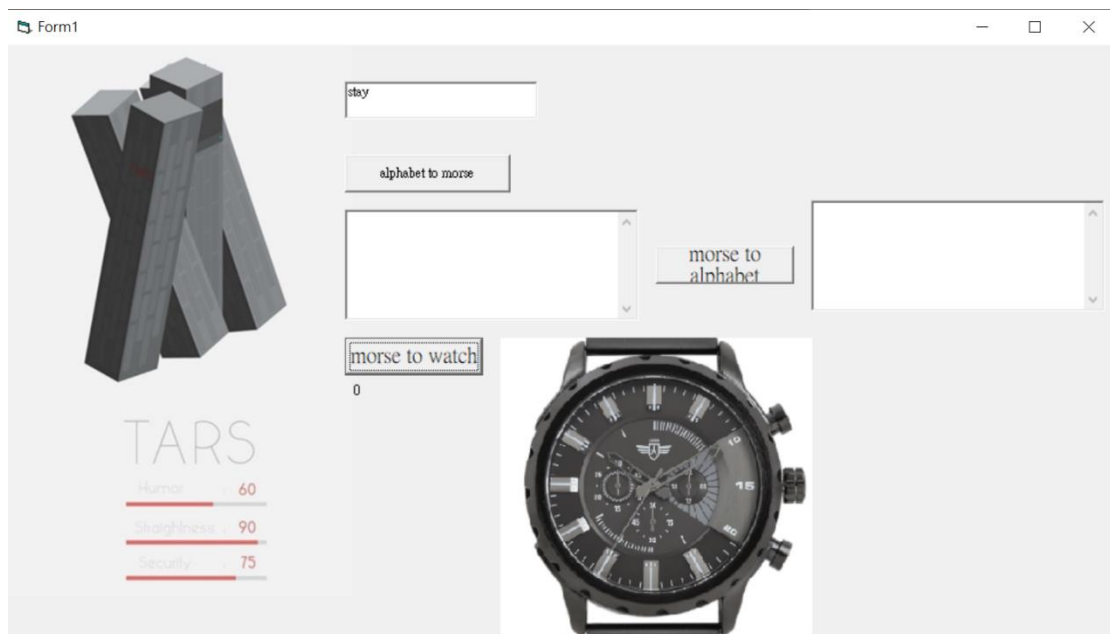# 資訊學習歷程檔案

一、星際效應

在這部電影中，主角透過摩斯密碼傳送訊息，因此我們寫一支能轉換英文字母與摩斯密碼的程式。圖一是這支程式的使用介面。

圖一、介面設計

以下是程式設計，首先我先將各個英文字母對應的摩斯密碼依序存在陣列中，圖二。接著，將輸入字串分成一個個字元，並輸出相對應的摩斯密碼，圖三。而將摩斯密碼轉換成英文字串，也是類似的作法，圖四。最後，將摩斯密碼的點與線用秒針轉動的方式呈現，如圖五。所以圖六的程式便是將每個摩斯密碼拆成點與線，在呈現在時鐘上。最終的執行結果如圖七。

```
Private Sub Form_Load()
    morse = Array(".-", "-...", "-.-.", "-..", ".", "..-.", "--.", "....", "..", ".---
End Sub
```

图二、程式-1

```
'第1题，你只要想办法看到a输出morse(0)，看到b输出morse(1)，看到c输出morse(3)....
Private Sub Command1_Click()
    Text2.Text = ""
    For i = 1 To Len(Text1)
        Text2.Text = Text2.Text & morse(Asc(Mid(Text1, Int(i), 1)) - Asc("a")) & vbCrLf
    Next

End Sub
```

图三、程式-2

```
Private Sub Command4_Click()
    Text3.Text = ""
    a = Split(Text2.Text, vbCrLf)
    For i = 0 To UBound(a)
        For j = 0 To UBound(morse)
        If a(i) = morse(j) Then
            Text3.Text = Text3.Text & Chr(Asc("a") + j)
            Exit For
        End If
        Next
    Next

End Sub
```

图四、程式-3

图五、摩斯密码中的点与线在钟面上的呈现方式

```
Private Sub Timer1_Timer()
    Me.Cls   '清除form上面的所有作畫
    '繪製圓心與刻度16進位
    x = (Image1.Left + Image1.Width / 2)
    y = (Image1.Top + Image1.Height / 2)
    Me.Circle (x, y), 2000
    For i = 1 To 12
        Me.CurrentX = x + Cos(i * 2 / 12 * 3.14) * 1500
        Me.CurrentY = y + Sin(i * 2 / 12 * 3.14) * 1500
    Next
    Label1 = Label1 + 1
    If Label1 Mod 2 = 1 Then
        a = 0
    Else
        If (Label1 / 2) <= Len(Text2.Text) Then
            If Mid(Text2.Text, Label1 / 2, 1) = "-" Then
                a = 3

            ElseIf Mid(Text2.Text, Label1 / 2, 1) = "." Then
                a = 1

            Else
                a = 0
            End If
        Else
            Timer1.Interval = 0
        End If
    End If


    '******第三題結束
    x = (Image1.Left + Image1.Width / 2) + 2000 * Cos(a * 2 / 12 * 3.14) 'cos(n), n的值由0-2PI
    y = (Image1.Top + Image1.Height / 2) + 2000 * Sin(a * 2 / 12 * 3.14)
    Me.Circle (x, y), 200, vbRed
    '畫線
    Line ((Image1.Left + Image1.Width / 2), (Image1.Top + Image1.Height / 2))-(x, y), vbRed
End Sub
```
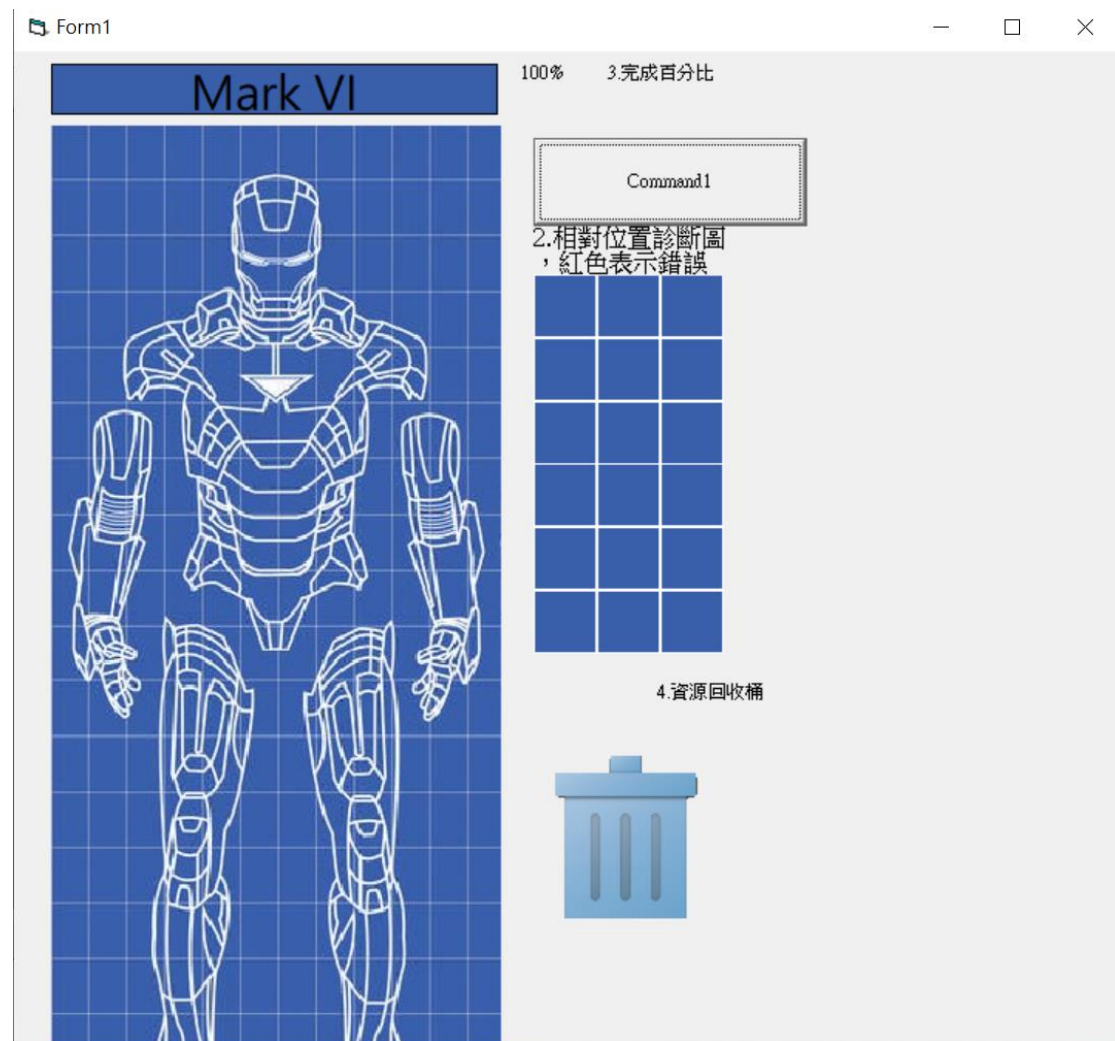
圖六、程式-3

