Perturbed Boundary Value Problems on Unbounded Domains

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In this talk we study perturbed boundary value problems on unbounded domains. The conventional naive asymptotic expansions don't work for this type of problems, and usually multiple scale analysis is needed. In stead of switch-back and the multiple scale analysis by other researchers, we will construct generalized asymptotic expansions to handle the problem. Using rigorous analysis, we can show that the generalized asymptotic expansions are also uniformly convergent. To demonstrate this method, we will case-study the Lagerstrom model. The extension to the Poisson-Boltzmann equation is also feasible. The talk is based on two recent papers published in Asymptotic Analysis, the first one joint with Prof. R. Wong and the second one with Prof. M. Ma.