

1030-53-24

**Oksana Bihun\*** ([oksana@math.missouri.edu](mailto:oksana@math.missouri.edu)), Department of Mathematics, University of Missouri-Columbia, 202 Math. Sci. Bldg, Columbia, MO 65211, and **Carmen Chicone** ([carmen@math.missouri.edu](mailto:carmen@math.missouri.edu)). *Optimization of the Distortion Energy Functional over Homotopy Classes of Diffeomorphisms.*

Let  $M$  and  $N$  be smooth compact orientable Riemannian  $n$ -manifolds equipped with the Riemannian metrics  $g_M$  and  $g_N$  respectively. We consider the problem of mapping the manifold  $M$  to  $N$  via a diffeomorphism  $f$ , which distorts the manifold  $M$  as little as possible. Results on the existence of minima of the functional  $\Phi(f) = \int_M \|f^*g_N - g_M\|^2$  will be presented. We will also discuss a related problem: Let  $M$  be equipped with two Riemannian metrics  $g_1$  and  $g_2$ , together with corresponding second fundamental forms  $II_1$  and  $II_2$ . We consider the problem of minimizing the energy functional  $E(v) = \|v\|_X^2 + \int_M \|(h^v)^*g_2 - g_1\|^2 + \int_M \|(h^v)^*II_2 - II_1\|^2$  over the class of time-dependent vector fields  $v \in X = L^2([0, 1]; W^{k,2}(TM))$ , where  $h^v$  is the time-one map of the evolution operator induced by the vector field  $v \in X$  ( $h^v$  belongs to a certain homotopy class),  $k \in \mathbb{N}$  and  $TM$  denotes the tangent bundle of  $M$ . A proof of the existence of a minimizer of the energy functional  $E$  in  $X$  will be sketched. (Received June 18, 2007)