)。 (m),沿 Z 轴移动-0.01 (m)。	
Midth: Additional ro Cone Par GE	0.02 tation cameters: R2=R Position: 沿X车	c .1=0.01 (m) 油移动 0.3 (x ~ 90 , h=0.02 (m)。 (m),沿 Z 轴移动-0.01 (m)。	0
Vidth: Additional ro Cone Par GE	0.02 tation cameters: R2=R Position: 沿X车	c .1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m),沿 Z 轴移动-0.01 (m)。	0
Vidth: Additional ro Cone Par GE 1 Crank nents/Text attr	0.02 tation cameters: R2=R Position: 沿X车	c .1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	<u>(</u>
Vidth: Additional ro Cone Par GE I Crank nents/Text attr iption GO pos	0.02 tation cameters: R2=R Position: 沿X车	C 1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE Crank nents/Text attr iption GO pos	0.02 tation cameters: R2=R Position: 沿 X 年 ibute C	 1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE Crank nents/Text attr iption GO pos	0.02 tation cameters: R2=R Position: 沿 X 年 ibute C	C 1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE 1 Crank nents/Text attr iption GO pos Cone :: Cone	0.02 tation cameters: R2=R Position: 沿 X 年 ibute C	C 1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE Crank nents/Text attr iption GO pos Cone :: A Cone ments/Text at	0.02 tation cameters: R2=R Position: 沿 X 年 ibute C sition ↓ + 正 tribute C	C 1=0.01 (m) 油移动 0.3 (x v 90 0 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE 1 Crank inents/Text attr iption GO pos Cone Cone Cone Cone Cone Cone	0.02 tation cameters: R2=R Position: 沿 X 年 ibute C sition ← ● ttribute C sition Material	C 1=0.01 (m) 油移动 0.3 (x ~ 90 0 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE 1 Crank nents/Text attr iption GO pos Cone Cone Cone Cone Cone	0.02 tation cameters: R2=R Position: 沿 X 年 ibute C sition ↓ + 正 tribute C	C 1=0.01 (m) 油移动 0.3 (x v 90 , h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	
Vidth: Additional ro Cone Par GE Crank nents/Text attr iption GO pos Cone Cone Cone Cone Market attr iption GO pos Cone ments/Text attr iption GO pos Cone ments/Text attr iption GO pos	0.02 tation cameters: R2=R Position: 沿 X 年 □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □ ↓ □	с 1=0.01 (m) 油移动 0.3 (x v 90 0 (m), h=0.02 (m)。 (m), 沿 Z 轴移动-0.01 (m)。	





Link: 由 6 个 Link 组成,颜色为绿色。

Link1 Parameters: Points: (0, 0, 0), (0, 1, 0), Radius=0.01 (m),

Width=0.02 (m).

GE Position: 沿 X 轴移动 0.03 (m), 再绕 Y 轴转动 90 (°)。

Name: Link S + + • • • •	Name: Link & + + • • • • • • • • • • • • • • • • •
Link Type: Link Comments/Text attribute C	Link Type:
Parameters Colors GE position Material Points C C C C C C C C C C C C C C C C C C C	Parameters Colors GE position Material Translation x: 0.03 C y: C z: C
Radius: 0.01 C Width: 0.02 C Additional rotation C C	Rotation Y V 90 C C C C C

复制 Link1, 生成 Link2。

Link2 GE Position:沿X 轴移动修改为-0.03 (m),其余不变。 复制 Link2,生成 Link3。

Link3 Parameters: Points: (0, 0, 0), (0, 0.06, 0).

GE Position: 添加绕 X 轴旋转 90 (°),其余不变。

复制 Link3, 生成 Link4。

Link4 GE Position: 添加沿 Y 轴移动 1 (m),其余不变。

复制 Link4, 生成 Link5。

Link5 Parameters: Points: (0, 0, 0), (0, 0.2, 0).

GE Position:删除 X 轴方向的移动和转动, Y 轴移动修改为-0.2 (m)。





复制 Link5, 生成 Link6。

Link6 GE Position: 沿 Y 轴移动修改为 1 (m),其余不变。

使用 Assign to all GE 功能将 Link 颜色设置为绿色。







Slider: 由1个Box组成,颜色为棕黄色。

Box Parameters: A=0.04 (m), B=0.08 (m), C=0.02 (m).

