Creating, Sizing, Translating and Rotating 2D Shapes in Excel 2007 - *by George Lungu*

Most of the models on this blog are designed for Excel 2003 or earlier versions. Sometimes however Excel 2007 or 2010 are the only versions available even though they might be far slower when running these models. This presentation is an introduction to Excel 2007.

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Enable the Macros First:

Since this is so important, the operation is explained for all versions of Excel:

- In Excel 2003 or older:

Tools => Macro => Security => Low (or Medium) => OK => Save => Close => Reopen Workbook

In Excel 2007:

- Right Click the Office Button => Excel Options => Trust Center => Trust Center Settings => Macro Settings => Disable all macros with notification => OK => Save and Close => Reopen Workbook

- When you reopen a file with macros if you get a "Security Warning" do the following: Options => Enable this content => OK

In Excel 2010 – being done in two stages:

A) Open File => File => Options => Trust Center => Trust Center Settings => Macro Settings => Enable all macros … => OK => OK => Save

B) File => Options => Trust Center => Trust Center Settings => Protected View => Disable them … => OK => OK => Save => Close => Reopen Workbook

Rename First Worksheet:

- Let's open a new Excel 2007 workbook, go to the tab bar, double click the tab of the first sheet and change its name by typing Shapes_1
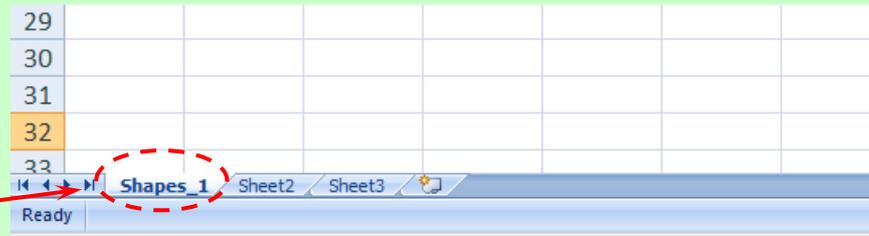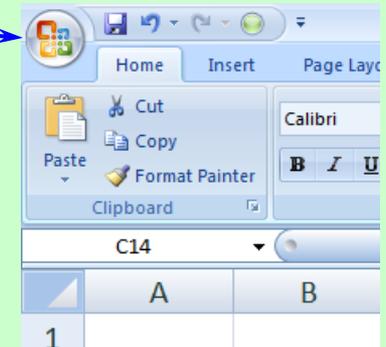
Type in Labels and Data:

- Go to the upper left corner of the sheet and type the following six labels (in column B) and the six numbers (in column C) just like in the snap shoot to the right
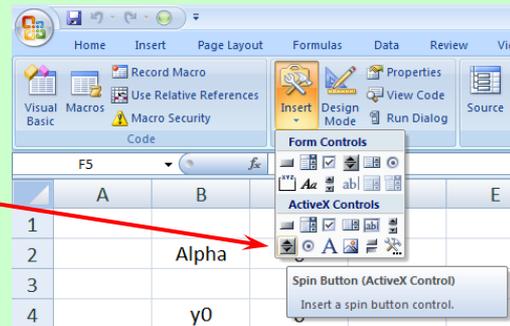- Next we will create buttons and VBA macros
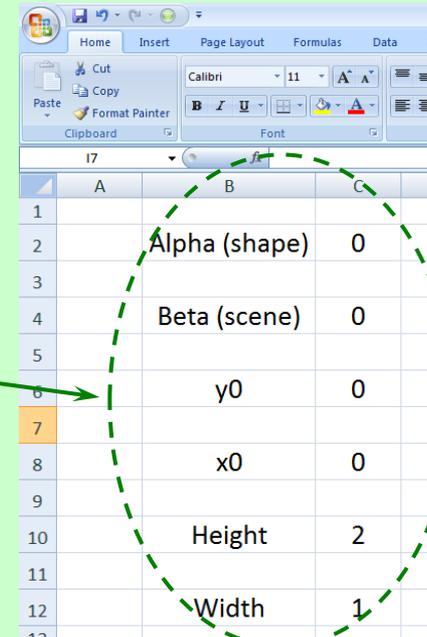
Bring up the Developer Tab in the Ribbon:

- Go to the **MS Office Orb** => Excel Options => Popular => Show the Developer Tab in the Ribbon

Create a Spin Button:

- Developer => Controls => Insert => ActiveX Controls => Spin Button => Drag draw a button on the sheet

|	A	B	C
2		Alpha (shape)	0
4		Beta (scene)	0
6		y0	0
8		x0	0
10		Height	2
12		Width	1

