2B3-PJ3BG1簡報

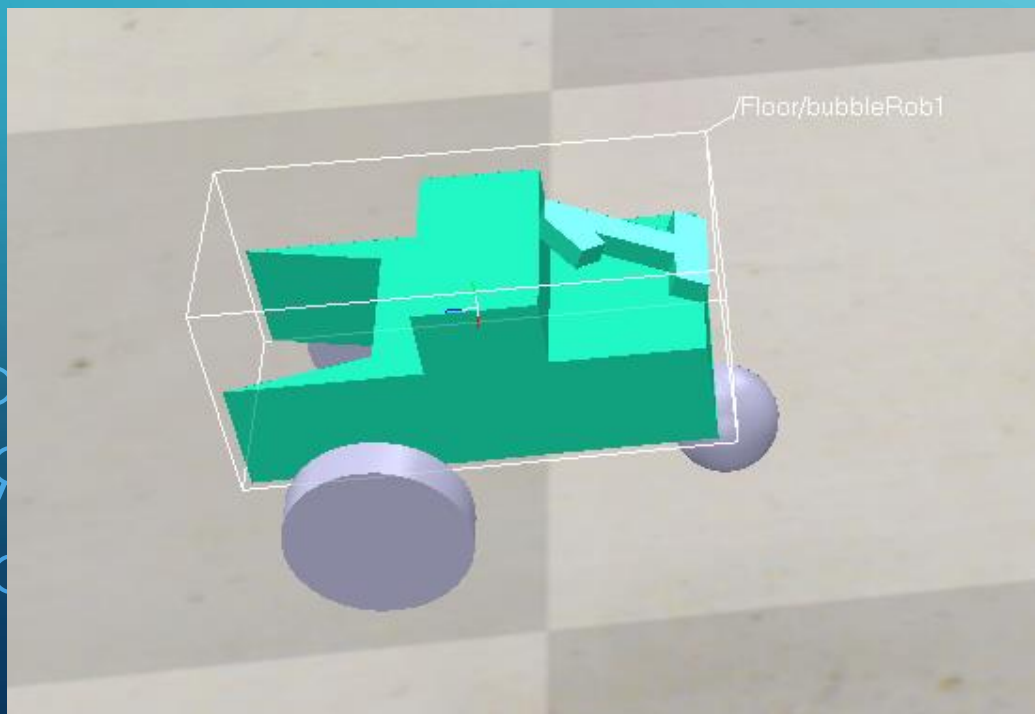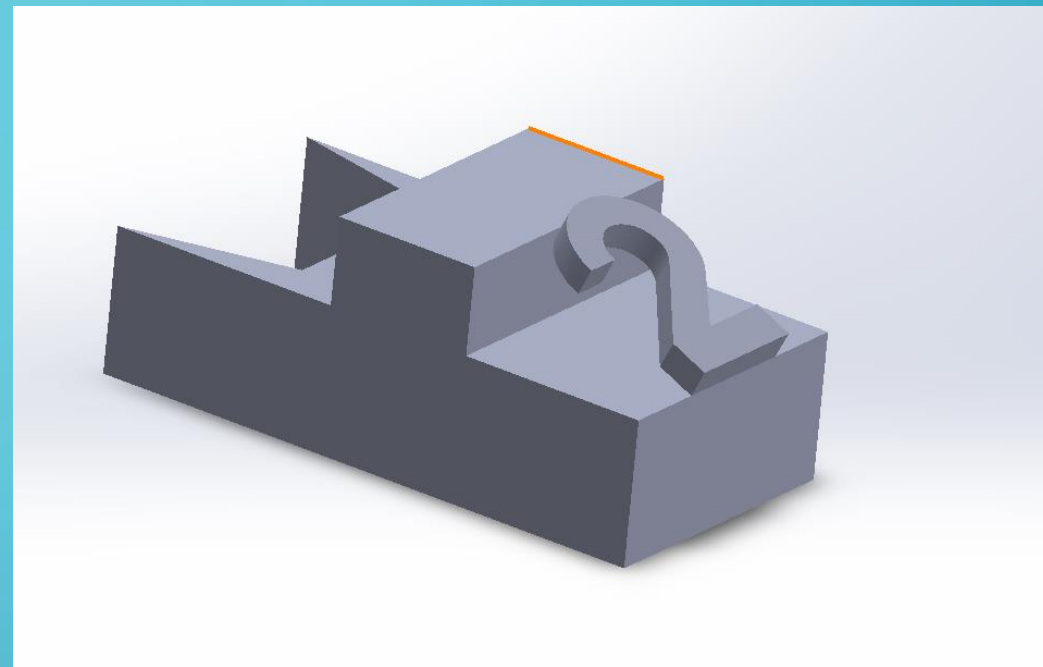# 小組分工