GE Position:沿Z轴移动-0.03(m)。

Name: Slider Slider I I I I I I I I I I I I I I I I I I I	Name: Slider Slider I Comments/Text attribute C Description GO position Box Type: Box +
Type: 🔒 Ray	Comments/Text attribute C
Comments/Text attribute C	Parameters Colors GE position Material
	Translation
Parameters Colors GE position Material	x:
A: 0.04	y:
B: 0.08	2: -0.03
C: 0.02	





Support: 由1个Box 和1个Plate 组成,颜色为棕绿色。

Box Parameters: A=2 (m), B=0.02 (m), C=0.02 (m).

GE Position:沿 Z 轴移动-0.03 (m)。

Name: Support 🖋 🕂 🖬	Name: Support 🖋 🕂 🖬
	Comments/Text attribute C
Description GO position	Description GO position
Box	Box
Type: Box V + +	Type: 🎯 Box 🗸 🕂 🖬 🛍
	Comments/Text attribute C
Parameters Colors GE position Material	Parameters Colors GE position Material
A: 2 C	Translation
B: 0.02	x:
C: 0.02	у:

Plate Parameters: Points: (0, 0, 0), (0, 0.02, 0), (0, 0, 0.1), Radius=0, Width=0.02(m).

GE Position: 先沿 X 轴、Y 轴和 Z 轴分别移动-1 (m)、-0.01 (m)和-0.02 (m),再依次绕 Y 轴和 X 轴旋转 90 (°)。

Name: Supp	ort 🔗 🕂 🗐	Name: Suppo
Comments/Te	ext attribute C	Comments/re
		Description
Description	GO position	Box Pla
Box	ate	Type:
Type: 🦻	Plate 🗸 🕂 🖬	Comments/
Comments/	Text attribute C	
		Parameters
Parameters	Colors GE position Material	Translation
Pointe	Colors de position Material	x: -1
Foints	C C C	y: -0.01
	C 0.02 C C	z: -0.02
	C C 0.1 C	Rotation
		Y ·
Radius:		x
Width:	0.02	

ort ø **+** xt attribute C GO position ate Î Plate Fext attribute C Colors GE position Material С С С С ~ 90 С ~ 90 С ~

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Connecting rod: 由1个Link组成,颜色为浅蓝色。
Link Parameters: Points: $(0, 0, 0)$, $(0, 0.6, 0)$, Radius=0.01 (m),
Width=0.02 (m).
GE Position:绕Y轴旋转90(°)。
Name: Connecting rod 🖋 🕂 💽
Description GO position
Type: Link Type: Comments/Text attribute C
Parameters Colors GE position Material Points C C C C C C
Radius: 0.01 C
Additional rotation





1.2 定义刚体参数

Base0: Base0 是每个 UM 多体系统中固有的零号物体,不需要单独创建,可以赋予 几何图形,如下图,将 Scene Image 赋给 Base0,即作为 Scene image。



Crank: 选择几何 Crank, 勾选自动计算, 计算质量、转动惯量和质心。



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Slider: 选择几何 Slider, 勾选自动计算。











Connecting rod: 选择几何 Connecting rod, 勾选自动计算。







1.3 描述铰

jCrank: 选择 Base0 作为铰的 1 号物体, Crank 为 2 号物体, 类型为 Rotational。

Joint points (0, 0, 0) 和 (0, 0, 0);

Joint vectors (0, 0, 1) 和 (0, 0, 1);

Description: 勾选 Prescribed function of time, 选择 Expression 类型, 定义函 数表达式 1.5*t, 以此作为角位移驱动。

