

Compute the center of a circle

Advanced Microscopy Facility)

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There are situations on the focused ion beam system where the user wishes to fabricate a feature in the center of a silicon nitride grid, from the silicon nitride side. In this situation the etched window is not visible to use to find the center.

The following method computes the center of a circle P based on three points A, B and C on the edge of the circle.

- Let A, B and C be points on a circle.
- Let point D be the midpoint of AB
- Let point E be the midpoint of BC
- Let point P be the center of the circle

1. The slope of AB: $M_{AB} = \frac{B_y - A_y}{B_x - A_x}$

2. The slope of BC: $M_{BC} = \frac{C_y - B_y}{C_x - B_x}$

3. Point D: $D_x = \frac{A_x + B_x}{2}$ $D_y = \frac{A_y + B_y}{2}$

4. Point E: $E_x = \frac{B_x + C_x}{2}$ $E_y = \frac{B_y + C_y}{2}$

5. The slope of DP: $M_{DP} = \frac{P_y - D_y}{P_x - D_x}$

6. The slope of EP: $M_{EP} = \frac{P_y - E_y}{P_x - E_x}$

7. Slope of DP is negative reciprocal of slope of AB: $M_{DP} = -\frac{1}{M_{AB}}$

8. Slope of EP is negative reciprocal of slope of BC: $M_{EP} = -\frac{1}{M_{BC}}$

9. Substitute (1), (2), (5) and (6) into (7) and (8) and solve for P_x and P_y .

Refer to the Matlab function `circle_center.m` to compute center coordinates.