Properties and Applications of the Simplified Generalized Perpendicular Bisector

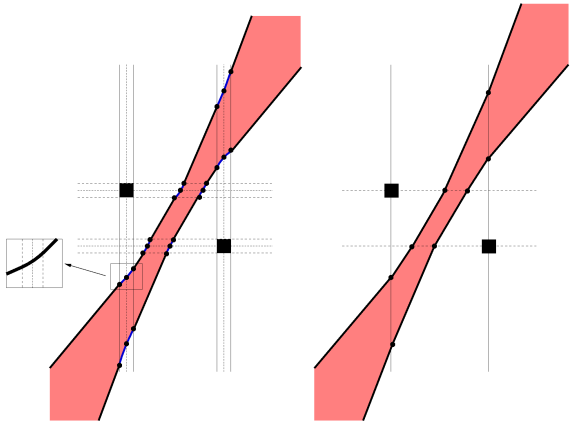
A. Richard, G. Largeteau-Skapin, M. Rodríguez, E. Andres, L. Fuchs, JSD. Ouattara

[1] Laboratoire XLIM SIC, UMR 6172,
Université de Poitiers, France

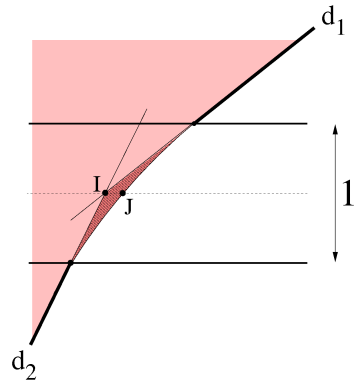
April, 2011
DGCI 2011, Nancy, France

What is the Simplified Generalized Perpendicular Bisector (SGPB) ? [1,2]

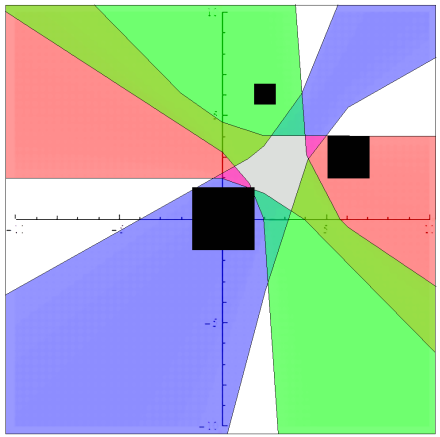
- Set of the perpendicular bisector (PB) of all the couple of points that belong to two given regions ⇒ GBP, SGPB.



GPB



SGPB



Circumcenter

- Pixels of same or different sizes.

[1] Rodríguez, M., Sere, A., Largeteau-Skapin, G., Andres, E., *Generalized perpendicular bisector and circumcenter* In Computational modeling of objects represented in images, Comp'Image. Volume 6026 of LNCS., Buffalo, USA, Springer (2010) 1-10.
[2] Andres, E. Largeteau-Skapin, G., Rodríguez, M., *Generalized perpendicular bisector and exhaustive discrete circle recognition.*, Submitted for publication at Graphical Models (2010).

Properties

- In 2D, the SGPB is composed with at most 10 line segments and half-lines.
- Its dual is a convex polygon with at most 8 vertices and 8 edges.