Body 1:	• • • • •	-		
Base0	✓ Crank	-	Body1: Body2:	1
Type: < Rotational		~	Type: C Rotational	
Geometry Descriptio	n		Geometry Description	
Joint points		R	Configuration	
Base0		13	Rotation: 0.0000000000 2	
			Shift: 0.0000000000 1	
Crank		73		
			Prescribed function of time	
Joint vectors			Type of description	
Base0 a	axis Z : (0,0,1)	~	Expression Crile	
0 0	<u>n</u> 1	<u>n</u>	O Function O Curve	
Crank	axis Z : (0,0,1)	~	() Time-table	
0 0	<u>n</u> 1	n	1.5*t t	
ect ds		™Æ		1
bject Dobject Curves -F(+) Variables -B Subsystems		\$ (⁶) #	- □ Name: jCrank + •	
ect ds bject b			- Crank + Body1: Body2: Base0 ▼ Crank Type: 《 Rotational Geometry Description	
bject Doject Doject Curves F(x) Variables Dobystems Subsystems Manages Bodies Joints Crank			→ S → ■ → → → → → → → → → → → → → → → →	
bject bject bject curves r/v Variables bolt			- C Name: Crank + Body1: Body2: Base0 ▼ Crank Type: ≪ Rotational Geometry Description Joint points Base0 C C C	
bject bject Cobject Curves F() Variables b) Attributes Subsystems Images Bodes Joints Scalar torques Linear forces Contact forces Contact forces			- Crank + € Body1: Body2: Base0 ▼ Crank Type: ≪ Rotational Geometry Description Joint points Base0 Crank Crank C C	
bject bject Corves 			- C Name: Crank + Body1: Body2: Base0 ✓ Crank Type: ≪ Rotational Geometry Description Joint points Base0 C C Crank C C Joint vectors	
bject bject Curves Curves Curves Curves Curves Corables Bodes Subsystems Bodes Joints Scalar torques Linear forces Contact force			→ S → ■ → → → → → → → → → → → → → → → →	
bject bject Colject Curves F() Variables b) Attributes Subsystems Images Bodes Joints Scalar torques Linear forces Contact forces Special forces Special forces Contact forces Dinters Contact forces Contact forces Contac			→ → → → → → → → → → → → → → → → → → →	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
bject bject Colycet Corves F/O Variables bar boles boles boles boles boles consts consts const forces consections boles consections consections boles consections conse			- C Name: Crank + Body1: Body2: Base0 ↓ Crank Type: 《 Rotational Geometry Description Joint points Base0 C C Crank C C Crank C C Crank C C C C C C C C C C C C C C C	
bject bject Curves F(v) Variables bject bject curves bject b			- C Name: Crank + Body 1: Body 2: Base0 ▼ Crank Type: ≪ Rotational Geometry Description Joint points Base0 C C C Crank C C Crank C C Crank C C C C C C C C C C C C C C C	

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jLink: 选择 Base0 作为铰的 1 号物体, Link 为 2 号物体, 类型为 Rotational。

Joint points (0, -0.8, 0) 和 (0, -0.2, 0);

Joint vectors (0, 0, 1) 和 (0, 0, 1);

Description:在 Value 处输入-20 (°),作为初始条件。

Body1: Body2:	
Base0 🗸 Link 🗸	
Type: < Rotational 🗸 Name: jLink 🕂 🗭 🗑	\bigtriangledown
Geometry Description Joint force Body1: Body2:	
Joint points Base0 V Link	•
Base0	~
Link Geometry Description Joint force	
Configuration Rotation: 0.0000000000	1
Joint vectors Shift: 0.0000000000	1
Base0 axis Z : (0,0,1) V Joint coordinate	
0 n 0 n 1 Prescribed function of time	
Link axis Z : (0,0,1) Value: -20.0000000000	1
0 n 0 n 1 Fixed	
Object ds - C	







jSlider:选择 Link 作为铰的 1 号物体, Slider 为 2 号物体, 类型为 Translational。

Joint points: (0, 0, 0) 和 (0, 0, 0);

Joint vectors: (0, 1, 0) 和 (0, 1, 0);

Description: 在 Value 处输入 0.65 (m), 作为初始条件。

Body1: Body2:					
Link 🔄 Slider	-			_	
ype: 🛃 Translational	\sim				
Geometry Description Joint force		Name: jSlider		• 🕩 🗓	\bigtriangledown
Joint points	-	Body 1:	Body	2:	
Link	rs -	Link	✓ Slider	r	•
C	C	Type: 👍 Tra	nslational		`
Slider	۲.,	Geometry De	escription Joint fo	orce	
C C	C	Configuration			
loint vectors		Rotation:	0.000000000000000		1
avis Y • (0, 1, 0)	~	Shift:	0.0000000000000000000000000000000000000		1/
	-	Joint coordina	ite		
		Prescribed	function of time		
Slider axis Y : (0,1,0)	~	Value:	0.65000000000		1
0 <u>n</u> 1 <u>n</u> 0	n	Eived			



