105-1: EE4052

計算機程式設計

Computer Programming

Unit 14: 動畫

連 豐 力

臺 大 電 機 系

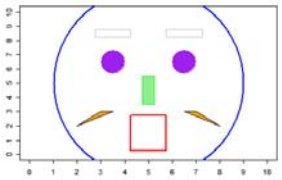
Sep 2016 - Jan 2017

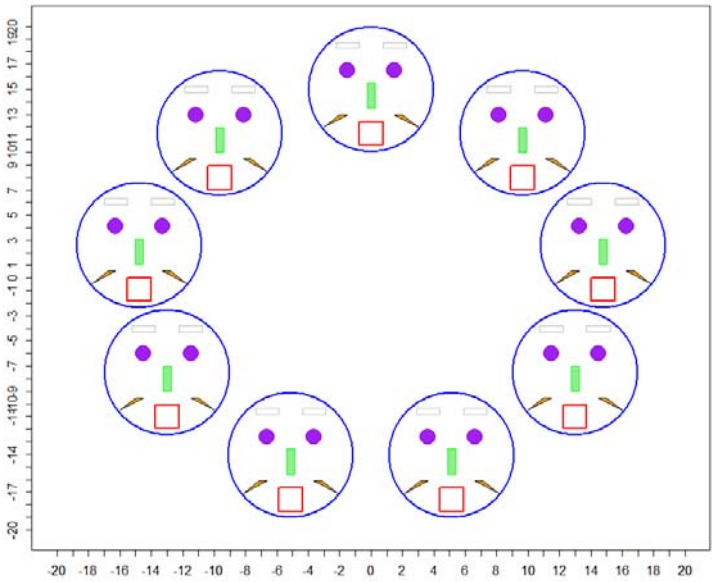
Unit 14: 繪圖+流程->動畫

- for(index in index.set) {

  statement

  }



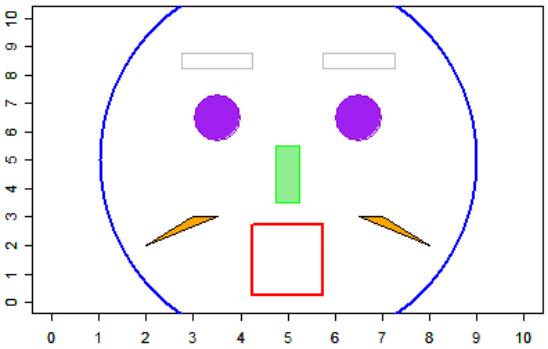


大綱

畫一個臉

圖形元件 – 圓形 矩形 多邊形

- symbols( )　　# 圓形 矩形
- polygon( )　　# 多邊形



圖形元件 – 圓形 矩形 多邊形

- windows(width = 4.5, height = 3.3, pointsize = 8)
- old.par <- par(mex = 0.8, mar = c(5, 4, 4, 2) + 0.1)

- plot(0:10, 0:10, xlab = "", ylab = "", pch = 1:11, col = 1:8, type = "n")
- axis(side = 1, at = 0:10)
- axis(side = 2, at = 0:10)

- # 臉輪廓
- symbols(5, 5, circles = 4, fg = "blue", lwd = 2, inches = FALSE, add = TRUE)

計算機程式設計 – 2016F
Chap 10: 多重繪圖與顏色
Feng-Li Lian @ NTU-EE

圖形元件 – 圓形 矩形 多邊形

- # 眼睛
- symbols(3.5, 6.5, circles = 0.5, fg = "dark violet", bg = "purple", inches = FALSE, add = TRUE)
- symbols(6.5, 6.5, circles = 0.5, fg = "dark violet", bg = "purple", inches = FALSE, add = TRUE)

- # 眉毛
- symbols(3.5, 8.5, rectangles = matrix(c(1.5, 0.5), nrow =1), fg = "gray", inches = FALSE, add = TRUE)
- symbols(6.5, 8.5, rectangles = matrix(c(1.5, 0.5), nrow =1), fg = "gray", inches = FALSE, add = TRUE)

圖形元件 – 圓形 矩形 多邊形

- # 鼻子
- symbols(5, 4.5, rectangles = matrix(c(0.5, 2), nrow =1), fg = "green", bg = "lightgreen", inches = FALSE, add = TRUE)

- # 嘴巴
- symbols(5, 1.5, squares = 1.5, fg = "red", lwd = 2, inches = FALSE, add = TRUE)

- # 鬍子
- polygon(c(3.5, 3, 2), c(3, 3, 2), col = "orange")
- polygon(c(6.5, 7, 8), c(3, 3, 2), col = "orange")

- par(old.par)

