Additional material

Tracing Field-Coherent Quad Layouts

paper 1125

Extraction of separatrix directions on singularities

1 Extraction of separatrix directions on singularities

As shown in Figure 1, we consider a vertex v and a cross field defined on each surrounding face and we want to derive the directions of the separatrices on v (Fig. 1.a).
We assume the cross field do be defined exactly in the barycenter B_i of each face. We define the set of directions that span between two adjacent faces by linearly interpolating the directions of their crosses placed at the two barycenters. Intuitively, a separatrix appears when one of these spanned interpolated directions hits the vertex (Fig. 1.b).
In practice, for each pair of consecutive faces f_0, f_1 we extract a pair of coherent directions u_0 and u_1, then we test if u_0 and u_1 rotate in opposite directions in order to parallel match the vectors $(B_0 - v)$ and $(B_1 - v)$, respectively. In this case we derive the direction s by interpolating between u_0 and u_1 considering the angles a_0 and a_1 shown in Figure 1.c. If the test with u_0 and u_1 fails, we perform the same test with the other pair of orthogonal directions of the cross field.
In order to avoid that the two directions $(B_0 - v)$ and $(B_1 - v)$ span an angle $\gamma > 90°$ (introducing inconsistencies in the evaluation of separatrices in a 4-rosy field), then we split γ into three equivalent angles, defining three triangles (see Figure 1.d). We interpolate the field for each sub triangle, then we perform the separatrix test for each pair of consecutive sub triangles.

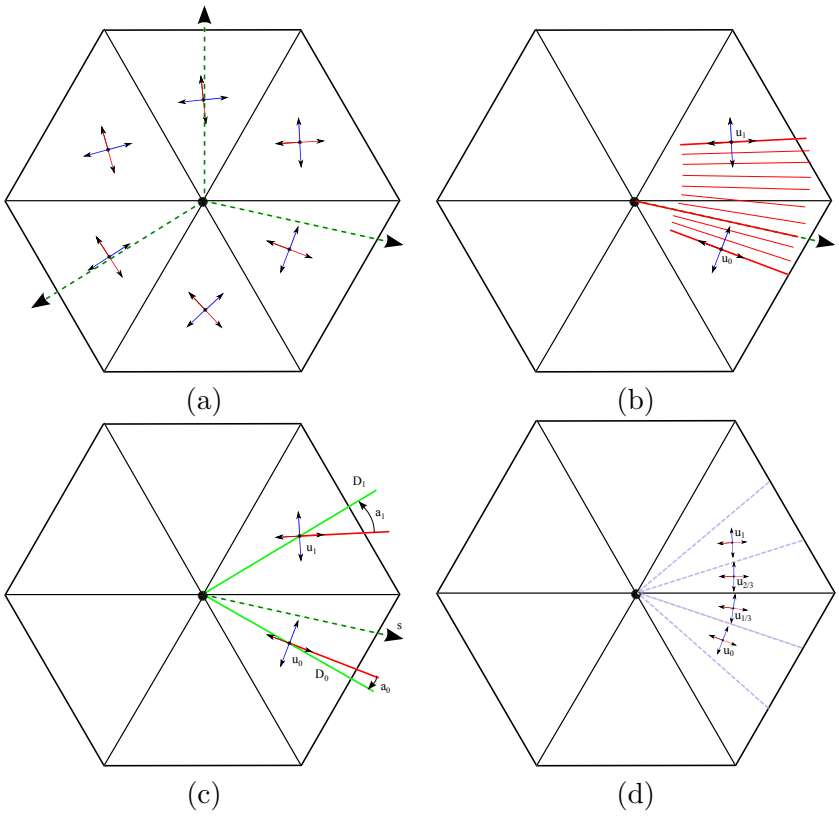

Figure 1: Derivation of separatrix directions on a singularity: (a) The initial cross field and the cross field set at triangle's barycenter; (b) A separatrix direction is found when the set of directions obtained spanning between u_0 and u_1 meet the singularity; (c) This test is performed by checking if $(B_0 - v) \times u_0$ and $(B_1 - v) \times u_1$ have opposite directions, the direction s is obtained by interpolating between a_0 and a_1; (d) Each face is splitted in three sub-faces to avoid the angle between $(B_0 - v)$ and $(B_1 - v)$ to be greater then $90°$.