圖七、執行結果

二、鋼鐵人

在這個主題中，我要寫出一隻程式，模擬在電影中主角移動虛擬鋼鐵人的位置。圖一是這支程式的介面設計。

圖一、介面設計

程式設計結果如下。首先，要先進行初始化，讀取圖檔與進行版面配置，圖八。再來是寫透過滑鼠來模擬電影中用手移動鋼鐵人不同構造的部分，圖九。最後，與計算鋼鐵人完成度百分比與顯示在錯誤位置的構造，圖十。執行結果如圖十一。

```vb
'第一題，初始化
Private Sub Command1_Click()
    For i = 1 To 18
        If i <> 1 Then
            Load Image1(i)
            Image1(i).Left = Image1(i - 1).Left + Image1(i - 1).Width
            Image1(i).Top = Image1(i - 1).Top
            If i Mod 3 = 1 Then
                Image1(i).Left = Image1(1).Left
                Image1(i).Top = Image1(i - 1).Top + Image1(i - 3).Height
            End If
        End If
        Print (Chr(i))
        Image1(i).Tag = i
        Image1(i).Picture = LoadPicture("a (" & i & ").jpg")
        Image1(i).Visible = True
        If i <> 1 Then
            Load Shape3(i)
            Shape3(i).Left = Shape3(i - 1).Left + Shape3(i - 1).Width
            Shape3(i).Top = Shape3(i - 1).Top
            If i Mod 3 = 1 Then
                Shape3(i).Left = Shape3(1).Left
                Shape3(i).Top = Shape3(i - 1).Top + Shape3(i - 3).Height
            End If
        End If
        Shape3(i).FillColor = RGB(57, 95, 170)
        Shape3(i).Visible = True
    Next
    For i = 1 To 18
        If i <> 1 Then
            Load Image5(i)
            Image5(i).Left = Image5(i - 1).Left + Image5(i - 1).Width
            Image5(i).Top = Image5(i - 1).Top
            If i Mod 3 = 1 Then
                Image5(i).Left = Image5(1).Left
                Image5(i).Top = Image5(i - 1).Top + Image5(i - 3).Height
            End If
        End If
        Image5(i).Tag = ""
        Image5(i).Visible = True
    Next
    Shape2.BackColor = RGB(57, 95, 170)
    Shape2.Width = Shape1.Width
    Label1 = "100%"
End Sub
```

圖八、程式-1

```vb
'第二題，完成image1()拖曳交換功能
Private Sub Image1_MouseDown(Index As Integer, Button As Integer, Shift As Integer, X As Single, Y As Single)
    '滑鼠按下，若是左鍵，則設定開始拖曳
    If Button = vbLeftButton Then
        Image1(Index).Drag vbBeginDrag
    End If
End Sub

Private Sub Image1_DragDrop(Index As Integer, Source As Control, X As Single, Y As Single)
    '拖曳中第一次放開滑鼠，會觸發此dragdrop事件
    '比如從第一格(左上角)image1(1)拖到第三格(右上角)image1(3)放開
    '從(來源)第一格image1(1)，因此上面的source會是image1(1)
    '到(目的地)第三格image1(3)，上面的參數index會是3

    '********第二題開始
    Image2.Picture = Image1(Index).Picture
    Image1(Index).Picture = Source.Picture
    Source.Picture = Image2.Picture
    Image2.Tag = Image1(Index).Tag
    Image1(Index).Tag = Source.Tag
    Source.Tag = Image2.Tag

    '*******第二題結束

    相對位置診斷
    完成百分比

    If Source.Name = "Image5" And Source.Tag = "" Then
        Source.Picture = LoadPicture("")
    End If
End Sub
```