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jCrank_Slider:选择Crank作为铰的1号物体,Slider为2号物体,类型为Rotational。

Joint points: (0.3, 0, 0) 和 (0, 0, 0);

Joint vectors: (0, 0, 1) 和 (0, 0, 1);

Description:在 Value 处输入-20 (°),作为初始条件。

Body1: Body2:			
Crank 🚽 Slider	-	Name: jCrank_Slider 🕂 🗍	\bigtriangledown
Type: < Rotational	~		
Autodetection		Crank VISider	-
Geometry Description Joint force		Type: K Rotational	~
Crank	F .s	Autodetection	
0.3 C	C	Geometry Description Joint force	
Slider	۲.,	Configuration	
	C	Rotation: 0.00000000000	\angle
Joint vectors		Shift: 0.0000000000	1
Crank axis Z : (0,0,1)	\sim	Joint coordinate	
0 <u>n</u> 0 <u>n</u> 1	n	Prescribed function of time	
Slider axis Z : (0,0,1)	\sim	Value: -20.000000000000	1
0 <u>n</u> 0 <u>n</u> 1	n	Fixed	
		/	



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jSupport:选择 Base0 作为铰的1号物体, Support 为2号物体, 类型为 Translational。

Joint points: (0, 0.8, 0) 和 (0, 0, 0);

Joint vectors: (1, 0, 0) 和 (1, 0, 0)。

Name: jSupport 🕂 🛨	ii	
Body1: Body2:		
Base0 Support	-	
ype: 🛃 Translational	~	Name: jSupport 🕂 🗭 🗑
Geometry Description Joint force		Body1: Body2:
Joint points Base0	T _e	Base0 Support
C 0.8 C	C	Type: 🚄 Translational
Support	r,	Geometry Description Joint force
	C	Configuration Rotation: 0.00000000000
Joint vectors		Shift: 0.0000000000
Base0 axis X : (1,0,0)	\sim	loint coordinate
1 <u>n</u> 0 <u>n</u> 0	n	Prescribed function of time
Support axis X : (1,0,0)	\sim	Value: 0.00000000000
	n	Fixed
K		



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jLink_ConnectingRod:选择 Link 作为铰的 1 号物体, Connecting rod 为 2 号物体, 类型为 Rotational。

Joint points: (0, 1.2, 0) 和 (0, 0, 0);

Joint vectors: (0, 0, 1) 和 (0, 0, 1);

Description: 在 Value 处输入 80 (°), 作为初始条件。

Name: jLink_Connecting r 🕂 🚺 🔽	
Body1: Body2:	
Link 🗸 Connecting rod 🗸	
Type: < Rotational 🗸	Name: JLink_Connecting r(+ U · W ·
Geometry Description Joint force	Body1: Body2:
Joint points	Link 💽 Connecting rod 💌
Link K	Type: < Rotational 🗸
C 1.2 C C	Geometry Description Joint force
Connecting rod	Configuration
	Rotation: 0.0000000000 2
Joint vectors	Shift: 0.0000000000 🟒
Link axis Z : (0,0,1) ~	Joint coordinate
0 <u>n</u> 0 <u>n</u> 1 <u>n</u>	Prescribed function of time
Connecting rod axis Z : (0,0,1) ~	Value: 80.0000000000 🔀
0 <u>n</u> 0 <u>n</u> 1 <u>n</u>	Fixed
	X '



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jConnectingRod_Support:选择 Connecting rod 作为铰的 1 号物体, Support 为 2 号物体,类型为 Rotational。 Joint points: (0, 0.6, 0) 和 (0, 0, 0);

Joint vectors: (0, 0, 1) 和 (0, 0, 1);

Description:在 Value 处输入-60 (°),作为初始条件。

Name: jConnecting rod_Sl 🕇 🚺 🔽	
Body1: Body2:	
Connecting rod 💽 Support 💌	_
Type: < Rotational 🗸 🗸	
Autodetection	Name: Connecting rod_Si + L+ U
Geometry Description Joint force	Body1: Body2:
Joint points	Connecting rod 🗸 Support 🗸
Connecting rod	Type: Kentational
C 0.6 C C	
Summert	Geometry Description Joint force
Support N	Configuration
	Rotation: 0.0000000000 1
Joint vectors	Shift: 0.0000000000 🔀
Connecting rod axis Z : (0,0,1) ~	loint coordinate
0 n 0 n 1 n	
Support axis Z : (0,0,1) V	Value: -60.0000000000 🏒
	Fixed



