# 國立虎尾科技大學

## 機械設計工程系

## 2021-協同產品實習-stage1-ag2

飛機起降

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#### 設計工具

原本是打算要用 onshape 繪製,但因還是比較熟悉 inventor 的操作所以還是使用 inventor。

#### 設計動機

自己蠻喜歡飛機類的東西,小時候常常去小港的餐廳看飛機起降, 加上想設計路徑類的模擬,所以決定坐飛機的起降。

### 協同設計方法與流程

零件是我自己畫完的所以沒有需要協同的問題,網站則是用 git remote add、fork 及反向 pull request 讓各自附屬分組網站與主分組網站的內容保持同步。

# 3D 組合圖



## 導入物件

先將要導入的圖檔轉成 stl 格式,先組合好然後在 coppeliasim 裡 File→Import→Mesh,然後選擇要編譯的 stl 檔。



🝸 CoppeliaSim Edu - New file - rendering: 1 ms (7.9 fps) - SIMULATION STOPPED

### 拆解物件

導入的 stl 檔都會變成一個整體零件,而事先組好是因為零件拆解後較容易定位,且座標較容易設定等等。

先點選要拆解的物件,點選 Edit→Grouping/Merging→Divide 這 樣就能把物件拆成個別的物件了。

File	Edit Add Simulation Tools Plugins Add-ons	Scenes Help
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" <b>î</b>	Redo	
	Make last selected object parent	v scene new scene new scene
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_	Morph selection into convex shapes	
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ON	Copy selected objects	10
0	Paste buffer	11
	Delete selected objects	12
	Cut selected objects	2
DI3	Select all	3
2	Remove	• 4
63	Grouping / Merging	Group selected shapes
	Reorient bounding box	<ul> <li>Ungroup selected shapes</li> </ul>
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<u> 28</u>	🕀 💁 🧐 Resi	<sup>Z8</sup> Merge selected paths
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ToppeliaSim Edu - New file - rendering: 3 ms (8.0 fps) - SIMULATION STOPPED

### 調整座標

選取剛剛拆解的全部物件·點選左上的 Edit→Reorient bounding

box→with reference of world 這樣物件就會全部對齊了。

File	Edit Add Simulation Tools Plugins Add-ons	Scenes Help
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	Make last selected object parent	v scene new scene new scene
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	Delete selected objects	12
	Cut selected objects	_ 2
DA3	Select all	3
2	Remove	4
63	Grouping / Merging	▶ <b>5</b>
	Reorient bounding box	<ul> <li>with reference frame of world</li> </ul>
20	Sha	oe with main axes of random shape
A	Sha	pe with main axis of cylinder shape
9=	🗄 💁 🧐 Res	ze with main axis of cuboid shape

#### 

## 加入 Joint 物件

右鍵→Add→Joint→Revolute、這樣就能叫出一個旋轉軸、並生成

#### 在 0.0.0 上。



#### 設定相關性質,框框裡為旋轉軸長度及直徑。

Scene Object Properties				
Joint		Comm	Common	
Configuration				
✓ Position is cyclic Pos. min. [deg] Position [deg]	+0.000e+00	Screw pitch [m/deg] Pos. range [deg]	+0.00e+00	
	IK c	alculation weight	1.00	
	Мах	, step size [deg]	1.00e+01	
Apply to selection				
Mode				
Torque/force mode		U Hybrid operation		
Adjust dependency equation				
		Apply	o selection	
Viewel time				
Visual properties				
Length [m]	0.150	Adjust o	olor A	
Diameter [m]	0.020	Adjust o	olor B	
		Apply	o selection	
Dynamic properties				
	Chow duparoio -	morecties dialog		
	SHOW Gynattiic I			

要移動旋轉軸至主軸的話,先點選要移動的物件,按著 shift 點要移動到的物件,然後點選移動調整,使 X,Y,Z 重合,旋轉軸就會與物體在同一軸線上。



## 編排樹狀圖

將左邊的各物件排列,然後將部分物件結合成一個,直接用滑鼠拉

#### 或用 Edit 結合。



結合後的從屬關係。

🏐 (scene 1) 🕍	
🗕 🕂 🖓 DefaultCamera	
🔚 💧 Shape	
😑 🚽 💧 Shape0	
🗌 🖵 🔗 Revolute_joint	
	_