圖九、程式-2

```vb
'第三題，相對位置診對，錯誤以紅色顯示並顯示完成百分比
Private Sub 完成百分比()
    '先假設"完成"
    '檢查每片的TAG
    '第一片TAG應該是1，第二片應該是2，第n片是n，如果違反上述原則，則推翻假設
    finish = True      '假設拼圖"完成"
    correct = 18      '成上述假設，完成狀態下，正確的片數應該是18(3*6)

    '*******第3-2題開始
    finish = False
    For i = 1 To 18
        If Image1(i).Tag <> i Then
            correct = correct - 1
        End If
    Next
    '*******第3-2題結束

    '計算正確率
    Shape2.Width = Shape1.Width * correct / 18
    Label1 = Int(correct / 18 * 100) & "%"
    '如果假設沒被推翻，也就是完成圖狀態，則顯示JARVIS訊息
    If finish = True Then    '完成狀態，顯示訊息與彩色馬克六號
        MsgBox "I have indeed been uploaded, sir. We're online and ready.", , "JAVIS"
    End If

End Sub
```
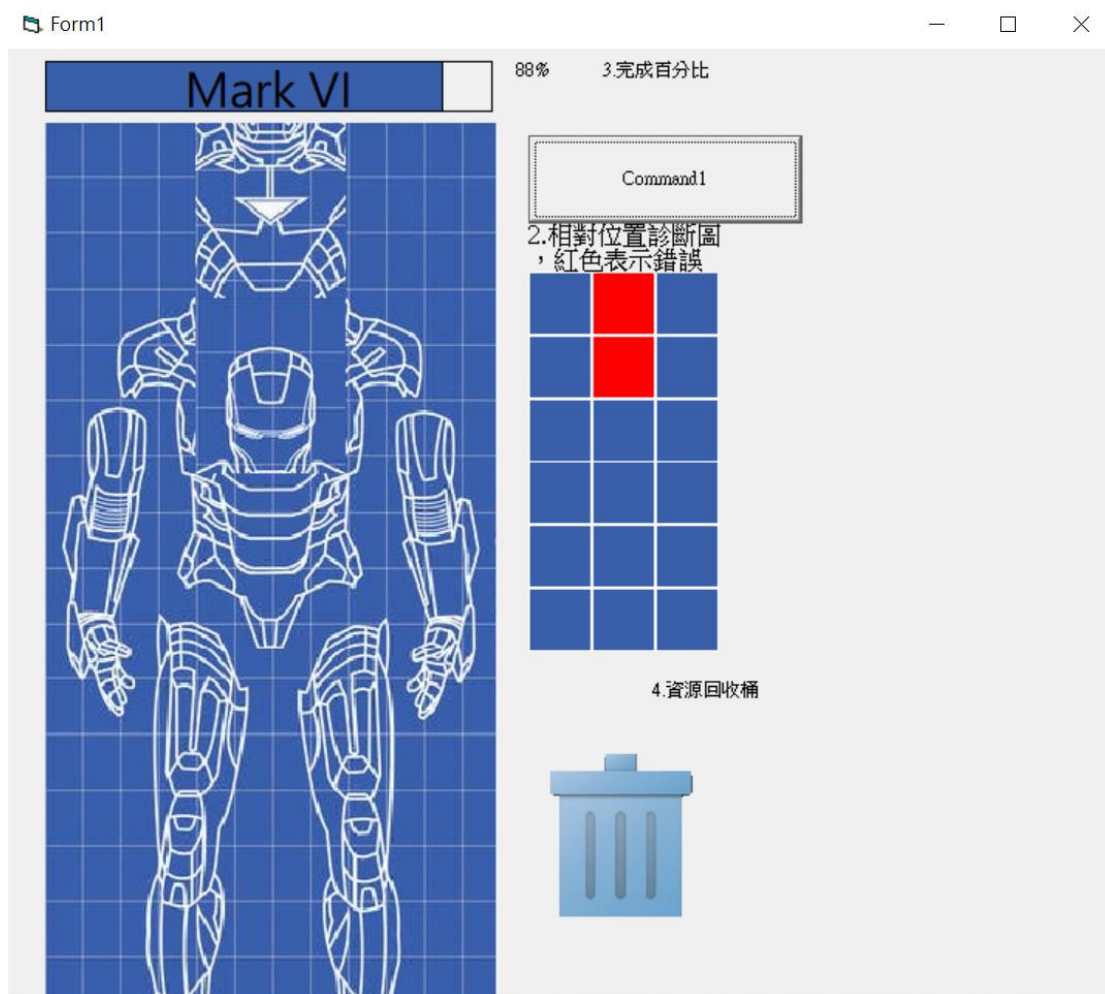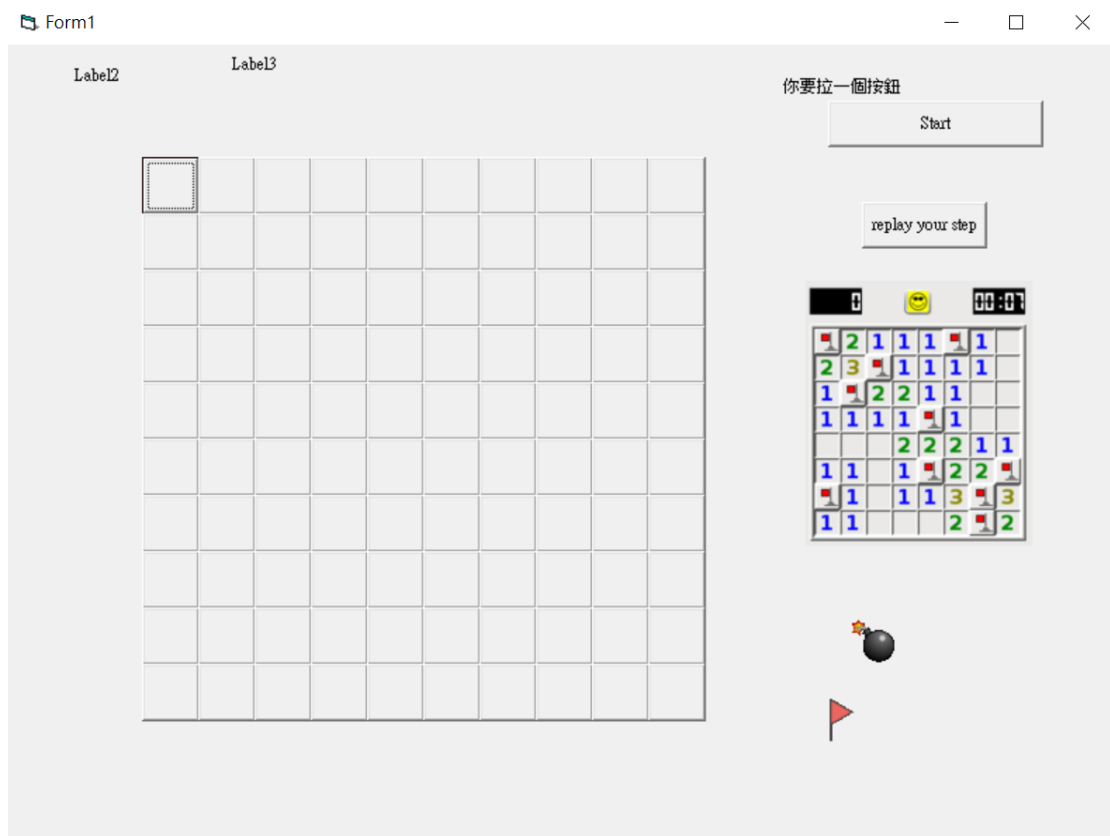
圖十、程式-3

圖十一、執行結果

三、踩地雷

透過這個程式，自己設計出踩地雷遊戲。初始畫面如圖十二所示。

圖十二、初始畫面

程式設計說明如下。首先，我先利用一個矩陣當作踩地雷的盤面，並寫判斷是否有踩到地雷與計算格子周圍的炸彈數，圖十三。再來，我寫能在格子上插旗的功能，圖十四。最後，我再加入可以重播玩家點格子的過程的功能，圖十五。執行結果如圖十六。

```
Private Sub Command1_Click(Index As Integer)
    If Command1(Index).Tag = "1" Then
        Command1(Index).Picture = Image1.Picture
        MsgBox "boom"
    Else
        Command1(Index).Tag = "0"
        Command1(Index).Caption = 0
            If Index Mod 12 <> 0 And Index > 11 Then
                If Command1(Index - 13).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If Index > 11 Then
                If Command1(Index - 12).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If (Index - 11) Mod 12 <> 0 And Index > 11 Then
                If Command1(Index - 11).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If Index Mod 12 <> 0 Then
                If Command1(Index - 1).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If (Index - 11) Mod 12 <> 0 Then
                If Command1(Index + 1).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If Index Mod 12 <> 0 And Index < 132 Then
                If Command1(Index + 11).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If Index < 132 Then
                If Command1(Index + 12).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
            If (Index - 11) Mod 12 <> 0 And Index < 132 Then
                If Command1(Index + 13).Tag = "1" Then
                    Command1(Index).Caption = Command1(Index).Caption + 1
                End If
            End If
    End If

End Sub
```

圖十三、程式-1

```
'第二題，地雷紅旗標示
'button會傳回滑鼠狀態，1表示左鍵，2表右鍵，4表中鍵
'image2是旗子，image3是空白圖
'按第一下插旗，按第二下收回旗子
Private Sub Command1_MouseDown(Index As Integer, Button As Integer, Shift As Integer, X As Single, Y As Single)
    If Button = 2 & Command1(Index).Tag <> "0" Then
        If Command1(Index).Picture = Image3.Picture Then
            Command1(Index).Picture = Image2.Picture
        Else
            Command1(Index).Picture = Image3.Picture
        End If
    End If
End Sub
```

