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**FAKULTÄT FÜR MATHEMATIK**
**Dekan Univ.–Prof. Dr. Harald Rindler**

Einladung zur öffentlichen Defensio von

## Dipl.-Ing. Engelputzeder Nina

Thema der Dissertation:

# Linear Time Variant Systems and Gabor Riesz Bases

Abstract: Embedded in the context of application oriented harmonic analysis, the first part of the work is devoted to linear time variant systems (LTV). As a particularly important class of operators (LTV systems) the structure of Gabor multipliers is studied in this thesis. Gabor multipliers are operators which are generated through decomposition of a function through a Gabor frame, pointwise multiplication with a weight function (mask) and reconstruction via the dual frame. Besides constituting an intuitive way of time variant filtering, they are of special importance as most operators coming up in engineering applications can be approximated well with Gabor multipliers]. There are two key research question motivated by numerical filtering applications in acoustics which are treated in the first part of this thesis. First, it currently seems to be common practice in the acoustics research community to use Gabor multipliers for the purpose of near time implementations of linear time invariant (LTI) filters. It will be shown that from an analytical point of view this operators are not exactly identical even though in most cases results seem very similar. The error will be analysed and error estimates will be given. Moreover suited parameter combinations will be deduced and put at hand to practitioners in order to guarantee sufficient approximation quality for applications. Second, the interconnection between the finite discrete Gabor multiplier as implemented in applications and the continuous infinite dimensional Short-Time-FourierTransform multiplier - for which abstract mathematical results are valid - is investigated. In this work, as link in between, the concrete quantitative and qualitative behavior of the sampling and discretization error is investigated. The second large part of the thesis project deals with the design of Gabor Riesz bases for mobile communication applications. The underlying theoretical problem is motivated in a wider setting by the practical problem of signal transmission in wireless communication. In particular the part of signal modulation is considered. In particular two designs, a special structure of a multi pulse Gabor Riesz basis and the Hermite functions as basis for the transmission, are compared with respect to spectral efficiency, numerical efficiency and stability of results. Such designs can be used for Cyclic prefix orthogonal frequency-division multiplexing (CP-OFDM) [97] [106] [118] [29], which is a multicarrier scheme being used or proposed for numerous wireless standards like WLAN (IEEE 802.11a/g/n, HIPERLAN/2), broadband wireless access (IEEE 802.16), wireless personal area networks (IEEE 802.15), and digital audio and video broadcasting (DAB, DRM, DVB-T).

Prüfungssenat:

ao. Univ.-Prof. Mag. Dr. Günther Hörmann (Vorsitz)
(Universität Wien)

ao. Univ.-Prof. i.R. tit. Univ.-Prof. Dr. Hans Georg Feichtinger
(Universität Wien)

Ao.Univ.Prof. Dipl.-Ing. Dr.techn. Gerald Matz
( Technische Universität Wien)

Doz. Dr. Peter Balazs
(Institut für Schallforschung OEAW, Wien)

**Zeit:** Freitag, 19. Februar 2016, 15:00 Uhr

**Ort:** Fakultät für Mathematik, Besprechungsraum 02. Stock, Oskar-Morgenstern-Platz 1