After you drew the button, while the button is still highlighted right click it and bring up the "Properties" tab. There, you change the name into "Alpha", change Min to -1 and Max to 75.
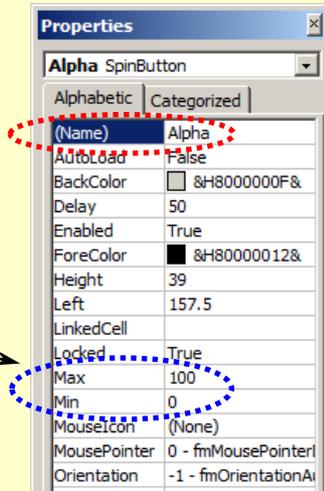
About the Controls Tab:

- Clicking the Design Mode button will bring you in or out of design mode. After you finish changing the button properties you will need to get out of design mode in order to use it.

- Instead of right clicking the button you can also bring up the properties by clicking the "Properties" in the Controls tab.
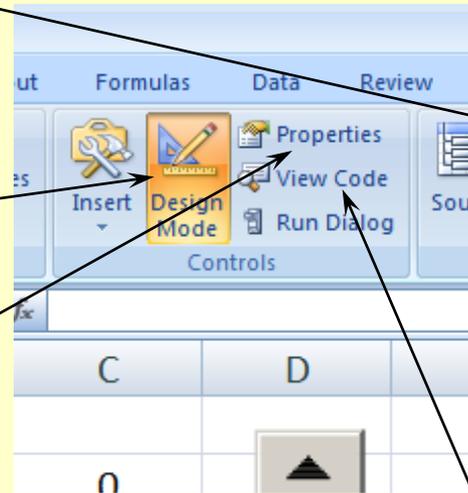
- In 2007 you can bring up the VBA editor by either clicking the "View Code" button or by using the Alt+F11 shortcut

The first macro (a rotation macro):

- This macro will increase or decrease the value of the rotation angle and will also wrap around 0 degrees while going down and around 360 degrees while going up.
- After adjusting the properties double click the button (which brings up the VBA editor) and write the following code.
- After finishing, exit the design mode and test the macro

```
Private Sub Alpha_Change()

    If Alpha > 71 Then Alpha = 0

    If Alpha < 0 Then Alpha = 71

    [C2] = 5 * Alpha

End Sub
```

An outline of all the buttons and macros:

The following buttons and macros are created using the same procedure. Here is an outline of the values and code used.

