as a time warping followed by a Fourier Transform, which enables an efficient implementation using the FFT. Although many of these techniques were applied to speech [84], the use of time-frequency representations other than the STFT for music analysis remains rather scarce [76, 85] and in particular the FChT to the best of our knowledge has almost not been explored for this purpose, except a very few exceptions [86, 87].

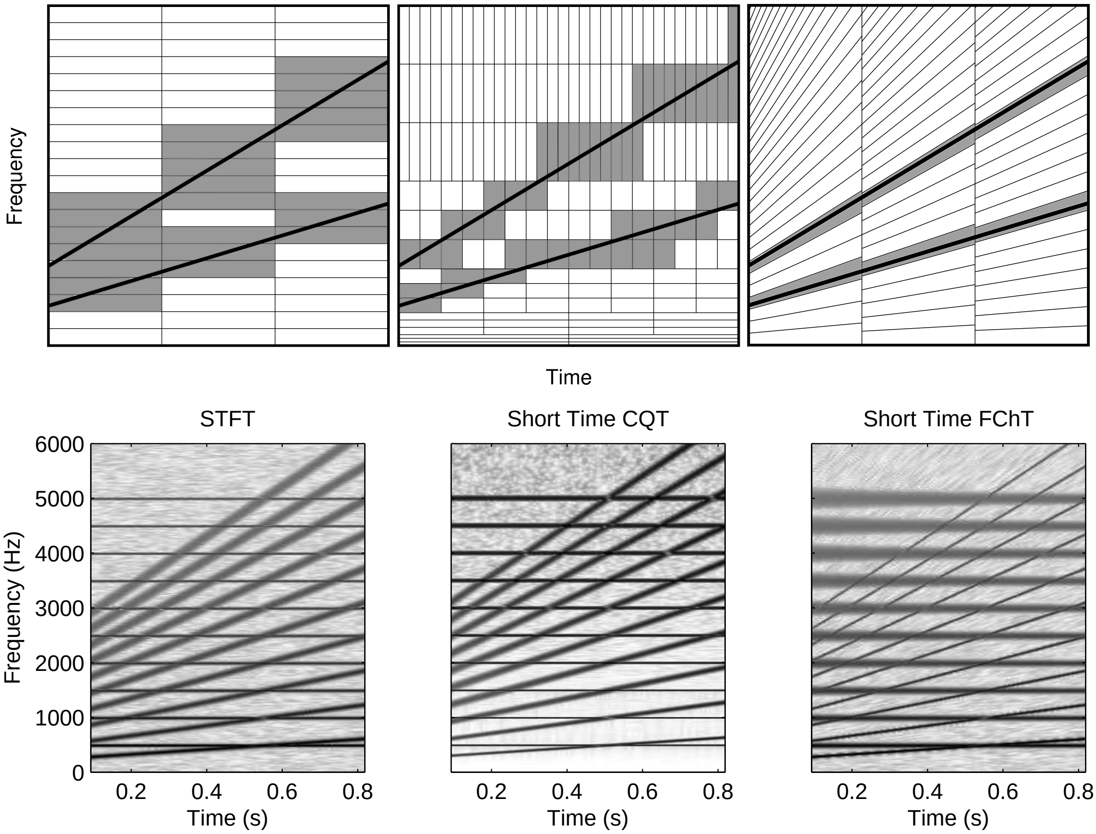

FIGURE 7.1: Above: Time-frequency tiling sketch for the STFT, the Short Time CQT and the Short Time FChT (from left to right). The resulting resolution for an harmonic chirp with two components is depicted. Below: Analysis of a synthetic stationary harmonic signal and an harmonic chirp, for each time-frequency representation.

In the course of our work two different time-frequency representations were studied and further developed, namely the Constant-Q Transform and the Fan Chirp Transform. Existing efficient algorithms for multi-resolution spectral analysis of music signals were reviewed [88, 89], and compared them with a novel proposal based on the IIR filtering of the FFT [73]. The proposed method, apart from its simplicity, shows to be a good compromise between design flexibility and reduced computational effort. With regards to the Fan Chirp Transform, a formulation and an implementation was proposed devised to be computationally manageable and which enables the generalization of the FChT for the analysis of non-linear chirps [74]. Besides, the combination with a constant Q Transform was explored in order to build a multi-resolution FChT.

Figure 7.1 shows a comparison of the time-frequency tiling for the STFT, the Short Time CQT (STCQT) and the Short Time FChT (STFChT). The resulting resolution