1000-35-29 **A Majumdar**, **J M Robbins** and **M Zyskin*** (M.Zyskin@bris.ac.uk), Department of Mathematics, University of Bristol, BS8 1TW Bristol, England. *Harmonic Tangent Unit Vector Fields on Polyhedra.*

We are considering unit-vector fields (ie, maps to S^2) on a convex three-dimensional polyhedron P in R^3 which, on the faces of P, are required to be tangent to the faces. Homotopy classes of continuous tangent unit vector fields on P with vertices removed are classified by edge signs (two possible directions parallel to an edge), kink numbers for pairs of edges with a common vertex (relative degrees of $S^1 \mapsto S^1$ maps in their common face), and wrapping numbers (relative degrees of maps on surfaces in P separating a vertex from other vertices). A lower bound for the energy of continuous tangent unit vector fields is obtained in terms of homotopy invariants. On a rectangular prism, an upper bound for the energy is obtained for a large family of homotopy types which differs from the lower bound by a constant factor depending on the aspect ratios of the prism. Transitions between regular and singular-on-edge minimal-energy configurations are observed as a function of the aspect ratios. Research is related to problems in bi-stable liquid crystal display designs. (Received July 20, 2004)