

Portfolio 1 Task: Colouring Book (easy)

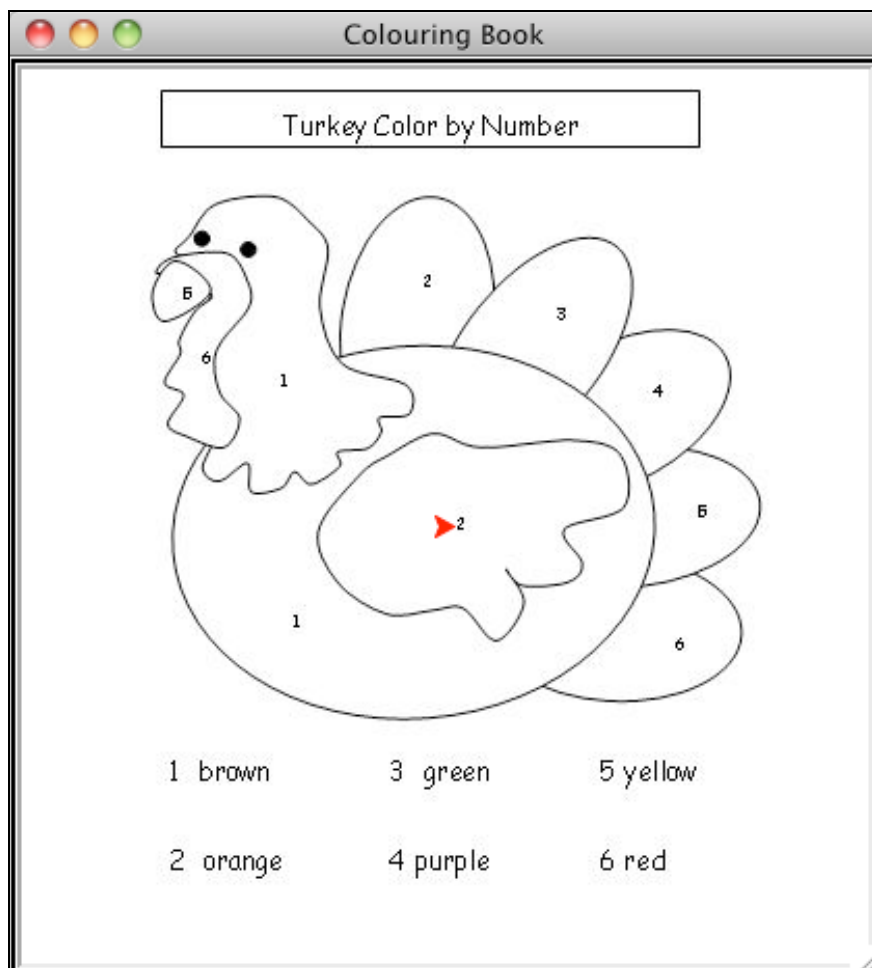
Overview

This task involves developing a simple Python program that uses Turtle graphics.

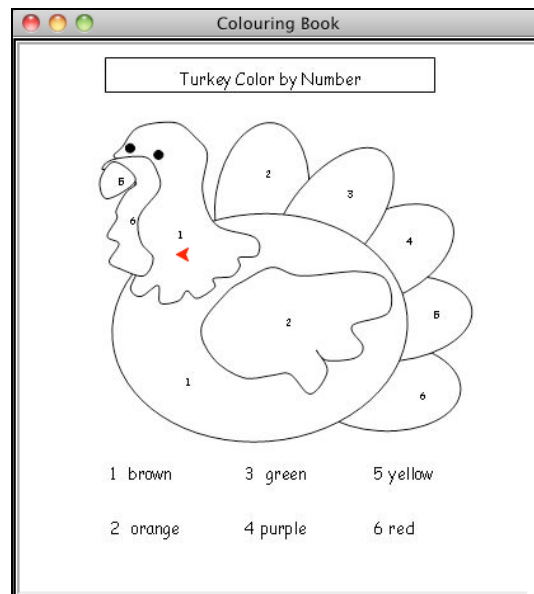
In this task you will develop a colouring game for children that allows them to colour pictures by tracing shapes onto the screen and then filling them with different colours. Your program will provide keyboard controls for tracing a shape, filling a shape and changing the brush's colour.

As an example of your program's required behaviour consider the following example.