40723217 林立翔（組長）：建設連線環境，整合設定場景物件

40923219 陳柏成　　　　：七段顯示器計分板、計時器建模及程式編寫

40923225 黃亦銘　　　　：場景建模、統整各組員資料、簡報撰寫

40923241 蔡淳宇　　　　：場景建模、球員設計及建模

40923246 蕭仲佑　　　　：轉軸式計分板建模及程式編寫，建設連線環境

40971219 黃柏儒　　　　：球員設計
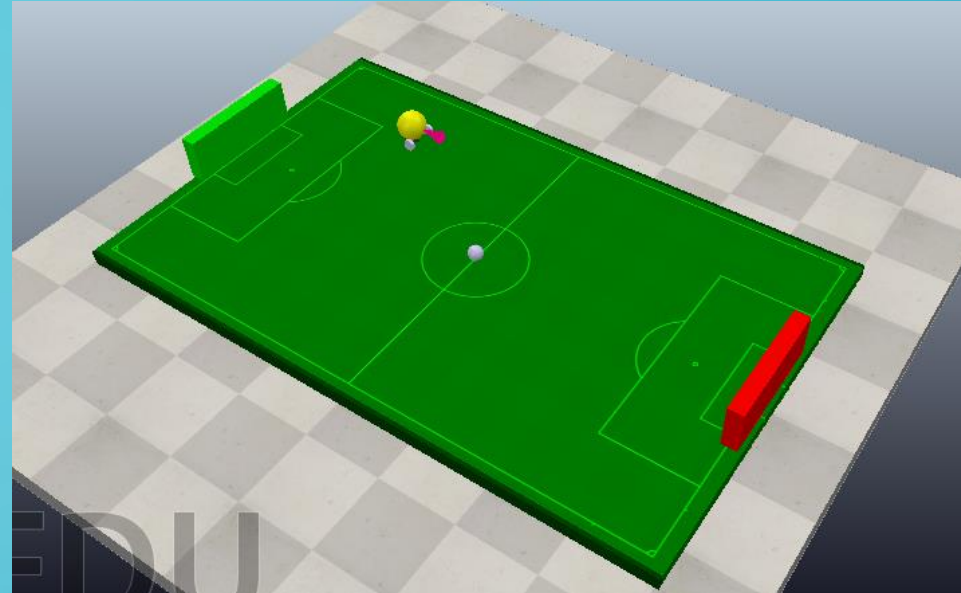
40971220 傅柏皓　　　　：SCITE程式編寫，報告撰寫

