

Relating second order geometry of manifolds in Euclidean spaces through projections and normal sections

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We use normal sections to relate the curvature locus of regular (resp. singular corank 1) 3-manifolds in \mathbb{R}^6 (resp. \mathbb{R}^5) with regular (resp. singular corank 1) surfaces in \mathbb{R}^5 (resp \mathbb{R}^4) . For example we show how to generate a Roman surface by a family of ellipses different to Steiner's way. Furthermore, we give necessary conditions for the 2-jet of the parameterization of a singular 3-manifold to be in a certain orbit in terms of topological types of the curvature loci of the singular surfaces obtained as normal sections. We also study the relations between the regular and singular cases through projections. We show there is a commutative diagram of projections and normal sections which relates the curvature loci of the different types of manifolds, and therefore, that the second order geometry of all of them is related.