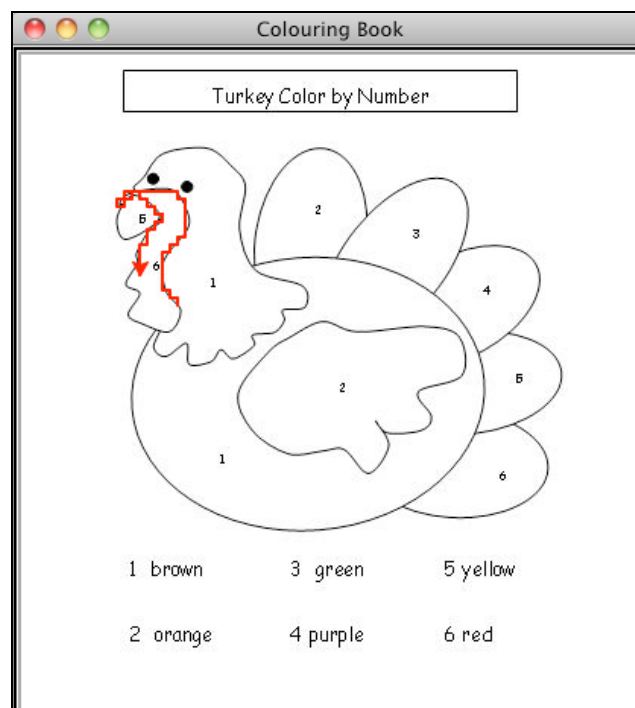
1. When your program begins it should display a picture to be coloured. We have supplied a program file that already does this and a selection of pictures. The red triangle in the middle of the picture below is the "turtle" cursor, which we will use as our paintbrush.



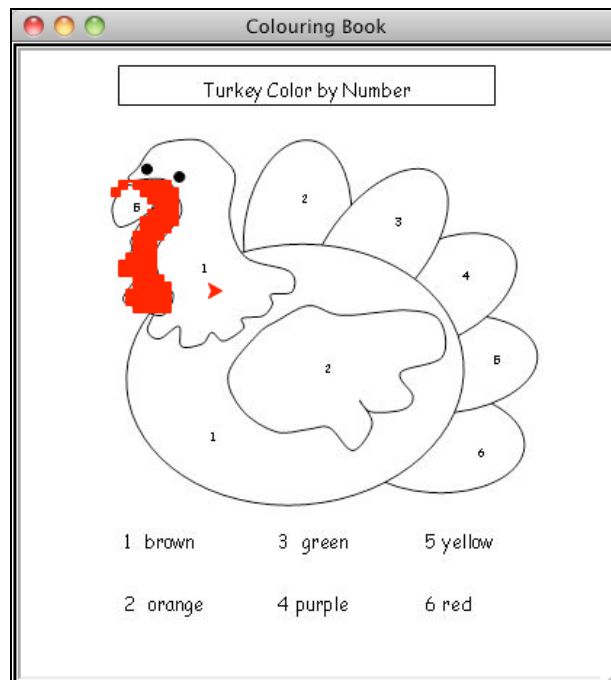
- We can move the cursor (brush) around using the four arrow keys to move it up, down, left and right. How far it moves each time a key is pressed is fixed; it is helpful to make the distance travelled fairly small, to enable accurate tracing. Your program has two distinct operating modes. When the program begins the cursor moves without drawing, as shown below, which we call “move” mode.



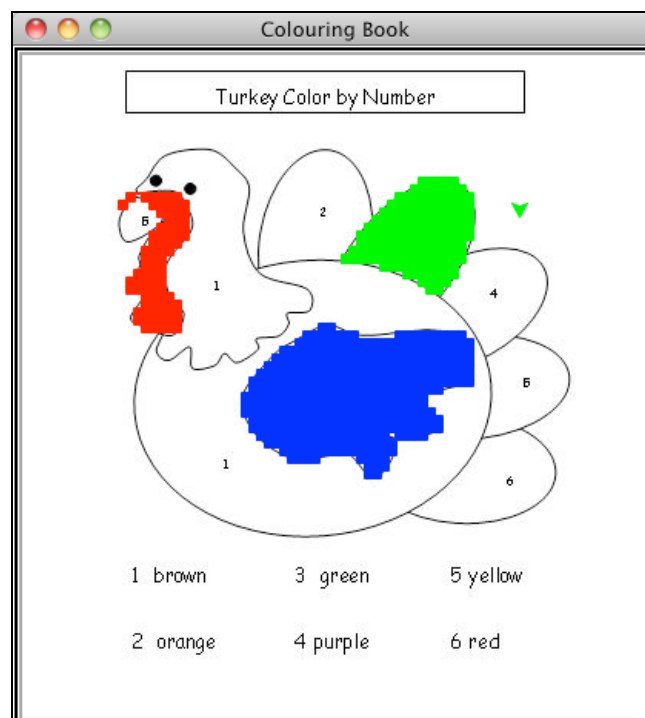
- Mode changes are affected by pressing the keyboard's space bar to toggle the mode. Pressing the space bar while in “move” mode changes the program to “paint” mode. In paint mode moving the cursor causes it to leave a line behind. This is done to trace out an area to be filled with colour, like the red area below.



4. When the space bar is next pressed the program goes back to “move” mode. Most importantly, when the mode changes from “paint” to “move” the shape that has just been traced out must be filled with solid colour, as shown below.



5. Your program must also provide the ability to change the brush's colour by pressing an alphabetic key. At a minimum you should provide three colours, red, green and blue, accessed via the 'r', 'g' and 'b' keys, to allow multi-coloured drawings.



6. Finally, tracing a shape accurately using just arrow keys is difficult, as our clumsy example above demonstrates. Therefore you must also provide the ability to undo the last step made by the user by pressing the 'z' key.

