

# Curvature Based Functions Variations and Applications

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In case of bendable surfaces, it is useful to discuss the variation of magnitudes such as the shape operator. The shape operator is a good way to measure how a regular surface bends in  $\mathbb{R}^3$  by valuation how the surface normal changes from point to point. We considered the variation of shape operator under infinitesimal bending of surface given in an explicit form and its application in considering what happened with the elliptic, hyperbolic, parabolic kind of points under the infinitesimal bending of surface.

We also considered the variation of curvature based functionals of some ruled surfaces, such as Gaudi surface with wide application in architecture, as well as helicoid with application on DNA helices or, more precisely on the flexibility of DNA molecule, i.e., the flexibility of double helix in infinitesimal bending theory.