球員設計製作

（淳宇、柏儒製作）
使用**SOLIDWORKS**繪製機器人外型

（立翔）
將機器人放入**COPPELIASIM**加入輪子

場地製作

（亦銘）
初始場地製作
建模

（柏成、仲佑）
（下圖為第一版）
加入記分板與計時器

（下圖為第二版）
加入轉盤記分板與機器人

程式碼

```python
from zmqRemoteApi_IPv6 import RemoteAPIClient
import time
import math
import keyboard

# 利用 zmqRemoteAPI 連線52的場景
client = RemoteAPIClient('2001:288:6004:17:2023:cdb:1:1', 23000)
print('Program started')
sim = client.getObject('sim')
# 非最後球員, 不可啟動模擬
# sim.startSimulation()
# 加入按鍵狀態, 起始值為 false
key_pressed = False
counter = 0

bubbleRob = sim.getObject('/bubbleRob1')
pos = [0.5,1,0.2]
ang = [0,0,0]

def setBubbleRobVelocity(leftWheelVelocity, rightWheelVelocity):
    leftMotor = sim.getObject('/leftMotor')
    rightMotor = sim.getObject('/rightMotor')
    sim.setJointTargetVelocity(leftMotor, leftWheelVelocity)
    sim.setJointTargetVelocity(rightMotor, rightWheelVelocity)

'''
# Example usage 1:
setBubbleRobVelocity(1.0, 1.0)
time.sleep(2)
setBubbleRobVelocity(0.0, 0.0)
'''

while True:
    if keyboard.is_pressed('w'):
        setBubbleRobVelocity(5.0, 5.0)
    elif keyboard.is_pressed('s'):
        setBubbleRobVelocity(-3.0, -3.0)
    elif keyboard.is_pressed('a'):
        setBubbleRobVelocity(-3.0, 3.0)
    elif keyboard.is_pressed('d'):
        setBubbleRobVelocity(3.0, -3.0)
    elif keyboard.is_pressed('q'):
        sim.setObjectPosition(bubbleRob, -1,pos)
        sim.setObjectOrientation(bubbleRob, -1,ang)
    else:
        setBubbleRobVelocity(0.0, 0.0)
```

📁 zmqRemoteApi_IPv6	2023/4/10 下午 02:49	檔案資料夾	
PC 1_red.py	2023/6/5 上午 01:46	JetBrains PyChar...	2 KB
PC 2_orange.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB
PC 3_yellow.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB
PC 4_green.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB
PC 5_blue.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB
PC 6_Indigo.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB
PC 7_purple.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB
PC 8_black.py	2023/6/5 上午 01:49	JetBrains PyChar...	2 KB

（立翔）
（上圖）
分配8台機器人使用之程式碼

（柏皓）
（左圖）
機器人使用之程式碼

程式碼詳解

（1～28行）：各部件命名、設置轉軸初始角度

（29～65行）：訂定初始位置、角度，設定好初始數值以及建立7段顯示用的陣列

```
1  function sysCall_init()
2      bubbleRob1 = sim.getObject('./bubbleRob1')
3      bubbleRob2 = sim.getObject('./bubbleRob2')
4      bubbleRob3 = sim.getObject('./bubbleRob3')
5      bubbleRob4 = sim.getObject('./bubbleRob4')
6      bubbleRob5 = sim.getObject('./bubbleRob5')
7      bubbleRob6 = sim.getObject('./bubbleRob6')
8      bubbleRob7 = sim.getObject('./bubbleRob7')
9      bubbleRob8 = sim.getObject('./bubbleRob8')
10     sensor = sim.getObject('./sensor')
11     sensor2 = sim.getObject('./sensor2')
12     ball = sim.getObject('./ball')
13
14     local math = require("math")
15     joint1= sim.getObject('./joint1')
16     joint2= sim.getObject('./joint2')
17     joint3= sim.getObject('./joint3')
18     joint4= sim.getObject('./joint4')
19     sensor = sim.getObject('./sensor')
20     r1 = 360
21     r2 = 360
22     r3 = 360
23     r4 = 360
24     sim.setJointTargetPosition(joint1, math.rad(r1+180))
25     sim.setJointTargetPosition(joint2, math.rad(r2+180))
26     sim.setJointTargetPosition(joint3, math.rad(r3+180))
27     sim.setJointTargetPosition(joint4, math.rad(r4+180))
28
29     pos1 = {0.5,1,0.2}
30     pos2 = {1,0.5,0.2}
31     pos3 = {1,-0.5,0.2}
32     pos4 = {0.5,-1,0.2}
33     pos5 = {-0.5,-1,0.2}
34     pos6 = {-1,-0.5,0.2}
35     pos7 = {-1,0.5,0.2}
36     pos8 = {-0.5,1,0.2}
37     posS = {0,0,0.2}
38     ang1 = {1.57,0,0}
39     ang2 = {0,0,3.14}
40     ang3 = {0,-1.57,-1.57}
41     ang4 = {0,0,0}
42
43
44
45     count = 14400
46     score1 = 0
47     score2 = 0
48     score3 = 0
49     score4 = 0
50     count = 6000
51     score5 = 0
52     score6 = 0
53     score7 = 0
54     score8 = 6
55     s0={1,1,1,1,1,0,1}
56     s1={0,0,1,1,0,0,0}
57     s2={0,1,1,0,1,1,1}
58     s3={0,0,1,1,1,1,1}
59     s4={1,0,1,1,0,1,0}
60     s5={1,0,0,1,1,1,1}
61     s6={1,1,0,1,1,1,1}
62     s7={0,0,1,1,1,0,0}
63     s8={1,1,1,1,1,1,1}
64     s9={1,0,1,1,1,1,1}
65     s={s0,s1,s2,s3,s4,s5,s6,s7,s8,s9}
```