圖十四、程式-2

```
Private Sub Command2_Click()
    Label1.Caption = 0
    For i = 0 To 143
        Command1(i).Tag = ""
        Command1(i).Caption = ""
        Command1(i).Picture = Image3.Picture
    Next

    Randomize
    n = 0
    Do
        X = Int(Rnd * 144)
        If Command1(X).Tag = "" And Command1(X).Visible = True Then
            n = n + 1
            Command1(X).Tag = "1"
            Command1(X).Caption = n
        End If
    Loop Until n = 10
End Sub

Private Sub Command3_Click()
    Label2 = Label1
    For i = 0 To 143
        Command1(i).Caption = ""
    Next
    Label3 = 1
    Timer1.Interval = 100

End Sub

Private Sub Timer1_Timer()
    If Int(Label3) <= Int(Label2) Then
        Command1_Click (a(Label3))
        Label3 = Label3 + 1
    End If
End Sub
```
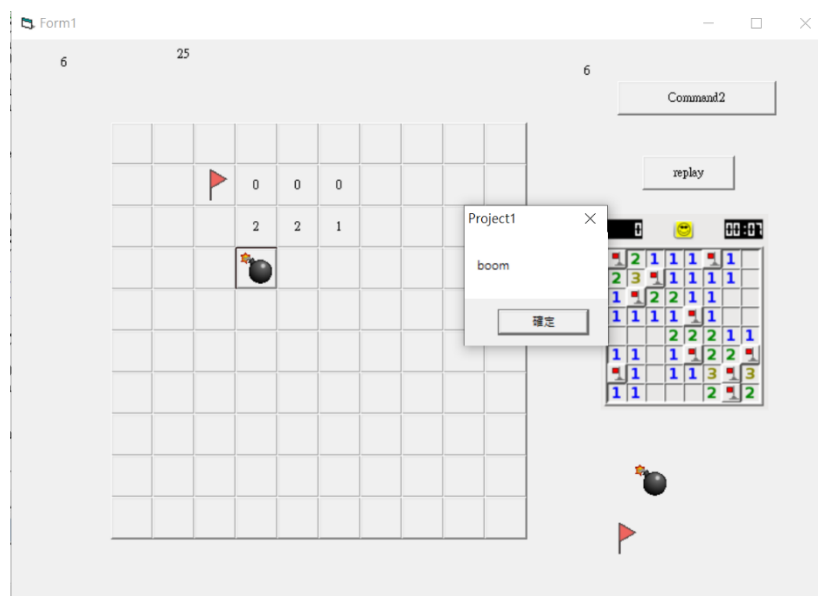
圖十五、程式-3

圖十六、執行畫面

四、數獨

在這個專案中，我製作一個數獨程式，他可以自動判斷那些數字違反規則，與透過電腦解題的功能，程式介面如圖十七。

程式說明如下，首先，一樣先建構出數獨的盤面，並讀入題目字串，圖十八。再來，進行列、行、九宮格是否有重複數字的檢查，圖十九。最後，利用深度優先搜尋演算法(DFS)，透過電腦解題，圖二十。執行結果見圖二十一。

圖十七、初始畫面

```vb
Private Sub Form_Load()
    數獨 = "060104050008305600200000001800407006006050300700901004509010002007206900040508070"
    Label1 = 0    '用來記載空格數
    '第一題，載入text1(1)到text1(80)
    'load的物件會與text1(0)同位置，請你指定座標，做成9*9的棋盤格
    For i = 0 To 80
        If i > 0 Then
        Load Text1(i)
            If i Mod 9 = 0 Then
                Text1(i).Left = Text1(0).Left
                Text1(i).Top = Text1(i - 9).Top + Text1(i - 9).Height
                If i Mod 27 = 0 Then
                    Text1(i).Top = Text1(i).Top + 100
                End If
            Else
                If i Mod 3 = 0 Then
                    Text1(i).Left = Text1(i - 1).Left + Text1(i - 1).Width + 100
                    Text1(i).Top = Text1(i - 1).Top
                Else
                    Text1(i).Left = Text1(i - 1).Left + Text1(i - 1).Width
                    Text1(i).Top = Text1(i - 1).Top
                End If
            End If
        End If
    Text1(i).Visible = True
        '第二題，解構上面宣告的數獨字串，
        '將之放到棋盤格相對應的位置
    If Mid(數獨, i + 1, 1) = 0 Then
        Text1(i).ForeColor = vbRed
        Text1(i) = ""
        Label1 = Label1 + 1
    Else
        Text1(i) = Mid(數獨, i + 1, 1)
        Text1(i).ForeColor = vbBlack
    End If
    Next
End Sub
```

圖十八、程式-1

```vb
Private Sub Text1_Change(index As Integer)
    '這個if可以避免某些錯誤,比如在load text1(i)期間就會觸發change事件
    '或空格其實就不需要比對
    If 電腦解 Or Text1(index).Visible = False Or Text1(index).Text = "" Then
        Exit Sub
    End If
    '第三題,檢驗row,如果重複,就把重複格黃色背景顯示
    For i = Int(index / 9) * 9 To Int(index / 9) * 9 + 8
        If Text1(index).Text = Text1(i).Text And i <> index Then
            Text1(i).BackColor = vbYellow
            Text1(index).SelStart = 0
            Text1(index).SelLength = 1
        Else
            Text1(i).BackColor = vbWhite
        End If
    Next
    '第四題,檢驗column,如果重複,就把重複格黃色背景顯示
    For i = index Mod 9 To 80 - (9 - index Mod 9) Step 9
        If Text1(index).Text = Text1(i).Text And i <> index Then
            Text1(i).BackColor = vbYellow
            Text1(index).SelStart = 0
            Text1(index).SelLength = 1
        Else
            Text1(i).BackColor = vbWhite
        End If
    Next
    '第五題,檢驗3*3小區,如果重複,就把重複格黃色背景顯示
    x = Int(Int(index / 9) / 3)
    y = Int(Int(index Mod 9) / 3)
    For i = 0 To 2
        For j = 0 To 2
            a = x * 27 + y * 3 + i * 9 + j
            Print a
            If Text1(index).Text = Text1(a).Text And a <> index Then
                Text1(a).BackColor = vbYellow
                Text1(index).SelStart = 0
                Text1(index).SelLength = 1
            Else
                Text1(i).BackColor = vbWhite
            End If
        Next
    Next
    '如果沒有違規,重新再計算一次空白格
    Label1 = 0
    For i = 0 To 80
        If Text1(i) = "" Then
            Label1 = Label1 + 1
        End If
    Next
End Sub
```

圖十九、程式-2

```vb
Private Function DFS(index As Integer)
'第六題，電腦解
For k = 1 To 9
    Text1(index) = k
    correct = True
    For i = Int(index / 9) * 9 To Int(index / 9) * 9 + 8
        If Text1(index) = Text1(i) And i <> index Then
            correct = False
            GoTo continue:
        End If
    Next

    For i = Int(index Mod 9) To Int(index Mod 9) + 72 Step 9
        If Text1(index) = Text1(i) And i <> index Then
            correct = False
            GoTo continue:
        End If
    Next
    For i = 0 To 2
        For j = 0 To 2
            If Text1(index) = Text1(Int(Int(index / 9) / 3) * 27 + i * 9 + Int(Int(index Mod 9) / 3) * 3 + j) And Int(Int(index / 9) / 3) * 27 + i * 9 + Int(Int(index |
                correct = False
                GoTo continue:
            End If
        Next
    Next

    If correct = True Then
        First = -1
        For i = index + 1 To 80
            If Text1(i) = "" Then
                First = i
                Exit For
            End If
        Next
        If First = -1 Then
            Label2 = Label2 + 1
            Text2 = Text2 & "Answer" & Label2 & vbCrLf
            For i = 0 To 80
                Text2 = Text2 + Text1(i)
                If i Mod 9 = 8 Then
                    Text2 = Text2 + vbCrLf
                End If
            Next
            Exit For
        Else
            DFS (First)
        End If
    End If
continue:
```

