1147-37-856 **Maxim Arnold*** (maxim.arnold@utdallas.edu), **Dmitry Fuchs**, **Ivan Izmestiev** and **Serge Tabachnikov**. *Evolutes of the ideal hyperbolic polygons.*

Evolute of the planar curve can be described as a set of the centers of all osculating circles to the curve. One way to define an evolute of a polygon is to define the centers of the circumcircles for all triplets of consecutive vertices. Thus the sides of the evolute are perpendicular bisectors to the sides of the polygon. In the case of ideal hyperbolic polygons the above construction provides the new ideal polygon whose sides are perpendicular to the respective sides of the given polygon. In the suitable coordinates one gets the sequence of relations for the cross-ratios: $[p_j, p_{j+1}, q_j, q_{j+1}] = -1$.

These relation extends to different values of constant in the right hand side as well as to twisted ideal polygons, that is, polygons with monodromy, and it descends to the moduli space of Moebius-equivalent polygons. We prove that this relation, which is, generically, a 2-2 map, is completely integrable in the sense of Liouville. We describe integrals and invariant Poisson structures, and show that these relations, with different values of the constants in the right hand side, commute, in an appropriate sense.

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