程式碼詳解

（66～130行）：記分板、計時器歸零，初始設定結束

```
66    for j = 0,6,1 do
67      a = sim.getObject('./_G['..j..']')
68        if (s[1][j+1]==1) then
69          sim.setShapeColor(a, nil, sim.colorcomponent_ambient_diffuse, {1, 0, 0})
70        else
71          sim.setShapeColor(a, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
72        end
73    end
74    for j = 0,6,1 do
75      b = sim.getObject('./G_['..j..']')
76        if (s[1][j+1]==1) then
77          sim.setShapeColor(b, nil, sim.colorcomponent_ambient_diffuse, {1, 0, 0})
78        else
79          sim.setShapeColor(b, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
80        end
81    end
82    for j = 0,6,1 do
83      d = sim.getObject('./_R['..j..']')
84        if (s[1][j+1]==1) then
85          sim.setShapeColor(d, nil, sim.colorcomponent_ambient_diffuse, {0, 1, 0})
86        else
87          sim.setShapeColor(d, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
88        end
89    end
90    for j = 0,6,1 do
91      c = sim.getObject('./R_['..j..']')
92        if (s[1][j+1]==1) then
93          sim.setShapeColor(c, nil, sim.colorcomponent_ambient_diffuse, {0, 1, 0})
94        else
95          sim.setShapeColor(c, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
96        end
97    end
98    for j = 0,6,1 do
99      local e = sim.getObject('./_C['..j..']')
100       if (s[1][j+1]==1) then
101         sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
102       else
103         sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
104       end
105   end
106   for j = 0,6,1 do
107     local f = sim.getObject('./C_['..j..']')
108       if (s[1][j+1]==1) then
109         sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
110       else
111         sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
112       end
113   end
114   for j = 0,6,1 do
115     local g = sim.getObject('./_C['..j..']')
116       if (s[1][j+1]==1) then
117         sim.setShapeColor(g, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
118       else
119         sim.setShapeColor(g, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
120       end
121   end
122   for j = 0,6,1 do
123     local h = sim.getObject('./_C_['..j..']')
124       if (s[1][j+1]==1) then
125         sim.setShapeColor(h, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
126       else
127         sim.setShapeColor(h, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
128       end
129   end
130 end
```

