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Lab No.: 2

A Lab Report on *Turn Test*

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LAB 2

Implement Turn Test
1. Check Left Turn
2. Check Right Turn
3. Check Co-linearlity
4. Compute Area

Code (https://github.com/Brihat9/CG/blob/master/cg_lab_2_lr_turn.py)

```python
#!/usr/bin/env python

from basics import *

def compute_area(base_point, first_point, second_point):
    """ computes cross product of two vectors to get area of parallelogram
        returns 1/2 of cross product as area of triangle formed
        first vectpr = base point to first point
        second vector = base point to second point
    """
    vecA = Point(first_point.x - base_point.x, first_point.y - base_point.y)
    vecB = Point(second_point.x - base_point.x, second_point.y - base_point.y)

    crossAB = vecA.x * vecB.y - vecA.y * vecB.x

    return crossAB / 2.0

def is_colinear(base_point, first_point, second_point):
    """ checks whether three points are colinear
        using area of triangle == 0 condition
    """
    area = compute_area(base_point, first_point, second_point)
    return area == 0.0

def is_left_turn(base_point, first_point, second_point):
    """ checks whether second point lies on the left of first point
        when seen from base point
    """
    area = compute_area(base_point, first_point, second_point)
    return True if area > 0.0 else False

def is_right_turn(base_point, first_point, second_point):
    """ checks whether second point lies on the right of first point
        when seen from base point
    """
    area = compute_area(base_point, first_point, second_point)
    return True if area < 0.0 else False

def main():
    """ Main Function """

    print("CG LAB 2 (Turn Test)")
    print("Brihat Ratna Bajracharya\n19/075\n")

    print("Enter coordinates of base point (P0)")
    print(" Base Point")
    base_point = Point.input_point()

    print("Enter coordinates of first point (P1)")
    print(" First Point")
    first_point = Point.input_point()
```

```
    print("Enter coordinates of second point (P2)")
    print(" Second Point")
    second_point = Point.input_point()

    area = compute_area(base_point, first_point, second_point)
    print(" \n Area of triangle formed by P0 P1 P2 is {0:{1}}"
        .format(area, '+' if area else ''))

    are_points_colinear = is_colinear(base_point, first_point, second_point)
    is_left = is_left_turn(base_point, first_point, second_point)
    is_right = is_right_turn(base_point, first_point, second_point)

    ''' TEST for colinear, left and right '''
    # print("\n Are points colinear? {}".format(are_points_colinear))
    # print(" Is P2 left of P1?    {}".format(is_left))
    # print(" Is P2 right of P1?   {}".format(is_right))

    print("\n\n RESULT\n ------")
    if not are_points_colinear:
        result = "right" if is_right else "left"
        print("\n Point P2 " + str(second_point) + " is in the " + result),
        print("of Point P1 " + str(first_point) + "\n when observed from"),
        print("Point P0 " + str(base_point))
    else:
        print("\n Point P0 " + str(base_point) + " is colinear with"),
        print("Point P1 " + str(first_point)),
        print("and Point P2 " + str(second_point))

    print("\nDONE.\n")

if __name__ == '__main__':
    main()
```

Output 1:

```
$ ./cg_lab_2_lr_turn.py
CG LAB 2 (Turn Test)
Brihat Ratna Bajracharya
19/075

Enter coordinates of base point (P0)
 Base Point
  X-Coord: 1
  Y-Coord: 1
Enter coordinates of first point (P1)
 First Point
  X-Coord: 8
  Y-Coord: 8
Enter coordinates of second point (P2)
 Second Point
  X-Coord: 4
  Y-Coord: 4

 Area of triangle formed by P0 P1 P2 is 0.0


 RESULT
 ------

 Point P0 (1, 1) is colinear with Point P1 (8, 8) and Point P2 (4, 4)

DONE.
```

Output 2:

```
$ ./cg_lab_2_lr_turn.py
CG LAB 2 (Turn Test)
Brihat Ratna Bajracharya
19/075


Enter coordinates of base point (P0)
 Base Point
  X-Coord: 1
  Y-Coord: 1
Enter coordinates of first point (P1)
 First Point
  X-Coord: 8
  Y-Coord: 8
Enter coordinates of second point (P2)
 Second Point
  X-Coord: 6
  Y-Coord: 4

 Area of triangle formed by P0 P1 P2 is -7.0


  RESULT
  ------

 Point P2 (6, 4) is in the right of Point P1 (8, 8)
 when observed from Point P0 (1, 1)

DONE.
```

Output 3:

```
$ ./cg_lab_2_lr_turn.py
CG LAB 2 (Turn Test)
Brihat Ratna Bajracharya
19/075


Enter coordinates of base point (P0)
 Base Point
  X-Coord: 1
  Y-Coord: 1
Enter coordinates of first point (P1)
 First Point
  X-Coord: 8
  Y-Coord: 8
Enter coordinates of second point (P2)
 Second Point
  X-Coord: 4
  Y-Coord: 11

 Area of triangle formed by P0 P1 P2 is +24.5


  RESULT
  ------

 Point P2 (4, 11) is in the left of Point P1 (8, 8)
 when observed from Point P0 (1, 1)

DONE.
```