Universal Mechanism 9





完成建模:切换为全局显示,保存模型。







2 UM Simulation 仿真过程

2.1 仿真

运行 UM Simulation 程序,加载模型,打开仿真控制界面,保持缺省的 Park 求解器, 设置仿真时间 10s,数据输出步长 0.005s。

Object simul	ation inspector					
Solver	Initial condition	object v	/ariables	XVA	Inform	ation
Simulation pro	ocess parameters	Solver options	Type of o	oordinates	for bodies	PP: Options
Solver BDF ABM Park Gear 2 Park Para	Ty C allel	pe of solution) Null space meth) Range space m	od (NSM) ethod (RSI	1)		
Time Step size for a Error toleranc Delay to re Keep syste Computati Block-d	t animation and data eal time simulation em matrix decompo ion of Jacobian diagonal Jacobian	storage 0.005 1E-6				
Inte	gration	Me	ssage			Close
$\overline{\langle}$						





切换到 Initial conditions 页面,点击 ☯ 按钮,自动计算出满足约束的初始条件。由于 系统存在两个闭环,故会出现切断铰 (×)。

		T.	itial canditiona					
Solv	er	In	itial conditions	Obj	ect variables	XVA	Information	
Coordin	ates	Cons	straints on initia	l condition	ns			
	-	a	\odot	x=0 ν	=0 <u></u>			
	÷	~	Coordinate		Velocity		Comment	
1.1			-0.358770670	271	0.184931506	849	jLink 1a	
1.5	×		0.6544003745	532	0.421348129	9906	jSlider 1c(cut)	
1.2			-0.358770670	271	-1.31506849	315	jCrank_Slider	1a
1.3			-0.034163380	9539	-0.29241576	3293	jSupport 1c	
1.4			-4.856438508	48	-0.01201721	61033	jLink_Connect	ing rod 1a
1.6	×		5.2152091787	75	-0.17291429	0746	jConnecting ro	d_Support
< Mess	age	dx	= 0.1	🗐 da=	0.1 🕮	1		>
Number	of d.o	.f. =	0	<u> </u>		1		

打开变量向导, 创建刚体 Support 上点 (-1, -0.11, 0) 的速度矢量, 拖到动画窗口。

🛐 Wizard of varial	bles					— ———————————————————————————————————
a+b Expression	User variables	🕀 Reactions	📫 Coordina	tes 🕟 Solver	variables	📫 All forces
🥩 Variables for	group of bodies	🔍 Joint force	s 🛆	Angular variables	-	Linear variables
Grank	Sel Sur Ca	ected oport oordinates of point in th	ne body-fixed fram	ne of reference -0.11		0
Connectir	ng rod	/pe) Coordinate)) Velocity) Acceleration		O Bipolar vecto O Bipolar veloci O Bipolar accele	or ity eration	
) X O Y	0	z Olv	1	۰





设置矢量列表在动画窗口顶部显示,双击可修改颜色。



在变量向导中创建刚体 **Support** 上点 (-1, -0.11, 0) 在 Base0 的 X 方向位移变量, 并在绘图窗口中显示。

Beb Expression User variables Variables for group of bodies Variables for group of bodies Image: Crank Image: Unix Sider Sider Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod Support Connecting rod
Variables for group of bodies A joint forces Angular variables Image: Selected Support Crank Link Slider Coordinates of point in the body-fixed frame of reference Image: Support Coordinates of point in the body-fixed frame of reference Image: Connecting rod Support Connecting rod Ocordinate Image: Connecting rod Bipolar vector Velocity Bipolar vector Velocity Bipolar acceleration Component Image: Component Image: X(Support) Coordinates of point (-1,-0.01,0) of body Support relative to Base0, SC Base0, projection X
Selected Support Support Support Connecting rod Support Condinates of point in the body-fixed frame of reference Support Type Condinate Bipolar vector Velocity Bipolar acceleration Component Suport Relative to body Base0 Suport Coordinates of point (-1,-0.01,0) of body Support relative to Base0, SC Base0, projection X
x(Support) Coordinates of point (-1,-0.01,0) of body Support relative to Base0, SC Base0, projection X 🖗 🗗