程式碼詳解

（131～194行）：用SENSOR檢查綠方得分，得分後先將球員和球的位置移回開始位置，將綠方分數+1並調整轉盤角度，用IF檢查是否進位再用FOR逐個調整7段顯示的顏色，途中加入了如果分數超過99就暫停模擬的機制

```
131 function sysCall_actuation()
132     result = sim.readProximitySensor(sensor)  |
133     if(r4>0 and result>0)then
134         sim.setObjectPosition(ball, -1, posS)
135         sim.setObjectOrientation(ball, -1, ang4)
136         sim.setObjectPosition(bubbleRob1, -1, pos1)
137         sim.setObjectPosition(bubbleRob2, -1, pos2)
138         sim.setObjectPosition(bubbleRob3, -1, pos3)
139         sim.setObjectPosition(bubbleRob4, -1, pos4)
140         sim.setObjectPosition(bubbleRob5, -1, pos5)
141         sim.setObjectPosition(bubbleRob6, -1, pos6)
142         sim.setObjectPosition(bubbleRob7, -1, pos7)
143         sim.setObjectPosition(bubbleRob8, -1, pos8)
144         sim.setObjectOrientation(bubbleRob1, -1, ang3)
145         sim.setObjectOrientation(bubbleRob2, -1, ang1)
146         sim.setObjectOrientation(bubbleRob3, -1, ang1)
147         sim.setObjectOrientation(bubbleRob4, -1, ang4)
148         sim.setObjectOrientation(bubbleRob5, -1, ang2)
149         sim.setObjectOrientation(bubbleRob6, -1, ang2)
150         sim.setObjectOrientation(bubbleRob7, -1, ang2)
151         sim.setObjectOrientation(bubbleRob8, -1, ang2)
152         score1 = score1 + 1
153         r3=r3-36
154         sim.setJointTargetPosition(joint3, math.rad(r3+180))
155         if(r3==0) then
156             r3=360
157             r4=r4-36
158             sim.setJointTargetPosition(joint3, math.rad(r3+180))
159             sim.setJointTargetPosition(joint4, math.rad(r4+180))
160         end
161         if (score1 <= 9) then
162             i = score1 +1
163             for j = 0, 6, 1 do
164                 a = sim.getObject('../_G['..j..']')
165                 if (s[i][j+1] == 1) then
166                     sim.setShapeColor(a, nil, sim.colorcomponent_ambient_diffuse, {1, 0, 0})
167                 else
168                     sim.setShapeColor(a, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
169                 end
170             end
171         elseif (score1 > 9 and score2<=9) then
172             score1 = 0
173             for j = 0, 6, 1 do
174                 a = sim.getObject('../_G['..j..']')
175                 if (s[1][j+1] == 1) then
176                     sim.setShapeColor(a, nil, sim.colorcomponent_ambient_diffuse, {1, 0, 0})
177                 else
178                     sim.setShapeColor(a, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
179                 end
180             end
181             score2 = score2 + 1
182             i = score2 +1
183             for j = 0, 6, 1 do
184                 b = sim.getObject('../G_['..j..']')
185                 if (s[i][j+1] == 1) then
186                     sim.setShapeColor(b, nil, sim.colorcomponent_ambient_diffuse, {1, 0, 0})
187                 else
188                     sim.setShapeColor(b, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
189                 end
190             end
191         else
192             sim.pauseSimulation()
193         end
194     end
195     result2 = sim.readProximitySensor(sensor2)
```