圖二十、程式-3

圖二十一、執行畫面

五、2048

透過這個程式，自己設計瘋迷全球的遊戲--2048。初始畫面如圖二十二。
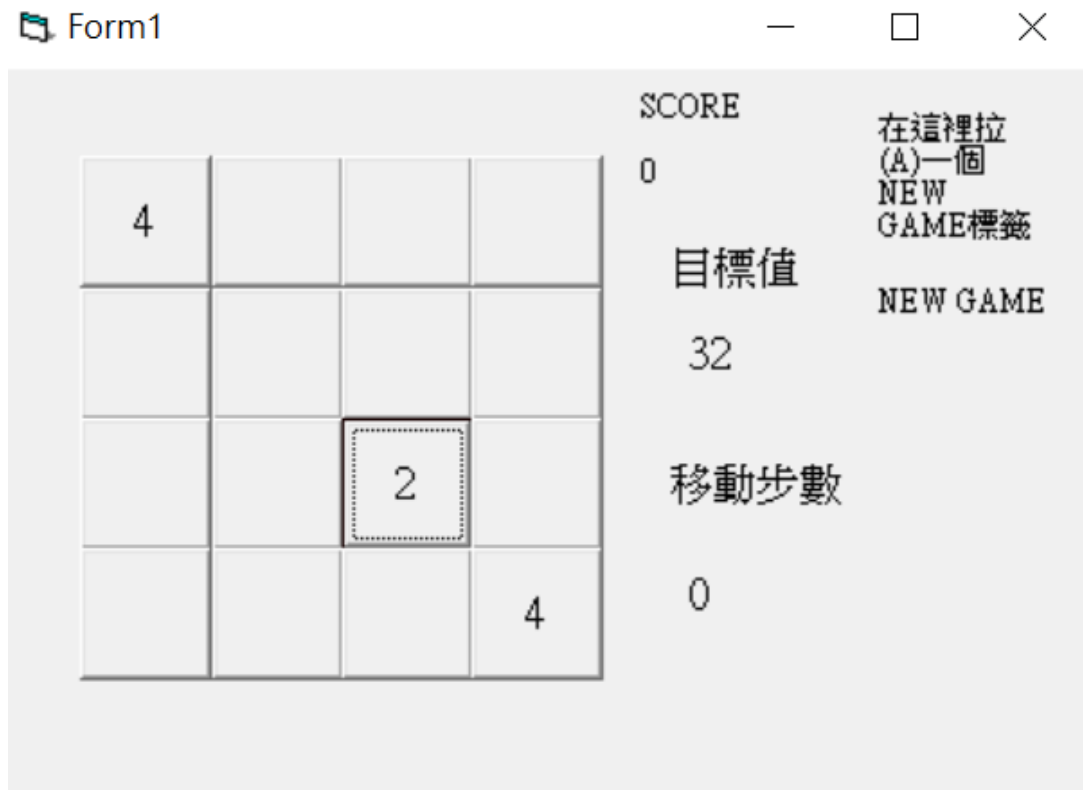
圖二十二、初始畫面

程式設計說明如下。首先，製作遊戲初始化，將盤面清空，並隨機產生三個空格，圖二十三。再來，處理上下鍵、左右鍵的融合，並加入計算分數的功能，圖二十四、圖二十五。最後，判斷是否已完成目標數字，圖二十六。執行

結果見圖二十七。

```
'第一題，new game，清空盤面，並在3空位產生數字{2,4}
'label3是步數，rnd會產生<1的亂數，randomize就是c的srand
Private Sub Label2_Click()
    Label3 = 0
    For i = 0 To 15
        Command1(i).Caption = ""
    Next
    Randomize
    n = 0
    Do
        x = Int(Rnd * 16)
        If Command1(x).Caption = "" Then
            Command1(x).Caption = 2 ^ Int(Rnd * 2 + 1)
            n = n + 1
        End If
    Loop Until n = 3



End Sub
```

圖二十三、程式-1

```
'第二題，處理右鍵的數字移動與融合
'第三題，處理左鍵的數字移動與融合
Private Sub Form_KeyDown(KeyCode As Integer, Shift As Integer)
    'Print KeyCode
    If KeyCode = vbKeyRight Or KeyCode = vbKeyLeft Or KeyCode = vbKeyDown Or KeyCode = vbKeyUp Then
        Label3 = Label3 + 1    '若按鍵是上下左右鍵則移動步數+1
    Else
        Exit Sub              '若不是則直接跳出
    End If
    '處理上下左右鍵
    If KeyCode = vbKeyRight Then
        For i = 3 To 15 Step 4
            For j = i - 1 To i - 3 Step -1
                k = j
                Do
                    If Command1(k + 1).Caption = "" Then
                        Command1(k + 1).Caption = Command1(k).Caption
                        Command1(k).Caption = ""
                    ElseIf Command1(k + 1).Caption = Command1(k).Caption Then
                        Command1(k + 1).Caption = Command1(k).Caption * 2
                        Command1(k).Caption = ""
                        Label8 = Label8 + Val(Command1(k + 1).Caption)
                    End If
                    k = k + 1
                Loop Until k = i
            Next
        Next

    ElseIf KeyCode = vbKeyLeft Then
        For i = 3 To 15 Step 4
            For j = i - 2 To i
                k = j
                Do
                    If Command1(k - 1).Caption = "" Then
                        Command1(k - 1).Caption = Command1(k).Caption
                        Command1(k).Caption = ""
                    ElseIf Command1(k - 1).Caption = Command1(k).Caption Then
                        Command1(k - 1).Caption = Command1(k).Caption * 2
                        Command1(k).Caption = ""
                        Label8 = Label8 + Val(Command1(k + 1).Caption)
                    End If
                    k = k - 1
```

圖二十四、程式-2

```
        ElseIf KeyCode = vbKeyUp Then
            For i = 0 To 3 Step 1
                For j = i + 4 To i + 12 Step 4
                    k = j
                    Do
                        If Command1(k - 4).Caption = "" Then
                            Command1(k - 4).Caption = Command1(k).Caption
                            Command1(k).Caption = ""
                        ElseIf Command1(k - 4).Caption = Command1(k).Caption Then
                            Command1(k - 4).Caption = Command1(k).Caption * 2
                            Command1(k).Caption = ""
                            Label8 = Label8 + Val(Command1(k + 1).Caption)
                        End If
                        k = k - 4
                    Loop Until k = i
                Next
            Next
        ElseIf KeyCode = vbKeyDown Then
            For i = 12 To 15 Step 1
                For j = i - 4 To i - 12 Step -4
                    k = j
                    Do
                        If Command1(k + 4).Caption = "" Then
                            Command1(k + 4).Caption = Command1(k).Caption
                            Command1(k).Caption = ""
                        ElseIf Command1(k + 4).Caption = Command1(k).Caption Then
                            Command1(k + 4).Caption = Command1(k).Caption * 2
                            Command1(k).Caption = ""
                            Label8 = Label8 + Val(Command1(k + 1).Caption)
                        End If
                        k = k + 4
                    Loop Until k = i
                Next
            Next
        End If
```

