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1 #py          www.labdeck.com
2 #          MatDeck as Python Editor
3
4 # This is an example which shows how to complete a MatDeck document in Python
5 # code. Using this way, the MatDeck Code Editor serves as the Python editor.
6 """
7 Animated Towers of Hanoi using Tk with optional bitmap file in background.
8
9 Usage: hanoi.py [n [bitmapfile]]
10
11 n is the number of pieces to animate; default is 4, maximum 15.
12
13 The bitmap file can be any X11 bitmap file (look in /usr/include/X11/bitmaps
14 for
15 samples); it is displayed as the background of the animation. Default is no
16 bitmap.
17 """
18
19 from tkinter import Tk, Canvas
20
21 # Basic Towers-of-Hanoi algorithm: move n pieces from a to b, using c
22 # as temporary. For each move, call report()
23 def hanoi(n, a, b, c, report):
24     if n <= 0: return
25     hanoi(n-1, a, c, b, report)
26     report(n, a, b)
27     hanoi(n-1, c, b, a, report)
28
29 # The graphical interface
30 class Tkhanoi:
31
32     # Create our objects
33     def __init__(self, n, bitmap = None):
34         self.n = n
35         self.tk = tk = Tk()
36         self.canvas = c = Canvas(tk)
37         c.pack()
38         width, height = tk.getint(c['width']), tk.getint(c['height'])
39
40         # Add background bitmap
41         if bitmap:
42             self.bitmap = c.create_bitmap(width//2, height//2,
43                                         bitmap=bitmap,
44                                         foreground='blue')
45
46         # Generate pegs
47         pegwidth = 10
48         pegheight = height//2
49         pegdist = width//3
50         x1, y1 = (pegdist-pegwidth)//2, height*1//3
51         x2, y2 = x1+pegwidth, y1+pegheight
52         self.pegs = []
53         p = c.create_rectangle(x1, y1, x2, y2, fill='black')
54         self.pegs.append(p)
55         x1, x2 = x1+pegdist, x2+pegdist
56         p = c.create_rectangle(x1, y1, x2, y2, fill='black')
57         self.pegs.append(p)
58         x1, x2 = x1+pegdist, x2+pegdist
59         p = c.create_rectangle(x1, y1, x2, y2, fill='black')
60         self.pegs.append(p)
61         self.tk.update()
62
63         # Generate pieces
64         piecewidth = width//10
65         pieceheight = height//10
66         pegdist = width//3
67         pegdist2 = pegdist + width//10
68         pegdist3 = pegdist + width//5
69         pegdist4 = pegdist + width//2
70         pegdist5 = pegdist + width//1.5
71         pegdist6 = pegdist + width//1
72         pegdist7 = pegdist + width//0.5
73         pegdist8 = pegdist + width//0.2
74         pegdist9 = pegdist + width//0.1
75         pegdist10 = pegdist + width//0.05
76
77         for i in range(1, n+1):
78             x1 = pegdist + i*(width//10)
79             y1 = height//2 - i*(height//10)
80             x2 = x1 + piecewidth
81             y2 = y1 + pieceheight
82             p = c.create_oval(x1, y1, x2, y2, fill='black')
83             self.pieces.append(p)
84
85             x1 = pegdist2 + i*(width//10)
86             y1 = height//2 - i*(height//10)
87             x2 = x1 + piecewidth
88             y2 = y1 + pieceheight
89             p = c.create_oval(x1, y1, x2, y2, fill='black')
90             self.pieces.append(p)
91
92             x1 = pegdist3 + i*(width//10)
93             y1 = height//2 - i*(height//10)
94             x2 = x1 + piecewidth
95             y2 = y1 + pieceheight
96             p = c.create_oval(x1, y1, x2, y2, fill='black')
97             self.pieces.append(p)
98
99             x1 = pegdist4 + i*(width//10)
100            y1 = height//2 - i*(height//10)
101            x2 = x1 + piecewidth
102            y2 = y1 + pieceheight
103            p = c.create_oval(x1, y1, x2, y2, fill='black')
104            self.pieces.append(p)
105
106            x1 = pegdist5 + i*(width//10)
107            y1 = height//2 - i*(height//10)
108            x2 = x1 + piecewidth
109            y2 = y1 + pieceheight
110            p = c.create_oval(x1, y1, x2, y2, fill='black')
111            self.pieces.append(p)
112
113            x1 = pegdist6 + i*(width//10)
114            y1 = height//2 - i*(height//10)
115            x2 = x1 + piecewidth
116            y2 = y1 + pieceheight
117            p = c.create_oval(x1, y1, x2, y2, fill='black')
118            self.pieces.append(p)
119
120            x1 = pegdist7 + i*(width//10)
121            y1 = height//2 - i*(height//10)
122            x2 = x1 + piecewidth
123            y2 = y1 + pieceheight
124            p = c.create_oval(x1, y1, x2, y2, fill='black')
125            self.pieces.append(p)
126
127            x1 = pegdist8 + i*(width//10)
128            y1 = height//2 - i*(height//10)
129            x2 = x1 + piecewidth
130            y2 = y1 + pieceheight
131            p = c.create_oval(x1, y1, x2, y2, fill='black')
132            self.pieces.append(p)
133
134            x1 = pegdist9 + i*(width//10)
135            y1 = height//2 - i*(height//10)
136            x2 = x1 + piecewidth
137            y2 = y1 + pieceheight
138            p = c.create_oval(x1, y1, x2, y2, fill='black')
139            self.pieces.append(p)
140
141            x1 = pegdist10 + i*(width//10)
142            y1 = height//2 - i*(height//10)
143            x2 = x1 + piecewidth
144            y2 = y1 + pieceheight
145            p = c.create_oval(x1, y1, x2, y2, fill='black')
146            self.pieces.append(p)
147
148            self.tk.update()
149
150    def report(self, n, a, b):
151        print(f'{n} piece moved from {a} to {b}.')