# 設定 Dynamic 性質

設定底座 Dynamic 性質,將機身本體實體化,設為動態物件。

Other metalling     X     Last selecter       Image: Selecter     Selecter </th <th>d object name d object name d object position: d object orientation: a 00000</th> <th>simple_non-pure) 4 y-0.0037 + 18824 0 - 6+400000 - q-00000</th> <th></th>	d object name d object name d object position: d object orientation: a 00000	simple_non-pure) 4 y-0.0037 + 18824 0 - 6+400000 - q-00000		
A Shape3	Scene Object Properties		Rigid Body Dynamic Properties x	
Shape6	Shape	Common	✓ Body is respondable	
Shape8	Visual properties Colors Adjust color		Local respondable matsk Global respondable matsk Bdit material	
Shape11     Shape10     Shape10     Shape10     Shape3	Other properties Stading angle (deg) 0. Show edges with angle (deg) 0.	Apply to selection	Apply to selection Body is dynamic Start in sleep mode Set to dynamic if get parent Compute mass & merits properties for selected convex shapes Mass	
	Wiefiame	Apply to selection	Mass [kg] 1.000+400 M=M*2 (for selection) M=M/2 (for selection) Priorinal property of inertia (mass	
	Texture / geometry properties			
	Adjust texture Clear textures (selection)	Quick textures (selection) View/modify geometry	Y [m <sup>2</sup> ]         1.000e-03         I=1/2         (for selection)           Z [m <sup>2</sup> ]         1.000e-03         I=1/2         (for selection)	
	Dynamic properties		Pos./orient. of inertia frame & COM relative to shape frame	
	Show dynamic proper	ties dialog	X [m]         +6.761e-02         Alpha (deg)         +9.03e+01           Y [m]         +7.739e-02         Beta [deg]         +3.62e+01           Z [m]         -6.294e-02         Gamma [deg]         +1.02e+02	
			Set inertia matrix and COM relative to absolute frame	
	DU /	0	Apply to selection	

#### 設定旋轉軸轉速及性質。

Scene hierarchy     ×	C Selected objects: 1 Last selected object operation: 5000000000000000000000000000000000000				
- j Shape5	Scene Object Properti	es		Joint Dynamic Properties	x
A Shape6	Joint	Comm	non	Motor properties	\+ <del>\\</del>
- O Shape8	Configuration			✓ Motor enabled	珠度
Shape13	✓ Position is cyclic	Screw pitch [m/deg]	+0.00e+00	Target velocity [deg/s] Mavirouro torme [N#m]	+6.0000e+01
□ → Ø back_right ○ Shape11 □ → Ø front_left	Pos. min. [deg] Position [deg]	Pos. range [deg] +0.000e+00 IK calculation weight	1.00	Lock motor when target velocity is zero     Edit engine specific properties	
Shape10		Max. step size [deg]	1.00e+01		Apply to selection
G Shape9		Apply	to selection	Control properties	
	Mode			Control loop enabled Target position [deg]	+0.0000e+00
	Tonquefforce mode	<ul> <li>Hybrid operation</li> <li>Adjust dependence</li> </ul>	cy equation	Upper velocity limit [deg/s] Position control (PID)	
		Apply	to selection	Proportional parameter	0.100
	Visual monerties	<b>万</b> 4		Integral parameter	0.000
	Length [m]	0.090 Adjust o	olor A	O Spring-damper mode	
	Diameter [m]	0.020 Adjust o	olor B	Spring constant K [N]	1.000e-01
		Apply	to selection	Damping coemicient © [14-5]	
	Dynamic properties				Apply to selection
		Show dynamic properties dialog		and the second and	/
	EDU				

#### 設定輪子性質·將輪子實體化·設為動態物件。

new scene new scene new scene new scene new	ew scene	
Scene hierarchy X Gene bierarchy DefaultComarce Come See Set Come See Set Come Set Come Set Shape4 Come Shape4 Come Shape4 Com	Selected objects: Last selected object new Last selected object pression Last selected object position Last selected object position Last selected object onentation	
- A Shape5	Scene Object Properties	Rigid Body Dynamic Properties x
- A Shape6	Shape Common	▼ Body is respondable
Shape8	Visual poperties Colors Adjust color	Local respondable mask V V V V V V V Głobal respondable mask V V V V V V V Edit material
Cock_nght     Cock_nght     Cock_nght     Cock     C	Other properties           Shading angle (deg)         0.0           Show edges with angle (deg)         0.0           Backface culling         Invert faces           Witeframe         Invert faces	Apply to selection           ✓ Body is dynamic           Start in alterp mode         Start of dynamic if gets parent           Compute mass & inertia properties for selected convex shapes           Mass           Mass first           L000e+00
	Apply to selection.	M=M/2 (for selection) Principal moments of inertia / mass
-	Adjust texture Quick textures (selection) Clear textures (selection) View/modify geometry	X [m*2] 1.000e-03 I=I*2 (for selection) Y [m*2] 1.000e-03 I=I/2 (for selection) Z [m*2] 1.000e-03
	Dynamic properties	Pos./orient. of inertia frame & COM relative to shape frame
	Show dynamic properties dialog	X [m]         +0.000e+00         Alpha [deg]         +0.00e+00           Y [m]         +0.000e+00         Beta [deg]         +0.00e+00           Z [m]         +0.000e+00         Gamma [deg]         +0.00e+00
EDU		Set inertia matrix and COM relative to absolute frame
	EDU	Apply to selection

## 設計結果與自評



因為還沒開發出讓機體有路徑前進的程式碼,所以按下播放鍵只能 使用鍵盤讓飛機緩緩前進後退轉彎,與預期的目標還是有段落差。

自評

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