Special Skew-Weyl relations and discrete time-frequency analysis

U. Kähler

In recent years one can observe an increasing interest in obtaining discrete counterparts for various continuous structures. One of the principal topics is the construction of discrete Dirac operators and its corresponding function theory. If we look into the continuous case one of the principal approaches is the one developed by F. Sommen which is based on Weyl relations and on the study of the algebra of endomorphisms. But a direct application of this method by using discrete Weyl relations creates some rather difficult problems since one has to work with two different relations for forward and backward difference operators (instead of a single partial derivative operator). For instance, while it is possible to construct Dirac operators which factorize the star Laplacian, the resulting vector variable operators from the Weyl relation are not creating a second-order scalar operator as in the continuous case. Furthermore, they do not commute like foward/backward differences, thereby creating a different algebraic structure. One way to overcome this problem is to use a special type of skew-Weyl relations, so-called Sommen-Weyl relations. In this talk we will show the advantages of such an approach in constructing discrete function theories and study its links with Umbral calculus and (discrete) time-frequency analysis.