A unified transform approach to prove Strichartz estimates for initial-boundary value problems*

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The unified transform method (UTM), a.k.a. the Fokas method, is an effective tool for defining (weak) solutions to boundary value problems (BVPs) in terms of boundary integral operators that explicitly depend on given data. These boundary integral operators are constructed through complex analytical arguments and offer several advantages over traditional transform methods. I briefly go over the UTM in a canonical setting, where the main differential operator includes a biharmonic term. I then present a novel approach for proving dispersive estimates for BVPs in terms of the size of boundary data in Sobolev spaces. These estimates eventually imply Strichartz estimates, which are essential for proving local well-posedness for nonlinear PDEs in a low regularity setting where the Banach algebra property breaks. Our approach combines the nice space time structure of UTM formulas with fundamental tools from harmonic analysis. In particular, the Van der Corput lemma plays a crucial role. In most parts of the talk, the discussion will be restricted to the one-dimensional setting. However, if time allows, I will move to multidimensional problems and show that certain analyticity issues may then arise due to the discontinuity of complex root functions. I will introduce some tricks to tackle these difficulties.

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