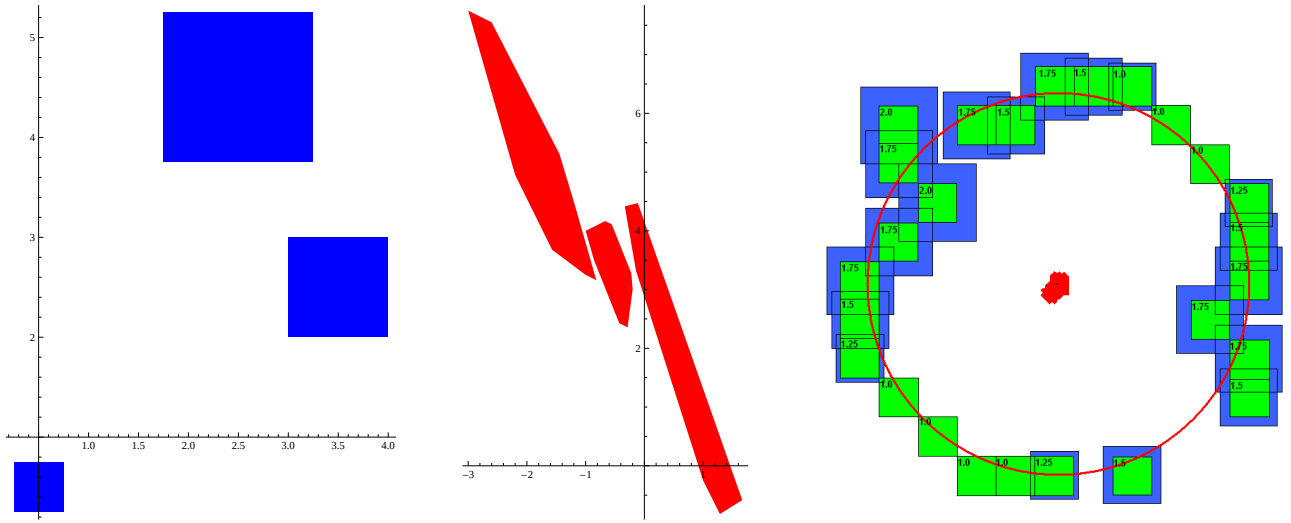


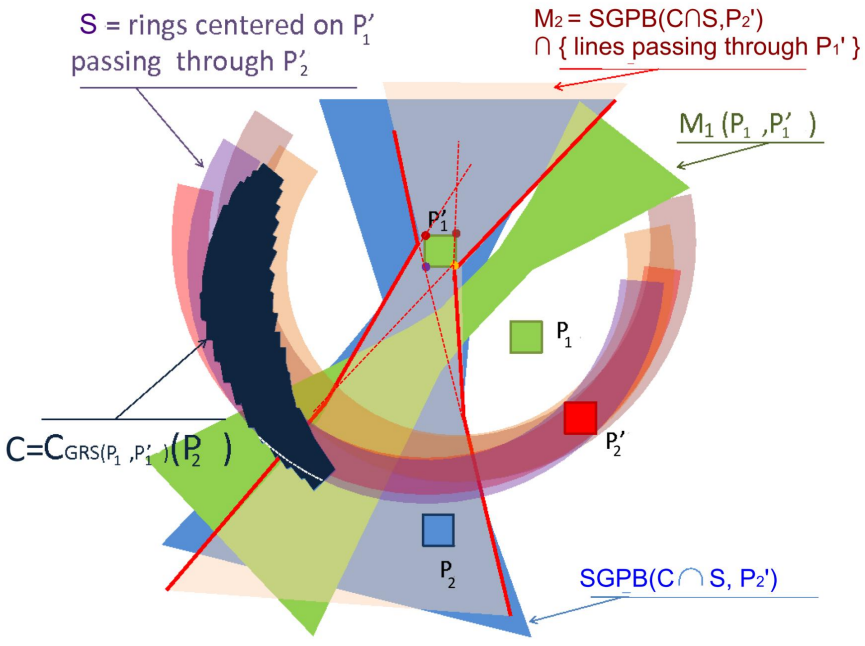
FIGURE: The dual of the three SGPB corresponding to three pixels of different sizes and application to noisy circle recognition.

Illustration of the rotation reconstruction using the SGPB

Method of Fontijne [3]

- **reconstruction of a rotation** ;
- from n points p_i and their images p'_i ;
- incremental determination of PB ;

"Visualization" of the error generated by this method



[3] Fontijne, D., Dorst, L. *Reconstructing rotations and rigid body motions from points correspondences as a sequence of reflections*. In : Applied Geometric Algebras in Computer Science and Engineering, AGACSE 2010, Amsterdam, The Netherlands (2010)