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**Musical Variations from a Chaotic Mapping** by Diana S. Dabby

In this paper Dabby proposed a chaotic mapping for generating musical variations of an original work. A variation in music is not just an altered version of the original work, but an achievement of variability which is still recognizable as the same piece. Unlike other applications inspired by chaotic dynamics, Dabby used the original piece as the source of the variations via chaotic mapping which allows complete freedom for generating music ideas. The output variations will have no limits for number of versions and will be suitable for any musical style.

Dabby indicated that the sensitive dependence property of chaotic trajectories offers a natural mechanism for variability. She applied the Lorenz equations to produce chaotic trajectory, and the *x*-values of the trajectory are mapped to pitches. For the original piece, each pitch corresponds to the *x*-values in order. For the variation, another trajectory is generated by different initial condition. A chaotic mapping is utilized to map the new trajectory to the original trajectory for generating pitches of the variation. The mapping ensures that only pitches in the original sequence will appear in the variation. The degree of variation is controlled by the initial condition.

In order to evaluate the chaotic mapping technique, Dabby first provided three variations with different degrees of variability of J.S. Bach Prelude in C Major from *the Well-Tempered Clavier, Book I*. Each variation demonstrated different strategies of changes, and established different new music ideas. For example, an appoggiatura was presented in variation 1, and melodic figuration and superimposed voices were observed in variation 2. In variation 3, a greater diversity was generated in rhythm, in which the durations of the beat patterns were redefined. Dabby also presented a variation from Gershwin's prelude for piano to show the mapping's capability of various styles.

In the last part of the paper, Dabby discussed the setting of parameters for the chaotic mapping. Factors, such as the choice of initial condition, step size, length of the integration, and the amount of truncation, need to be carefully arranged for maintaining the tracking ability between the original piece and the variation.

When I listened to the audio examples of the paper provided by the author, I was amazed by the quality of the results. It may be counter-intuitive to imagine that applying chaotic theory can produce a variation which keeps the original musical theme and structure. After the presentation, some people argued that the chaotic mapping simplifies the chaotic trajectory and does not contain the main characteristics of chaos, and the whole task may be accomplished by other simpler methods instead of using chaotic theory. I think the purpose of this paper is not to prove that chaotic theory is the most suitable or the easiest method for generating variation. Instead, the design of the mapping (modifying an existing theory to meet the requirements of musical variation) and ways of evaluating the quality of variations (the definition of variation degree and musical ideas) are the main contributions of this paper.