1124-65-349 **Evan Gawlik** and **Melvin Leok*** (mleok@ucsd.edu). *Interpolation on Symmetric Spaces via the Generalized Polar Decomposition.*

We construct interpolation operators for functions taking values in a symmetric space – a smooth manifold with an inversion symmetry about every point. Key to our construction is the observation that every symmetric space can be realized as a homogeneous space whose cosets have canonical representatives by virtue of the generalized polar decomposition – a generalization of the well-known factorization of a real nonsingular matrix into the product of a symmetric positive-definite matrix times an orthogonal matrix. By interpolating these canonical coset representatives, we derive a family of structure-preserving interpolation operators for symmetric space-valued functions. As applications, we construct interpolation operators for the space of Lorentzian metrics, the space of symmetric positive-definite matrices, and the Grassmannian. In the case of Lorentzian metrics, our interpolation operators provide a family of finite elements for numerical relativity that are frame-invariant and have signature which is guaranteed to be Lorentzian pointwise. We illustrate their potential utility by interpolating the Schwarzschild metric numerically. (Received September 13, 2016)