圖二十五、程式-3

```vb
        isdone = False
        lefted = 16
        For i = 0 To 15

            If Command1(i).Caption <> "" Then
                lefted = lefted - 1
                If Val(Command1(i).Caption) = Val(Label5) Then
                    isdone = True
                End If
            End If
        Next
        If isdone Then
            MsgBox Label5.Caption & "achieved"
        ElseIf lefted = 0 Then
            MsgBox "you failed"
        Else
            Randomize
            Do
                x = Int(16 * Rnd)
                If Command1(x).Caption = "" Then
                    Command1(x).Caption = 2 ^ Int(Rnd * 2 + 1)
                    Exit Do
                End If
            Loop Until 1 <> 1
        End If
End Sub


Private Sub Label5_Click()
    Label5.Caption = InputBox("請輸入2的n次方數")
End Sub
```
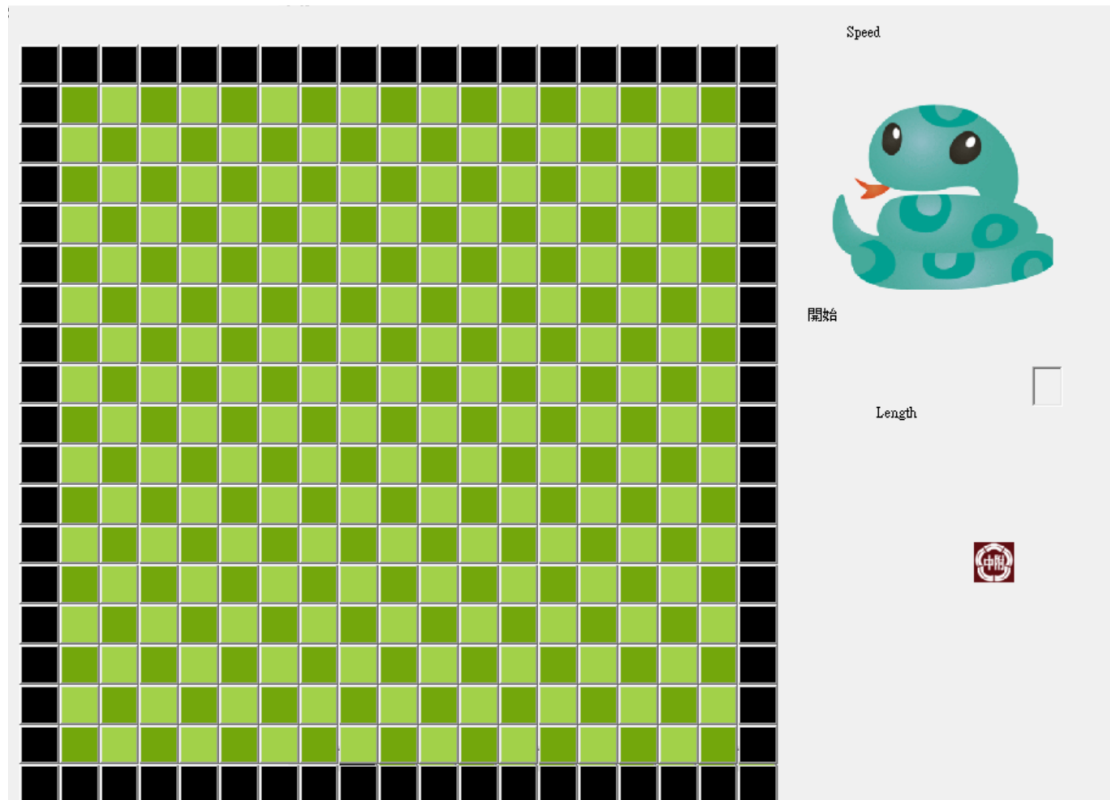
圖二十六、程式-4

圖二十六、執行結果

五、貪食蛇

以下我要介紹貪食蛇遊戲，圖二十七是遊戲初始畫面。

圖二十七、遊戲初始畫面

程式說明如下，一開始載入邊界黑色、內部是馬賽克花磚的遊戲盤面，並

設定上下左右控制參數，圖二十八。再來隨機在棋盤內部產生附中 logo(蘋果)

與設定蛇的初始位置，圖二十九。然後，處理蛇吃掉蘋果後身體加長、速度變

快與判斷蛇是否撞到牆或是自己的身體，如果是就結束遊戲，圖三十。遊戲進

行畫面如圖三十一。

```vb
Private Sub Form_KeyDown(KeyCode As Integer, Shift As Integer)
    If KeyCode = vbKeyUp Then
        sdir = -19
    ElseIf KeyCode = vbKeyDown Then
        sdir = 19
    ElseIf KeyCode = vbKeyLeft Then
        sdir = -1
    ElseIf KeyCode = vbKeyRight Then
        sdir = 1
    End If
End Sub
'第一題，載入361(19*19)個磚塊，邊界黑色，內部馬賽克花磚。
Private Sub Form_Load()
    For i = 1 To Command1.UBound
        Unload Command1(i)
    Next
    For i = 0 To 360
        If i > 0 Then
            Load Command1(i)
            If i Mod 19 = 0 Then
                Command1(i).Left = Command1(0).Left
                Command1(i).Top = Command1(i - 19).Top + Command1(i - 9).Height
            Else
                Command1(i).Left = Command1(i - 1).Left + Command1(i - 1).Width
                Command1(i).Top = Command1(i - 1).Top
            End If
        End If
        If i Mod 2 = 0 Then
            Command1(i).BackColor = RGB(115, 167, 12)
        Else
            Command1(i).BackColor = RGB(162, 209, 73)

        End If
        Command1(i).Visible = True
        Command1(i).Picture = Nothing
    Next
    For i = 0 To 18
        Command1(i).BackColor = vbBlack
    Next
    For i = 342 To 360
        Command1(i).BackColor = vbBlack
    Next
    For i = 0 To 342 Step 19
        Command1(i).BackColor = vbBlack
    Next
    For i = 18 To 360 Step 19
        Command1(i).BackColor = vbBlack
    Next
End Sub
```

圖二十八、程式-1

```vb
'第二題，產生蘋果(紅色)，注意不能放邊界，不能放在蛇上(假設蛇的顏色vbBlue)
Private Sub NewApple()
    apple = -1
    Do
        x = Int(Rnd * 360)
        If Command1(x).BackColor <> vbBlack And Command1(x).BackColor <> vbBlue Then
            apple = x
        End If
    Loop Until apple <> -1
    Command1(apple).Picture = Image2

End Sub
```

```vb
'第三題，遊戲開始按鈕，設定蛇的初始位置175 176 177，方向預設向右，蛇首177，每4/10秒移動依次
Private Sub Label1_Click()
    Form_Load
    Command1(175).BackColor = vbBlue
    Command1(176).BackColor = vbBlue
    Command1(177).BackColor = vbBlue
    snk = ChrW(175) & ChrW(176) & ChrW(177)
    sdir = 1
    shead = 177
    NewApple
    Timer1.Interval = 400
End Sub
```

