



SOME EQUIVALENT MULTIREOLUTION CONDITIONS ON LOCALLY COMPACT ABELIAN GROUPS

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ABSTRACT. Conditions under which a function generates a multiresolution analysis are investigated. The definition of the spectral function of a shift invariant space is generalized from \mathbb{R}^n to a locally compact abelian group and the union density and intersection triviality properties of a multiresolution analysis are characterized in terms of the spectral functions. Finally, all multiresolution analysis conditions are characterized in terms of the scaling and the spectral functions.

1. INTRODUCTION

The idea of multiresolution analysis (which will be abbreviated to "MRA") was developed in 1986 by S. Mallat and Y. Meyer and was fully presented in the famous paper [21] and then improvements have been done in [10, 14]. In recent years, the concept of MRA has become an important tool in mathematics and applications. It provides a natural framework for understanding of wavelet bases, bases that consist of the scaled and integer translated versions of a finite number of functions, and the construction of new examples. The theory of MRA has its roots in image and multiscale signal processing, and it concerned with the decomposition of signals into subspaces of different resolutions. If we think of the core subspace V_0 as a specified level of resolution, then moving to V_1 amounts to "zooming in" and increasing resolution by one level. On the other hand, V_{-1} represents one lower level of resolution,

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