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Bifurcation of Motions of Three Vortices and Applications

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We study pertured planar motion of three point vortices for special combinations of strengths and distances between them such that the triangle they form will remain similar. Depending on the orientation of the vortices, the similar triangles will be either contracting or expanding. The contracting (expanding) solution was shown to be unstable (stable). We show that when the ratios of the sides of a contracting triangle are perturbed, the triangle bifurcates from the similar solution and finally approaches the corresponding expanding similar solution, i.e. the one with the opposite orientation. We then study a related perturbation problem with the planar motion of three vortices serving as the leading order approximation to that of three slender coaxial vortex rings in a meridian plane having radii much larger than the distances between the rings.

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