1086-VN-2567 **Chad N Vidden*** (viddenc@uwplatt.edu). *Where Galerkin, Hilbert, and Wilf intersect: an application of the snake oil method for combinatorial sums to finite element method analysis.* Preliminary report.

A new finite element method called the symmetric direct discontinuous Galerkin method for solving diffusion partial differential equations is presented . Within the scheme formulation, there are two free parameters (β_0, β_1) which need to be chosen carefully in order to ensure convergence and accuracy of the method. A notion of numerical flux admissibility is defined to guide the choice of β terms. Analyzing the definition of admissibility leads to an explicit formula used to calculate β terms, but to do so, properties of finite Hilbert matrices need to be shown. To prove Hilbert matrix properties, Wilf's snake oil method for combinatorial sums is used. (Received September 25, 2012)