程式碼詳解

（195～257行）：紅方的得分，與綠方相同，同樣也加入了如果分數超過99就暫停模擬的機制

```
195        result2 = sim.readProximitySensor(sensor2)
196        if(r2>0 and result2>0)then
197            sim.setObjectPosition(ball, -1, posS)
198            sim.setObjectOrientation(ball, -1, ang4)
199            sim.setObjectPosition(bubbleRob1, -1, pos1)
200            sim.setObjectPosition(bubbleRob2, -1, pos2)
201            sim.setObjectPosition(bubbleRob3, -1, pos3)
202            sim.setObjectPosition(bubbleRob4, -1, pos4)
203            sim.setObjectPosition(bubbleRob5, -1, pos5)
204            sim.setObjectPosition(bubbleRob6, -1, pos6)
205            sim.setObjectPosition(bubbleRob7, -1, pos7)
206            sim.setObjectPosition(bubbleRob8, -1, pos8)
207            sim.setObjectOrientation(bubbleRob1, -1, ang3)
208            sim.setObjectOrientation(bubbleRob2, -1, ang1)
209            sim.setObjectOrientation(bubbleRob3, -1, ang1)
210            sim.setObjectOrientation(bubbleRob4, -1, ang4)
211            sim.setObjectOrientation(bubbleRob5, -1, ang2)
212            sim.setObjectOrientation(bubbleRob6, -1, ang2)
213            sim.setObjectOrientation(bubbleRob7, -1, ang2)
214            sim.setObjectOrientation(bubbleRob8, -1, ang2)
215            score3 = score3 + 1
216            r1=r1-36
217            sim.setJointTargetPosition(joint1, math.rad(r1+180))
218            if(r1==0) then
219                r1=360
220                r2=r2-36
221                sim.setJointTargetPosition(joint1, math.rad(r1+180))
222                sim.setJointTargetPosition(joint2, math.rad(r2+180))
223            end
224            if (score3 <= 9) then
225                i = score3 +1
226                for j = 0, 6, 1 do
227                    c = sim.getObject('./_R['..j..']')
228                    if (s[i][j+1] == 1) then
229                        sim.setShapeColor(c, nil, sim.colorcomponent_ambient_diffuse, {0, 1, 0})
230                    else
231                        sim.setShapeColor(c, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
232                    end
233                end
234            elseif (score3 > 9 and score4<=9) then
235                score3 = 0
235                score3 = 0
236                for j = 0, 6, 1 do
237                    c = sim.getObject('./_R['..j..']')
238                    if (s[1][j+1] == 1) then
239                        sim.setShapeColor(c, nil, sim.colorcomponent_ambient_diffuse, {0, 1, 0})
240                    else
241                        sim.setShapeColor(c, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
242                    end
243                end
244                score4 = score4 + 1
245                i = score4 +1
246                for j = 0, 6, 1 do
247                    d = sim.getObject('./R_['..j..']')
248                    if (s[i][j+1] == 1) then
249                        sim.setShapeColor(d, nil, sim.colorcomponent_ambient_diffuse, {0, 1, 0})
250                    else
251                        sim.setShapeColor(d, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
252                    end
253                end
254            else
255                sim.pauseSimulation()
256            end
257        end
```

程式碼詳解

```
258  if (count > 0) then
259      count = count - 1
260
261      if (score5 > 0) then
262          score5 = score5 - 1
263          for i = 0, 9, 1 do
264              if (score5 == i) then
265                  for j = 0, 6, 1 do
266                      local e = sim.getObject('./_C['..j..']')
267                      if (s[i+1][j+1] == 1) then
268                          sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
269                      else
270                          sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
271                      end
272                  end
273              end
274          end
275      elseif (score6 > 0 and score5 <1) then
276          score5 = 9
277          score6 = score6 - 1
278          for i = 0 , 9, 1 do
279              for j = 0, 6, 1 do
280                  local e = sim.getObject('./_C['..j..']')
281                  if (s[i+1][j+1] == 1) then
282                      sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
283                  else
284                      sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
285                  end
286              end
287              if (score6 == i) then
288                  for j = 0, 6, 1 do
289                      local f = sim.getObject('./C_[('..j..']')
290                      if (s[i+1][j+1] == 1) then
291                          sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
292                      else
293                          sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
294                      end
295                  end
296              end
297          end
298      elseif (score7 > 0 and score6 < 1) then
299          score5 = 9
300          score6 = 9
301          score7 = score7 - 1
302          for i = 0 , 9, 1 do
303              for j = 0, 6, 1 do
304                  local e = sim.getObject('./_C['..j..']')
305                  local f = sim.getObject('./C_['..j..']')
```

```
298      elseif (score7 > 0 and score6 < 1) then
299          score5 = 9
300          score6 = 9
301          score7 = score7 - 1
302          for i = 0 , 9, 1 do
303              for j = 0, 6, 1 do
304                  local e = sim.getObject('./_C['..j..']')
305                  local f = sim.getObject('./C_['..j..']')
306                  if (s[i+1][j+1] == 1) then
307                      sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
308                      sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
309                  else
310                      sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
311                      sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
312                  end
313              end
314              if (score7 == i) then
315                  for j = 0, 6, 1 do
316                      local g = sim.getObject('./__C['..j..']')
317                      if (s[i+1][j+1] == 1) then
318                          sim.setShapeColor(g, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
319                      else
320                          sim.setShapeColor(g, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
321                      end
322                  end
323              end
324          end
325      elseif (score8 > 0 and score7 <1) then
326          score5 = 9
327          score6 = 9
328          score7 = 9
329          score8 = score8 - 1
330          for i = 0 , 9, 1 do
331              for j = 0, 6, 1 do
332                  local e = sim.getObject('./_C['..j..']')
333                  local f = sim.getObject('./C_['..j..']')
334                  local g = sim.getObject('./__C['..j..']')
335                  if (s[i+1][j+1] == 1) then
336                      sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
337                      sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
338                      sim.setShapeColor(g, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
339                  else
340                      sim.setShapeColor(e, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
341                      sim.setShapeColor(f, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
342                      sim.setShapeColor(g, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
343                  end
344              end
345              if (score8 == i) then
346                  for j = 0, 6, 1 do
347                      local h = sim.getObject('./_C_['..j..']')
348                      if (s[i+1][j+1] == 1) then
349                          sim.setShapeColor(h, nil, sim.colorcomponent_ambient_diffuse, {0, 0, 0})
350                      else
351                          sim.setShapeColor(h, nil, sim.colorcomponent_ambient_diffuse, {1, 1, 1})
352                      end
353                  end
354              end
355          end
356      else
357          sim.pauseSimulation()
358      end
359  else
360      sim.stopSimulation()
361  end
362  end
```

