

Abstract

We demonstrate and develop dyadic–probabilistic methods in connection with non-homogeneous bilinear operators, namely singular integrals and square functions. We develop the full non-homogeneous theory of bilinear singular integrals using a modern point of view. The main result is a new global Tb theorem for Calderón–Zygmund operators in this setting. Our main tools include maximal truncations, adapted Cotlar type inequalities and suppression and big piece methods.

While proving our bilinear results we also advance and refine the linear theory of Calderón–Zygmund operators by improving techniques and results. For example, we simplify and make more efficient some non-homogeneous summing arguments appearing in $T1$ type proofs. As a byproduct, we can manage with ease quite general modulus of continuity in the kernel estimates. Our testing conditions are also quite general by virtue of the big piece method of proof.