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FlameCens: Visualization of Expressive Deviations in Music Performance

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Abstract : Music interpretation accounts to the way musicians shape their performance by deliberately deviating from composers' intentions, which are commonly communicated via some form of music transcription, such as a music score. For transcribed and non-improvised music, music expression is manifested by introducing subtle deviations in tempo, dynamics and articulation during the evolution of performance. This paper presents an application, named FlameCens, which, given two recordings of the same piece of music, presumably performed by different musicians, allow visualising deviations in tempo and dynamics during playback. The application may also compare a certain performance to the music score of that piece (i.e. MIDI file), which may be thought of as an expression-neutral representation of that piece, hence depicting the expressive queues employed by certain performers. FlameCens uses the Dynamic Time Warping algorithm to compare two audio sequences, based on CENS (Chroma Energy distribution Normalized Statistics) audio features. Expressive deviations are illustrated in a moving flame, which is generated by an animation of particles. The length of the flame is mapped to deviations in dynamics, while the slope of the flame is mapped to tempo deviations so that faster tempo changes the slope to the right and slower tempo changes the slope to the left. Constant slope signifies no tempo deviation. The detected deviations in tempo and dynamics can be additionally recorded in a text file, which allows for offline investigation. Moreover, in the case of monophonic music, the color of particles is used to convey the pitch of the notes during performance. FlameCens has been implemented in Python and it is openly available via GitHub. The application has been experimentally validated for different music genres including classical, contemporary, jazz and popular music. These experiments revealed that FlameCens can be a valuable tool for music specialists (i.e. musicians or musicologists) to investigate the expressive performance strategies employed by different musicians, as well as for music audience to enhance their listening experience.

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