（258～297行）：倒計時，時間最前面就設定好了，一點一點倒數就好，一樣用IF檢查進位用FOR設定七段顯示最後數到小於零時暫停模擬，由於我們秒數取到小數後兩位，所以進位的程式比較繁雜

開會記錄 5/25

- 小組會議

- 參與成員:林立翔、陳柏成、黃亦銘、蔡淳宇、蕭仲佑、黃柏儒、傅柏皓

- 會議記錄:組長林立翔協助組員傅柏皓重新安裝COPELIASIM以適配小組其他成員的版本 分配蔡淳宇、黃柏儒再次設計球員外觀(球員背號顏色改變) 分配蕭仲佑、陳柏成準備各項元件的CAD檔、場景檔 分配黃亦銘製作PPT，包含網頁上PDF的下載設置。

開會紀錄 6/1

- 小組會議
- 參與成員:林立翔、陳柏成、黃亦銘、蔡淳宇、蕭仲佑、黃柏儒、傅柏皓
- 會議記錄 組長林立翔確認各項進度後，開始分配書面報告內容 分配傅柏皓確立版面配置及報告格式 林立翔、陳柏成負責編輯、整理專案一路以來留下的影片 各成員各自將自己這學期的所做貢獻以圖文方式做成報告等待統整: 林立翔:建設連線環境，設定場景中物件初始位置 陳柏成:建立得分版、計時器，並編寫程式 黃亦銘:場景建模，統整各組員的報告並製作PDF 蔡淳宇:場景、球員設計並建模 蕭仲佑:轉軸式記分版的建立及程式編寫，協助林立翔建設連線環境 黃柏儒:球員設計，協助球員程式編寫 傅柏皓:協助黃亦銘進行報告撰寫，球員程式編寫。

開會紀錄 6/8

- 小組會議
- 參與成員:林立翔、陳柏成、蔡淳宇、黃柏儒
- 會議內容 蔡淳宇、黃柏儒在修改球員時COPELIASIM出現預期外的錯誤，模型進入模擬後無法正常貼地，在會議上提出後，林立翔、陳柏成加入一起尋找解決辦法 再確定不是模型彼此碰撞擠壓後，林立翔找出改進方案，藉由合理修改各部件質量使模型重量平衡，解決問題 再蔡淳宇、黃柏儒依此法調整完八個球員後，林立翔會在場景中編排球員們的位置 在蔡淳宇、黃柏儒修改的期間，陳柏成、林立翔討論如何設計出顯示進球球員的方法，還未得出結論，仍有討論空間。