In this talk, a modified local minimax method with new strategies is presented to numerically solve for multiple positive solutions to a singularly perturbed Neumann problem. Algorithm convergence and other related properties are verified. Motivated and convinced by new numerical results, the critical perturbation value is analytically verified, which closes a gap left in the literature for estimating such a value. Some interesting numerical results are displayed by their mesh profiles to illustrate the theory and method. (Received September 09, 2010)