# A Discrete Bisector Function Based on Annulus

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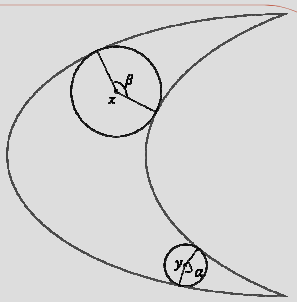
## Context and Contribution

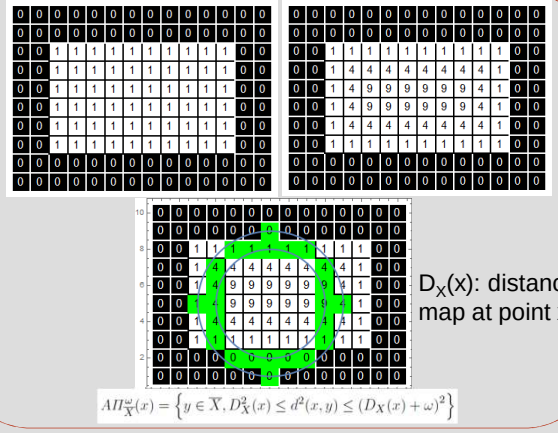
**Discrete bisector function :** important tool for analyzing and filtering skeletons. It associates to each point p, the maximal angle formed by p and the points of the background that are nearest to p.




**Contribution :**

- A new way to compute bisector function based on annulus
- An algorithm to compute it based on digital annulus generation
- Possibility to adapt the thickness and be more flexible when computing the bisector angle.

## Annulus Projection

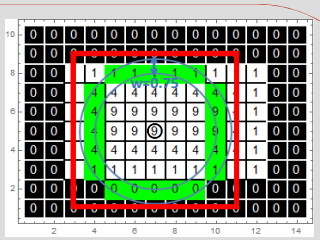


$D_X(x)$: distance map at point x

$$A\Pi_{\overline{X}}^{\omega}(x) = \left\{ y \in \overline{X}, D_{\overline{X}}^2(x) \leq d^2(x,y) \leq (D_X(x)+\omega)^2 \right\}$$

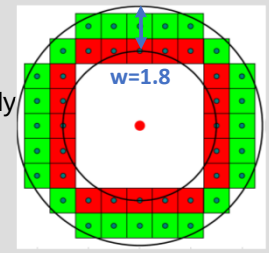
## Algorithm and Complexity

**Naive Algorithm**: a square window for every point x of the image.



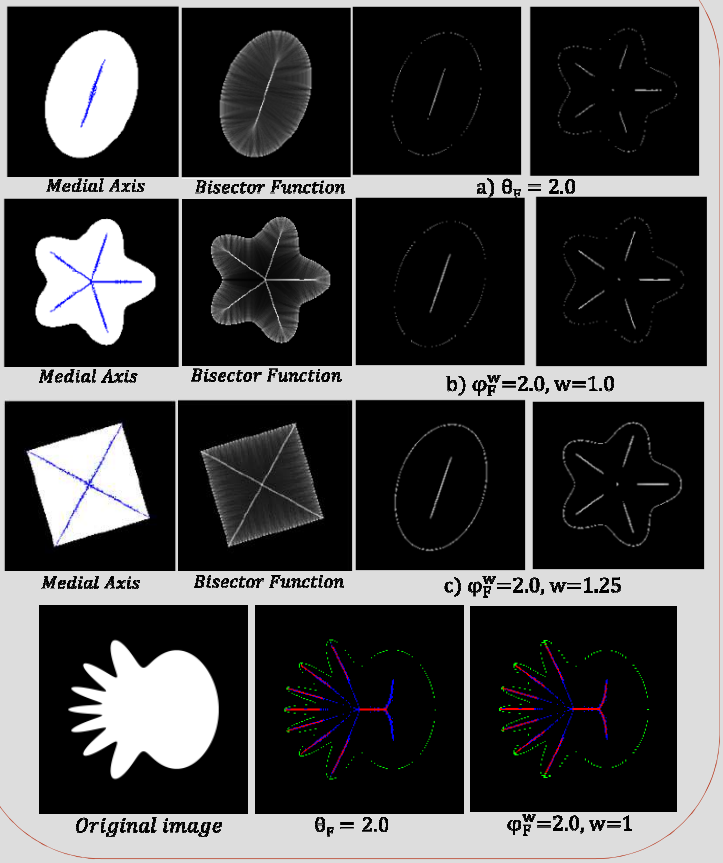
**Algorithm based on incremental digital annulus generation :** The thickness can vary, for a thickness greater than 1, one can generate concentric circles of thickness one and lower.

One can benefit from the symmetry condition and generate the circle only In the first octant and then apply symmetries.




**Complexity :** algorithm is not linear in time: for each point, we are considering an annulus whose number of points is linear to the distance map.

## Results




## Conclusion and Perspectives

### Conclusion :

- Promising results for filtering skeletons for high angles
- Can be extended to 3D and higher dimensions.

### Perspectives :

- Extend the work to higher dimensions
- Use homotopic thinning and compute skeleton based on the bisector function information.