**SOURCE CODE**

1. # 2d transformation
3. import pygame
4. import sys
5. import math
7. def translation(x,y,tx,ty):
8. **return** (x + tx, y + ty)
10. def scaling(x,y,sx,sy):
11. **return** (x \* sx, y \* sy)
13. def rotation(x,y,angle):
14. radian = math.radians(angle)
15. x\_new = x \* math.cos(radian) - y \* math.sin(radian)
16. y\_new = x \* math.sin(radian) + y \* math.cos(radian)
17. **return** (x\_new, y\_new)

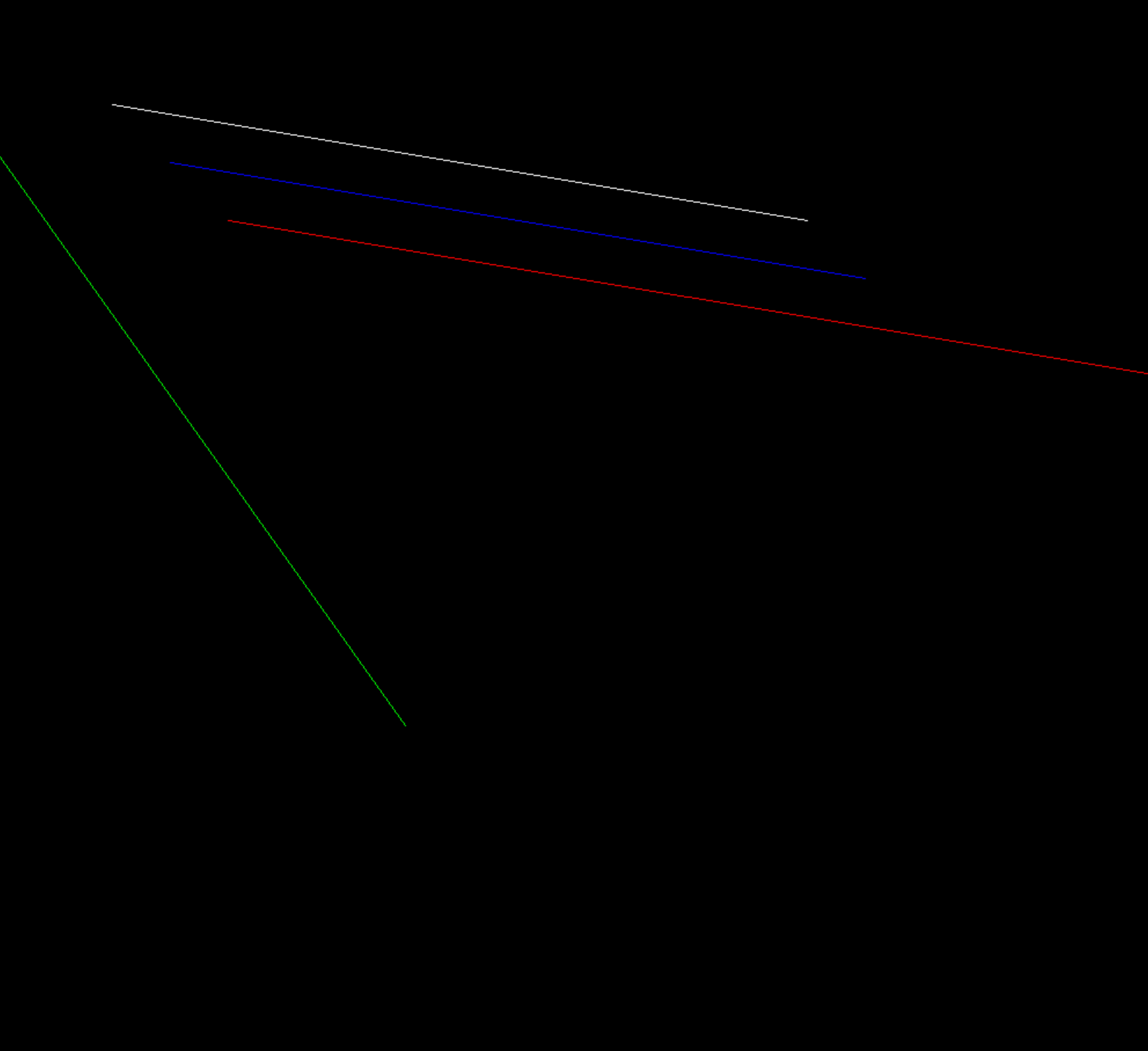
20. pygame.init()
21. WIDTH = 1000
22. HEIGHT = 1000
24. screen = pygame.display.set\_mode((WIDTH, HEIGHT))
26. pygame.display.set\_caption("2d Transformation")
28. WHITE = (255, 255, 255)
29. BLACK = (0, 0, 0)

32. def main():
33. screen.fill(BLACK)
34. x1 = 100
35. y1 = 100
36. x2 = 700
37. y2 = 200
39. pygame.draw.line(screen, WHITE, (x1,y1), (x2,y2), 1)
41. #after translation
42. tx1,ty1 = translation(x1,y1,50,50)
43. tx2,ty2 = translation(x2,y2,50,50)
44. pygame.draw.line(screen, (0,0,255), (tx1,ty1), (tx2,ty2), 1)
46. #after scaling
47. sx1, sy1 = scaling(x1, y1, 2, 2)
48. sx2, sy2 = scaling(x2, y2, 2, 2)
49. pygame.draw.line(screen, (255,0,0), (sx1, sy1), (sx2, sy2), 1)
51. #after rotation
52. angle = 45  #
53. rx1, ry1 = rotation(x1, y1, angle)
54. rx2, ry2 = rotation(x2, y2, angle)
55. pygame.draw.line(screen, (0,255,0), (rx1, ry1), (rx2, ry2), 1)

58. pygame.display.flip()
59. pygame.time.delay(100)

62. **if** \_\_name\_\_ == "\_\_main\_\_":
63. while True:
64. for event **in** pygame.event.**get**():
65. **if** event.type == pygame.QUIT:
66. pygame.quit()
67. sys.exit()
68. main()
69. pygame.time.delay(100)

**OUTPUT**



*Fig. 6.1: Output of 2d Transformation*