Specific requirements

To complete this task you must develop a Python program that uses the Turtle graphics module to allow given drawings to be coloured as described above. It must provide the user with the following capabilities.

- The ability to move the cursor a small, fixed amount by pressing any of the four arrow keys.
- The ability to change the cursor's colour using (at least) the 'r', 'g' and 'b' keys.
- The ability to undo the last step by pressing the 'z' key.
- The ability to toggle the "mode" by pressing the space bar. In "move" mode the cursor moves without drawing. In "paint" mode the cursor leaves a line as it moves. When the mode is changed from "paint" to "move", the area most recently traced out must be filled with the cursor's current colour.

Finally, you must use your program to colour a picture, to prove that it works! You can use one of the provided pictures or find one of your own provided it's not trivial. A simple shape like a square would not be considered a sufficient demonstration of your program's capabilities (or your artistic flair!). Take a screenshot of your artwork and include it with your submission for this task.

Development hints

This task is much easier than it sounds because most of the features you need are already available in the Turtle graphics module. For instance, you can use the `listen` and `onkey` functions from the Turtle package to allow the program to recognise key strokes. (See Chapter 24 of the *Python Library Reference* manual.) Similarly, the ability to change the colour of the cursor ("turtle"), undo the last step and fill an area of the screen with colour are all provided by built-in Turtle functions.

Optional extensions

As described above this program is fairly crude and there are several ways in which it could be profitably extended, e.g., by allowing a wider palette of colours or by providing the ability to move the cursor diagonally. You are welcome to make such extensions, but when your program is marked only the features described above will be assessed. The appendix below contains some of the colours recognised by the Turtle module.

Deliverables

The deliverables for this task are as follows.

1. A Python program called `colouring_book.py` that allows the user to colour pictures using the keyboard as described above. This program must work under Python Version 2.7. Create your program from the supplied `colouring_book_Q.py` template, with the '_Q' suffix removed from the file name.

2. A completed “statement” at the beginning of the Python file to identify your programming pair. (We can’t award you marks if we don’t know who you are!) Also you must indicate the percentage contribution made to the *whole* portfolio by both students. We do *not* expect a precise 50/50 split; an accurate and honest assessment is appreciated. This percentage will not affect your marks *except* in cases of extreme imbalances or disagreements.
3. A screenshot containing at least one significant piece of artwork created using your Python program. (You will *not* be assessed on the quality of your colouring! However, this file can be used by the marker to confirm that your program works if, for some reason, they have trouble running your code.)

Apart from working correctly, your program code must be well-presented and easy to understand, thanks to (sparse) commenting that explains the *purpose* of significant code segments and *helpful* choices of variable and function names.

					Aqua
				GreenYellow	Cyan
				Chartreuse	LightCyan
				LawnGreen	PaleTurquoise
				Lime	Aquamarine
				LimeGreen	Turquoise
				PaleGreen	MediumTurquoise
				LightGreen	DarkTurquoise
				MediumSpringGreen	CadetBlue
				SpringGreen	SteelBlue
				MediumSeaGreen	LightSteelBlue
				SeaGreen	PowderBlue
				ForestGreen	LightBlue
			Gold	Green	SkyBlue
			Yellow	DarkGreen	LightSkyBlue
			LightYellow	YellowGreen	DeepSkyBlue
			LemonChiffon	OliveDrab	DodgerBlue
			LightGoldenrodYellow	Olive	CornflowerBlue
IndianRed			PapayaWhip	DarkOliveGreen	MediumSlateBlue
LightCoral	Pink	LightSalmon	Moccasin	MediumAquamarine	RoyalBlue
Salmon	LightPink	Coral	PeachPuff	DarkSeaGreen	MediumBlue
DarkSalmon	HotPink	Tomato	PaleGoldenrod	LightSeaGreen	DarkBlue
LightSalmon	DeepPink	OrangeRed	Khaki	DarkCyan	Navy
Crimson	MediumVioletRed	DarkOrange	DarkKhaki	Teal	MidnightBlue
Red	PaleVioletRed	Orange			
FireBrick					
DarkRed					
Cornsilk		Lavender			
BlanchedAlmond		Thistle	White		
Bisque		Plum	Snow		
NavajoWhite		Violet	Honeydew		
Wheat		Orchid	MintCream		
BurlyWood		Fuchsia	Azure		
Tan		Magenta	AliceBlue		
RosyBrown		MediumOrchid	GhostWhite		
SandyBrown	Gainsboro	BlueViolet	WhiteSmoke		
Goldenrod	LightGrey	DarkViolet	Seashell		
DarkGoldenrod	Silver	DarkOrchid	Beige		
Peru	DarkGray	DarkMagenta	OldLace		
Chocolate	Gray	Purple	FloralWhite		
SaddleBrown	DimGray	Indigo	Ivory		
Sienna	LightSlateGray	SlateBlue	AntiqueWhite		
Brown	SlateGray	DarkSlateBlue	Linen		
Maroon	Black	MediumSlateBlue	LavenderBlush		
			MistyRose		