圖二十九、程式-2

```vb
'第三題，蛇的移動
Private Sub Timer1_Timer()
    shead = shead + sdir
    If Command1(shead).BackColor = vbBlack Then
        MsgBox "hit wall, game over"
        Timer1.Interval = 0
        Exit Sub
    End If
    If Command1(shead).BackColor = vbBlue Then
        MsgBox "bite self"
        Timer1.Interval = 0
        Exit Sub
    End If
    Command1(shead).BackColor = vbBlue
    If shead = apple Then
        Command1(apple).Picture = Nothing
        NewApple
        snk = snk & ChrW(shead)

    Else
        stail = AscW(Mid(snk, 1, 1))
        snk = Mid(snk, 2, Len(snk) - 1) & ChrW(shead)
        i = stail
        If i Mod 2 = 0 Then
            Command1(i).BackColor = RGB(115, 167, 12)

        Else
            Command1(i).BackColor = RGB(162, 209, 73)
        End If
    End If
    Timer1.Interval = 400 - (Len(snk) - 3) * 10
    Label4 = "speed = " & (Len(snk) - 3)
    Label2 = Len(snk)
End Sub
```
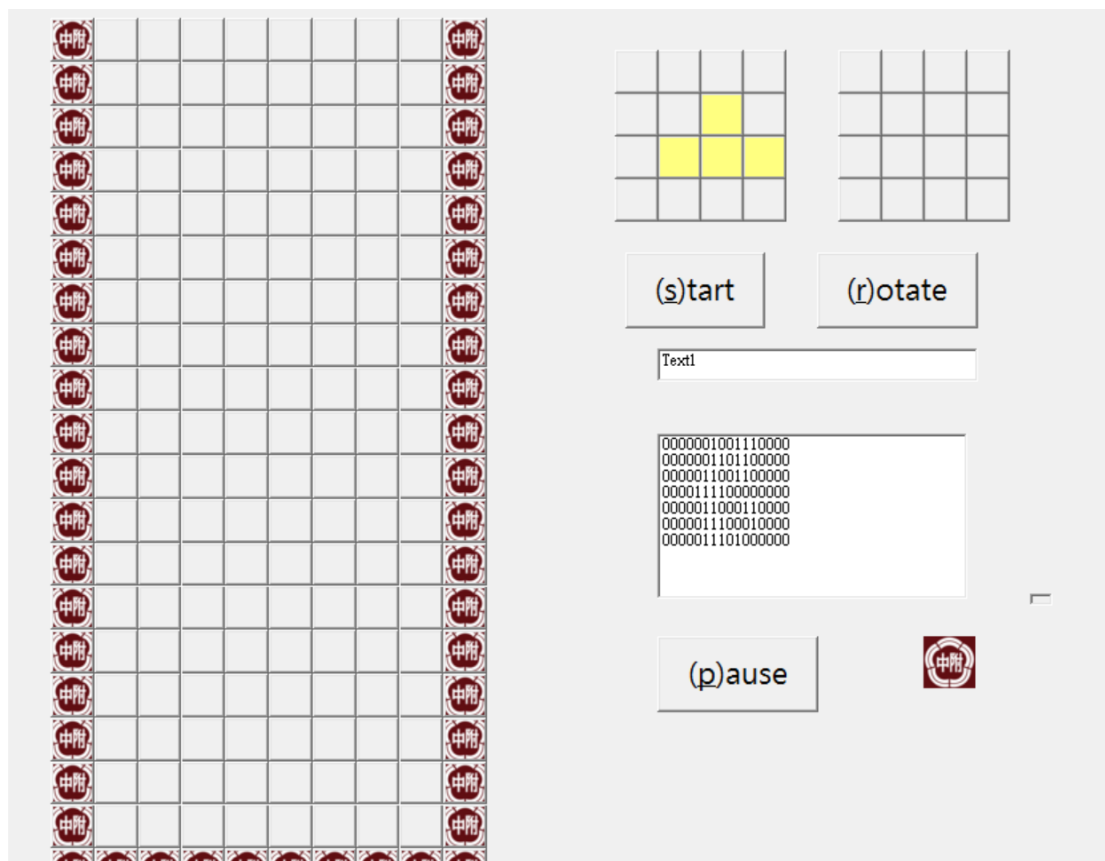
圖三十、程式-3
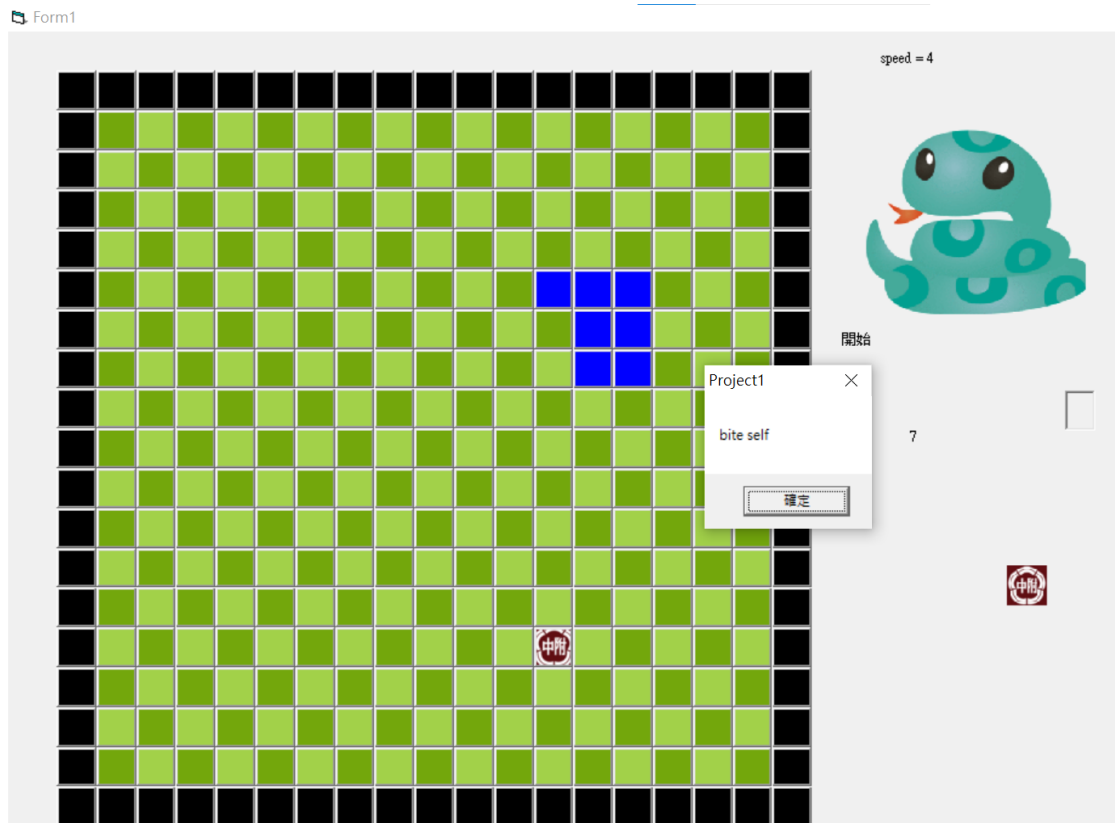
圖三十一、執行畫面

五、俄羅斯方塊

以下要介紹俄羅斯方塊遊戲的程式製作，初始畫面如圖三十二。

圖三十二、初始畫面

同樣的，要先製作遊戲初始畫面，設定邊界與方塊樣式，圖三十三。遊戲開始時要清空盤面與設定控制參數，圖三十四。接著分別是控制方塊移動、轉動並防止兩方塊重疊的函式，圖三十五、圖三十六。最後是製作自動下降、滿行消除與偵測方塊是否堆到頂並結束遊戲的功能，圖三十七。遊戲遊玩畫面見圖三十八。

```vbnet
'第一題，畫面初始
Private Sub Form_Load()
    For i = 1 To 199
        Load Command4(i)
        If i Mod 10 = 0 Then
            Command4(i).Left = Command4(i - 10).Left
            Command4(i).Top = Command4(i - 10).Top + Command4(i - 10).Height
        Else
            Command4(i).Left = Command4(i - 1).Left + Command4(i - 1).Width
            Command4(i).Top = Command4(i - 1).Top
        End If
        If i Mod 10 = 0 Or i Mod 10 = 9 Or i >= 190 Then
            Command4(i).BackColor = vbBlack
            Command4(i).Picture = Image1
        End If
        Command4(i).Visible = True
    Next
    Command4(0).BackColor = vbBlack
    Command4(0).Picture = Image1

    brk = Array("0000001001110000", "0000001101100000", "0000011001100000", "0000111100000000", "0000011000110000", "00000111000
    List1.Clear
    For i = 0 To UBound(brk)
        List1.AddItem brk(i)
    Next
    brkcolor = Array(vbBlue, vbCyan, vbGreen, vbMagenta, vbRed, &HFFC0C0, vbYellow)
    brkcolor = Array(vbBlue, vbCyan, vbGreen, vbMagenta, vbRed, &HFFC0C0, vbYellow)
End Sub
```