Buttons Properties		
Macro Name	Min Value	Max Value
Alpha	-1	75
Beta	-1	75
x0	-5	5
y0	-5	5
Height	0	50
Width	0	50

```
Private Sub Alpha_Change()
    If Alpha > 71 Then Alpha = 0
    If Alpha < 0 Then Alpha = 71
    [C2] = 5 * Alpha.Value
End Sub

Private Sub Beta_Change()
    If Beta > 71 Then Beta = 0
    If Beta < 0 Then Beta = 71
    [C4] = 5 * Beta.Value
End Sub

Private Sub x0_Change()
    [C6] = x0.Value
End Sub

Private Sub y0_Change()
    [C8] = y0.Value
End Sub

Private Sub Height_Change()
    [C10] = Height.Value / 10
End Sub

Private Sub Width_Change()
    [C12] = Width.Value / 10
End Sub
```
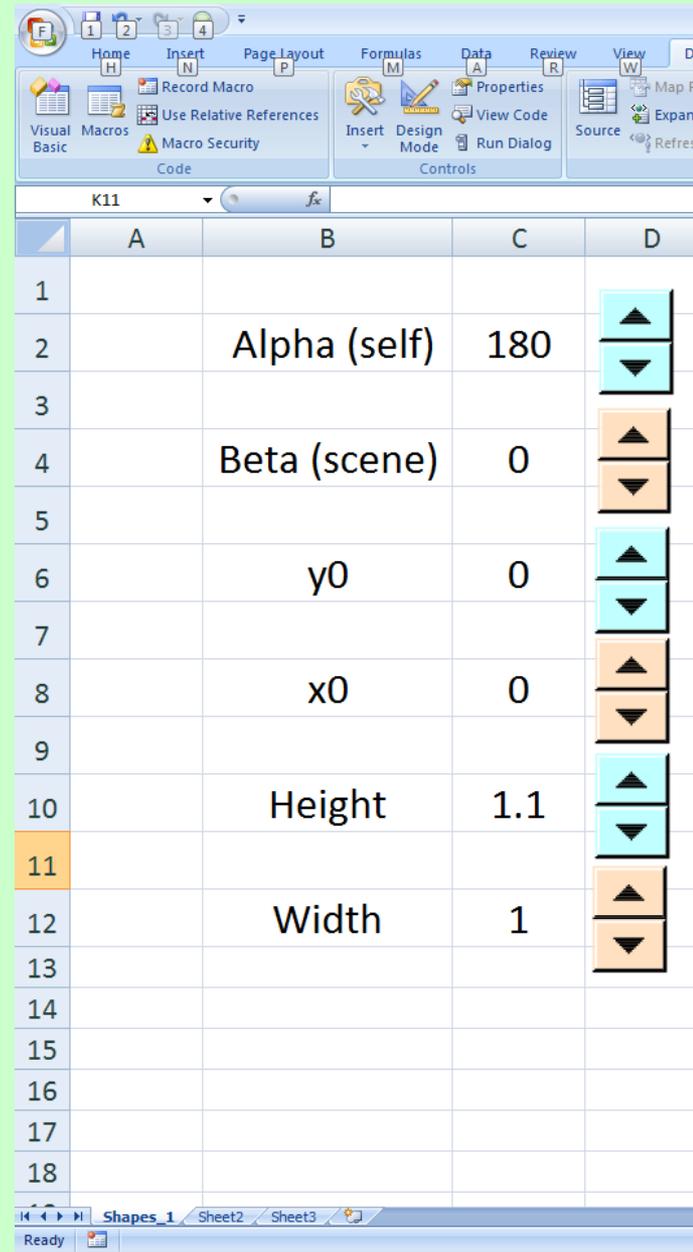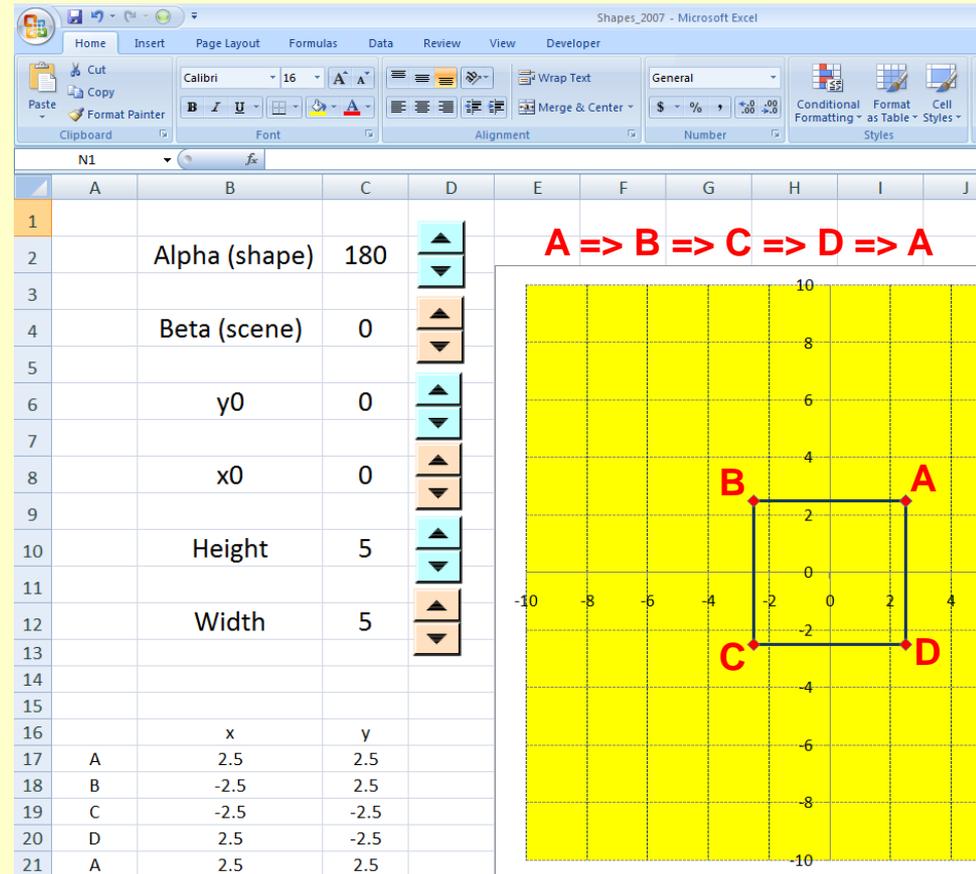
Creating the rectangle:

The charted data for the rectangle is contained in the range B17:C21 (excluding the labels). Below is an insight on how the data is charted from width and height. The data is plotted in a scatter chart. The procedure of plotting the data is not given here, but you can Google it.