152
153    def __del__(self):
154        self.tk.destroy()

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64     maxpiecewidth = pegdist*2//3
65     minpiecewidth = 2*pegwidth
66     self.pegstate = [[], [], []]
67     self.pieces = {}
68     x1, y1 = (pegdist-maxpiecewidth)//2, y2-pieceheight-2
69     x2, y2 = x1+maxpiecewidth, y1+pieceheight
70     dx = (maxpiecewidth-minpiecewidth) // (2*max(1, n-1))
71     for i in range(n, 0, -1):
72         p = c.create_rectangle(x1, y1, x2, y2, fill='red')
73         self.pieces[i] = p
74         self.pegstate[0].append(i)
75         x1, x2 = x1 + dx, x2-dx
76         y1, y2 = y1 - pieceheight-2, y2-pieceheight-2
77         self.tk.update()
78         self.tk.after(25)
79
80     # Run -- never returns
81     def run(self):
82         while 1:
83             hanoi(self.n, 0, 1, 2, self.report)
84             hanoi(self.n, 1, 2, 0, self.report)
85             hanoi(self.n, 2, 0, 1, self.report)
86             hanoi(self.n, 0, 2, 1, self.report)
87             hanoi(self.n, 2, 1, 0, self.report)
88             hanoi(self.n, 1, 0, 2, self.report)
89
90     # Reporting callback for the actual hanoi function
91     def report(self, i, a, b):
92         if self.pegstate[a][-1] != i: raise RuntimeError # Assertion
93         del self.pegstate[a][-1]
94         p = self.pieces[i]
95         c = self.canvas
96
97         # Lift the piece above peg a
98         ax1, ay1, ax2, ay2 = c.bbox(self.pegs[a])
99         while 1:
100            x1, y1, x2, y2 = c.bbox(p)
101            if y2 < ay1: break
102            c.move(p, 0, -1)
103            self.tk.update()
104
105         # Move it towards peg b
106         bx1, by1, bx2, by2 = c.bbox(self.pegs[b])
107         newcenter = (bx1+bx2)//2
108         while 1:
109             x1, y1, x2, y2 = c.bbox(p)
110             center = (x1+x2)//2
111             if center == newcenter: break
112             if center > newcenter: c.move(p, -1, 0)
113             else: c.move(p, 1, 0)
114             self.tk.update()
115
116         # Move it down on top of the previous piece
117         pieceheight = y2-y1
118         newbottom = by2 - pieceheight*len(self.pegstate[b]) - 2
119         while 1:
120             x1, y1, x2, y2 = c.bbox(p)
121             if y2 >= newbottom: break
122             c.move(p, 0, 1)
123             self.tk.update()
124
125         # Update peg state
126         self.pegstate[b].append(i)
127
128     def main():

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```
130 import sys
131
132 # First argument is number of pegs, default 4
133 if sys.argv[1:]:
134     n = int(sys.argv[1])
135 else:
136     n = 4
137
138 # Second argument is bitmap file, default none
139 if sys.argv[2:]:
140     bitmap = sys.argv[2]
141     # Reverse meaning of leading '@' compared to Tk
142     if bitmap[0] == '@': bitmap = bitmap[1:]
143     else: bitmap = '@' + bitmap
144 else:
145     bitmap = None
146
147 # Create the graphical objects...
148 h = Tkhanoi(n, bitmap)
149
150 # ...and run!
151 h.run()
152
153
154 # Call main when run as script
155 if __name__ == '__main__':
156     main()
157
158 ####
```