PROJECT PROPOSAL (STANDARD)

PROJECT NAME	Smoothing Properties of Initial-Boundary Value Problems
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PROJECT SUMMARY	Given a dispersive partial differential equation (PDE) on a certain domain, it is one of the major research directions to analyze the behavior of solutions with regards to the initial and boundary data. More precisely, main aim is to prove local and global in time well-posedness and possibly that the nonlinear solution belongs to a smoother (better) function space than that of the initial data. This proposed study is about utilizing harmonic analysis techniques to resolve some of the smoothing and consequently well-posedness issues for initial-boundary value problems of certain dispersive PDEs. Such techniques have been successfully applied on $\mathbb{R}^d$ and $\mathbb{T}^d$ (d-dimensional torus) by many mathematicians since early 1990s following the seminal papers of Bourgain. From mid 2000s and onwards, similar methods have been used to prove well-posedness of dispersive PDEs on half or fully bounded domains. Recently, also nonlinear smoothing estimates have been obtained for the Schrödinger equation with cubic nonlinearity, Zakharov system and derivative nonlinear Schrödinger equation on the half-line. These estimates simplified or improved the previous well-posedness theories of the initial-boundary value problems of the relevant equations. In the light of our previous work, we plan to examine initial-boundary value problems of the Kadomtsev-Petviashvilli (third and fifth order) and Zakharov-Kuznetsov equations as examples.