	X	Y
A	Width / 2	Height / 2
B	-Width / 2	Height / 2
C	-Width / 2	-Height / 2
D	Width / 2	-Height / 2
A	Width / 2	Height / 2

A => B => C => D => A

	A	B	C	D
2	Alpha (shape)	180		
4	Beta (scene)	0		
6	y0	0		
8	x0	0		
10	Height	5		
12	Width	5		
16		x	y	
17	A	2.5	2.5	
18	B	-2.5	2.5	
19	C	-2.5	-2.5	
20	D	2.5	-2.5	
21	A	2.5	2.5	

Next step: Shape Rotation and Shift:

A shape rotation is performed followed by a translation using the formulas to the right. The result is found in the range D17:E21 (see next page).

$$x_1 = x \cdot \cos(radians(\alpha)) - y \cdot \sin(radians(\alpha)) + x_0$$

$$y_1 = x \cdot \sin(radians(\alpha)) + y \cdot \cos(radians(\alpha)) + y_0$$
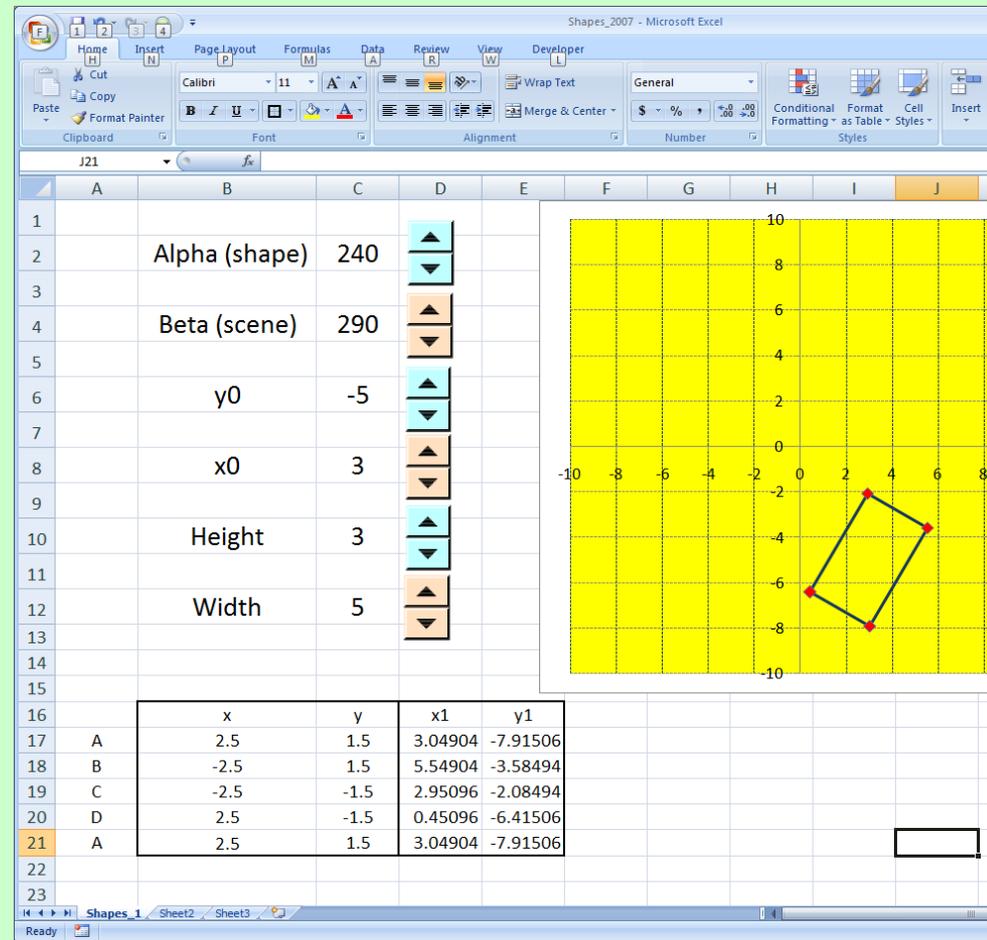
Shape Rotation   Shift

Shape Rotation and Shift – excel implementation:

- Range D17:E21 contains the formulas presented in the previous page:

D17: "=B17*COS(RADIANS(C$2))-
            C17*SIN(RADIANS(C$2))+C$8"

E17:"=B17*SIN(RADIANS(C$2))+
            C17*COS(RADIANS(C$2))+C$6

- After filling range D17:E17 with the above formulas copy down D17:E17 to row 21
- Change the chart data from B17:C21 to D17:E21 and you can see the results in the snapshot to the left.


