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Changchun Wang* (cwang@math.tamu.edu), 1100 Hensel Dr. Apt Y3L, College Station, TX 77840. *On theory and numerical method for computing eigen-solutions of nonlinear elliptic equation with Neumann boundary condition.* Preliminary report.

In order to numerically solve nonlinear elliptic eigen solution problems, a new formulation is developed by focusing the study of the problems on their variational energy profile and using the implicit function approach. Then a modified local minmax method is devised to compute the solutions in the order of their eigenvalues. The nonlinear Neumann boundary value eigen solution problems are very different from their Dirichlet counterparts and the linear ones. In particular, the former has, in addition to those sign-changing solutions, a positive constant solution which may bifurcate to many positive solutions. So a result based on Morse index approach is established to identify bifurcation points and to help computing positive solutions. Numerical results will be presented to illustrate the theory and method. This research is supported in part by NSF DMS-0713872/0820327/1115384. (Received September 22, 2011)