Geometrical Properties of The Moduli Space of Polygons in $\mathbb{R}^3$.

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Abstract

For any vector $r = (r_1, \ldots r_n)$, let M_r denote the moduli space (under rigid motions) of polygons in $\mathbb{R}^3$ with n-sides whose lengths are $r_1, \ldots, r_n$. We give an explicit characterization of the oriented S^1-cobordism class of M_r which depends uniquely on the length vector r, and we prove a formula expressing the volume of M_r as a piecewise polynomial function in the r_i's (in accordance with the Duistermaat–Heckman Theorem). An interesting application of the volume formula for M_r is the calculation of the cohomology ring $H^*(M_r)$ of M_r. In fact we show that the coefficients of the Duistermaat–Heckman polynomial encodes all the necessary information on the generators and relators of $H^*(M_r)$.