繪圖函數 – myFace( )

```
# draw face
myFace <- function( cx, cy ) {
# 臉輪廓
symbols( cx+0, cy+0, circles = 4, fg = "blue", lwd = 2, inches = FALSE, add = TRUE )
# 眼睛
symbols( cx-1.5, cy+1.5, circles = 0.5, fg = "dark violet", bg = "purple", inches = FALSE, add = TRUE )
symbols( cx+1.5, cy+1.5, circles = 0.5, fg = "dark violet", bg = "purple", inches = FALSE, add = TRUE )
# 眉毛
symbols( cx-1.5, cy+3.5, rectangles = matrix(c(1.5, 0.5), nrow =1), fg = "gray", inches = FALSE, add = TRUE )
symbols( cx+1.5, cy+3.5, rectangles = matrix(c(1.5, 0.5), nrow =1), fg = "gray", inches = FALSE, add = TRUE )
```

繪圖函數 – myFace( )

```
# 鼻子
symbols( cx+0, cy-0.5, rectangles = matrix(c(0.5, 2), nrow =1), fg = "green", bg = "lightgreen", inches = FALSE, add = TRUE )
# 嘴巴
symbols( cx+0, cy-3.5, squares = 1.5, fg = "red", lwd = 2, inches = FALSE, add = TRUE )
# 鬍子
polygon( c( cx-1.5, cx-2, cx-3), c( cy-2, cy-2, cy-3), col = "orange" )
polygon( c( cx+1.5, cx+2, cx+3), c( cy-2, cy-2, cy-3), col = "orange" )

}
```


繪圖函數 – myFaceOff( )

```
# draw face
myFaceOff <- function( cx, cy ) {
# 臉輪廓
symbols( cx+0, cy+0, circles = 4, fg = "white", lwd = 2, inches = FALSE, add = TRUE )
# 眼睛
symbols( cx-1.5, cy+1.5, circles = 0.5, fg = "white", bg = "white", inches = FALSE, add = TRUE )
symbols( cx+1.5, cy+1.5, circles = 0.5, fg = "white", bg = "white", inches = FALSE, add = TRUE )
# 眉毛
symbols( cx-1.5, cy+3.5, rectangles = matrix(c(1.5, 0.5), nrow =1), fg = "white", inches = FALSE, add = TRUE )
symbols( cx+1.5, cy+3.5, rectangles = matrix(c(1.5, 0.5), nrow =1), fg = "white", inches = FALSE, add = TRUE )
```

繪圖函數 – myFaceOff( )

```
# 鼻子
symbols( cx+0, cy-0.5, rectangles = matrix(c(0.5, 2), nrow =1), fg = "white", bg = "white", inches = FALSE, add = TRUE )
# 嘴巴
symbols( cx+0, cy-3.5, squares = 1.5, fg = "white", lwd = 2, inches = FALSE, add = TRUE )
# 鬍子
polygon( c( cx-1.5, cx-2, cx-3), c( cy-2, cy-2, cy-3), col = "white", border = "white" )
polygon( c( cx+1.5, cx+2, cx+3), c( cy-2, cy-2, cy-3), col = "white", border = "white" )

}
```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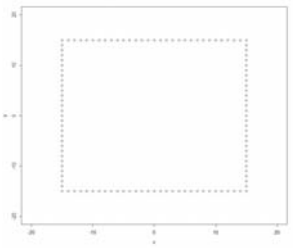
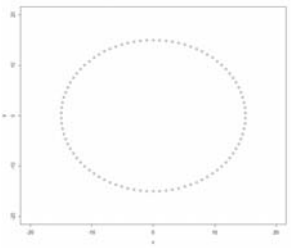
行走路徑與迴圈控制

行走路徑

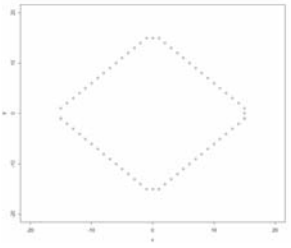
```
x <- c( -15:15, rep(15, 31), 15:-15, rep(-15, 31) )
y <- c( rep(15, 31), 15:-15, rep( -15, 31), -15:15 )
```

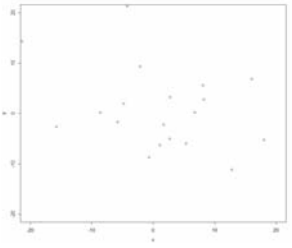
```
x <- sin(1:90/45*pi)*15
y <- cos(1:90/45*pi)*15
```





```
x <- c( -15:15, 15, 15:-15 )
y <- c( 1:15, 15, 15:1, 0, -1:-15. -15. -15:-1 )
```





```
x <- rnorm( 20 ) * 10
y <- rnorm( 20 ) * 10
```


迴圈控制

```
Num <- length(x)
for ( i in 1:Num ){
        myFace( x[i], y[i] )
        #line <- readline()
        Sys.sleep( 0.1 )
        myFaceOff( x[i], y[i] )
        #line <- readline()
}
for ( i in 1:Num ){
        myFace( x[i], y[i] )
}
```

行走路徑