Next Step : a Scene Rotation:

A scene rotation is performed using the formulas to the right. The result is found in the range F17:G21 (see next page).

$$x_2 = x_1 \cdot \cos(radians(\beta)) - y_1 \cdot \sin(radians(\beta))$$

$$y_2 = \underbrace{x_1 \cdot \sin(radians(\beta)) + y_1 \cdot \cos(radians(\beta))}_{\text{Scene Rotation}}$$

Scene Rotation – excel implementation:

- Range F17:G21 contains the formulas presented in the previous page:

F17: "=D17*COS(RADIANS(C$4))-
       E17*SIN(RADIANS(C$4))"

G17:"=D17*SIN(RADIANS(C$4))+
       E17*COS(RADIANS(C$4))"

- After filling range F17:G17 with the above formulas copy down F17:G17 to row 21
- Change the chart data from D17:E21 to F17:G21 and you can see the results in the snapshot to the left.
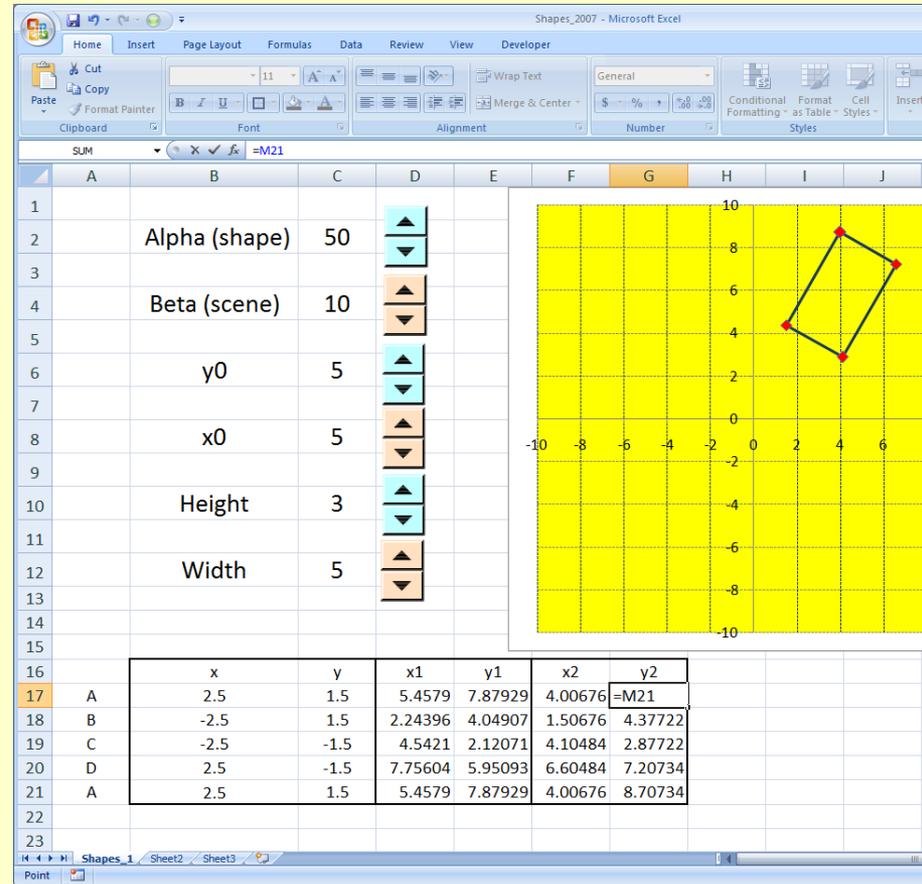
- When you build anything make sure to spend enough time between stages playing with the model to make sure the model performs as expected.
- Now that everything is finished you can try to see the global effects of buttons
- Even though you might not perceive it in this model, Excel 2007 is much slower than Excel 2003 or earlier versions. I heard MS might have improved on this in the 2010 version though I have not tried that version yet.

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Conclusion:

- Creating basic animation in Excel 2007 was demonstrated
- The interface is awkward, unintuitive and as much as I used it, it looks like a step backwards in productivity
- Based on what I read on other blogs most of the expert users don't like it
- The new users are OK with it
- As far as science modeling is concerned, 2007 is a very slow animal, it can be more than an order of magnitude slower than 2003 and it seems that the charting represents the bottleneck in speed

Resources:

- There are many good books around. The best author seems to be John Walkenbach from www.spreadsheetpage.com
- People in a rush who are interested in office applications can also watch the beginner series from: http://www.youtube.com/user/ExcelIsFun . This guy has almost 1000 videos and his presentations are really nice.