圖三十三、程式-1

```vbnet
' 開始遊戲
Private Sub Command5_Click()
    Timer1.Interval = 500
    For i = 1 To 199
        Command4(i).BackColor = &H8000000F
        If i Mod 10 = 0 Or i Mod 10 = 9 Or i >= 190 Then
            Command4(i).BackColor = vbBlack
            Command4(i).Picture = Image1
        End If
    Next
    nowXY = 3
    bridx = Int(Rnd * 3)
    Text1.Text = brk(bridx)
    移動 3, 3
    Picture1.SetFocus
End Sub

Private Sub Form_KeyDown(KeyCode As Integer, Shift As Integer)
    If KeyCode = vbKeyLeft Then
        移動 nowXY, nowXY - 1
    ElseIf KeyCode = vbKeyRight Then
        移動 nowXY, nowXY + 1
    ElseIf KeyCode = vbKeyDown Then
        移動 nowXY, nowXY + 10
    ElseIf KeyCode = vbKeyUp Then
        旋轉 nowXY
    End If
End Sub
```

圖三十四、程式-2

```vb
Private Function 移動(f As Integer, t As Integer)

    For i = 3 To 0 Step -1
        For j = 3 To 0 Step -1
            If Command1(i * 4 + j).BackColor <> &H8000000F Then
                Command4(f + i * 10 + j).BackColor = &H8000000F
            End If
        Next
    Next

    collision = False
    For i = 3 To 0 Step -1
        For j = 3 To 0 Step -1
            If Command1(i * 4 + j).BackColor <> &H8000000F Then
                If Command4(t + i * 10 + j).BackColor <> &H8000000F Then
                    collision = True
                End If
            End If
        Next
    Next

    If collision = False Then
        a = t
    Else
        a = f
    End If

    For i = 3 To 0 Step -1
        For j = 3 To 0 Step -1
            If Command1(i * 4 + j).BackColor <> &H8000000F Then
                Command4(a + i * 10 + j).BackColor = Command1(i * 4 + j).BackColor
            End If
        Next
    Next
    nowXY = a
    移動 = Not collision
End Function
```

圖三十五、程式-3

```
Private Function 旋轉(f As Integer)
    For i = 3 To 0 Step -1
        For j = 3 To 0 Step -1
            If Command1(i * 4 + j).BackColor <> &H8000000F Then
                Command4(f + i * 10 + j).BackColor = &H8000000F
            End If
        Next
    Next
    Command3_Click
    collision = False
    For i = 3 To 0 Step -1
        For j = 3 To 0 Step -1
            If Command1(i * 4 + j).BackColor <> &H8000000F Then
                If Command4(f + i * 10 + j).BackColor <> &H8000000F Then
                    collision = True
                End If
            End If
        Next
    Next

    If collision = True Then
        Command3_Click
        Command3_Click
        Command3_Click
    End If
    a = f
    For i = 3 To 0 Step -1
        For j = 3 To 0 Step -1
            If Command1(i * 4 + j).BackColor <> &H8000000F Then
                Command4(a + i * 10 + j).BackColor = Command1(i * 4 + j).BackColor
            End If

        Next
    Next
    nowXY = a
End Function
```

圖三十六、程式-4

```
Private Sub Timer1_Timer()
    If Not 移動(nowXY, nowXY + 10) Then
        For i = 3 To 0 Step -1
            For j = 3 To 0 Step -1
                If Command1(i * 4 + j).BackColor <> &H8000000F Then
                    a = Int((nowXY + i * 10 + j) / 10) * 10 + 8
                    Print a
                    Do
                        eliminate = True
                        For k = a To a - 7 Step -1
                            If Command4(k).BackColor = &H8000000F Then
                                eliminate = False
                            End If
                        Next
                        If eliminate = True Then
                            For k = a To 11 Step -1
                                Command4(k).BackColor = Command4(k - 10).BackColor
                            Next
                        Else
                            Exit Do
                        End If
                    Loop
                End If
            Next
        Next
        If nowXY < 10 Then
            Timer1.Interval = 0
            MsgBox "game over"
        Else
            nowXY = 3
            bridx = Int(Rnd * 7)
            Text1.Text = brk(bridx)
        End If
    End If

End Sub
```

圖三十七、程式-5
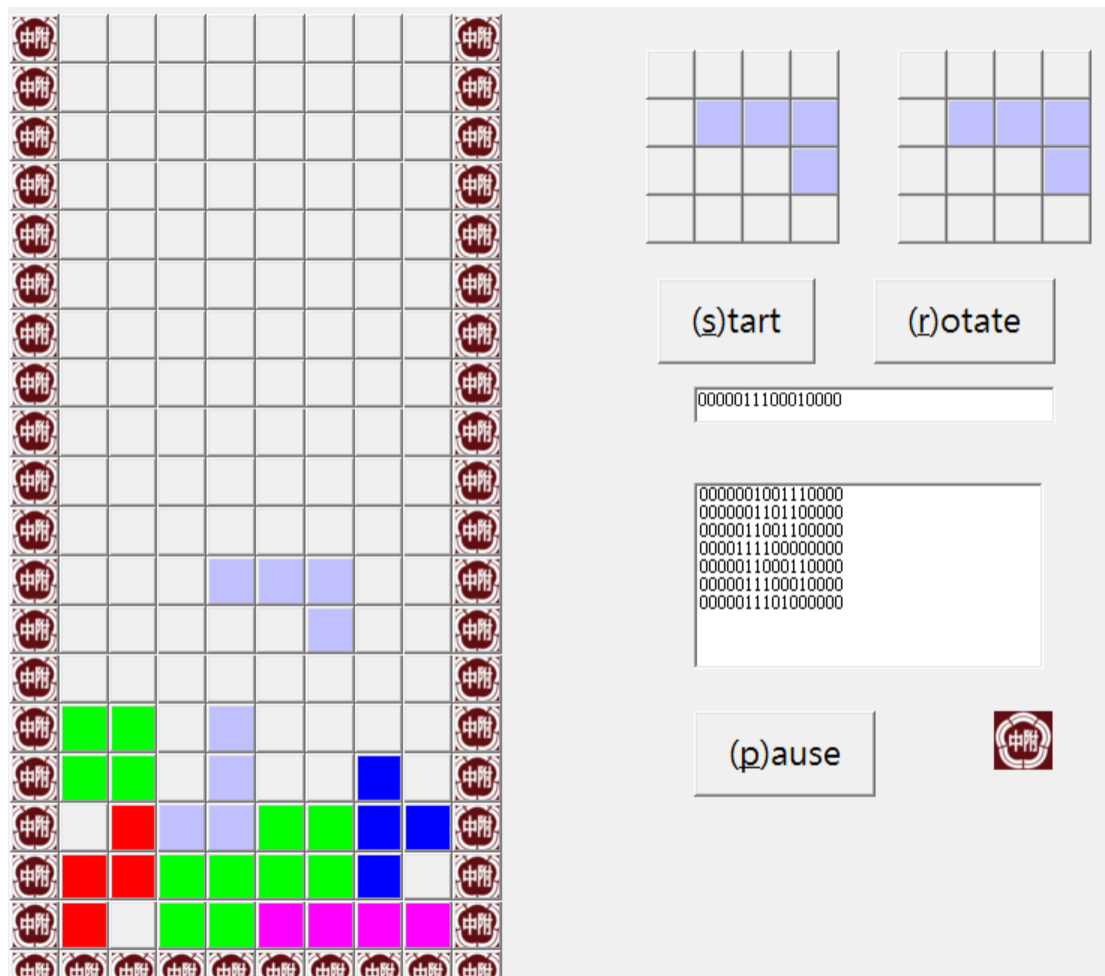
圖三十八、執行畫面

心得與感想

　　在這一年的資訊課中，我體會到科技的力量，一行行代碼，創造出變化多端的遊戲、功能。透過老師適時的提示與提點，讓我能享受思考的樂趣與獲得完成的成就感，也不會迷失在代碼迷宮中無法找到出口。此外，老師也將枯燥、艱澀的 bfs、dfs 演算法結合遊戲製作，生動的學習並活用它們，也讓我這年的資訊課豐富、圓滿的結束了。

程式演示影片

https://www.youtube.com/watch?v=bKqrDq04P-o&ab_channel=ohmygod