

# Pa-Pi-Pun: A System for Creating Jazz Harmony From Simple Chord Progressions

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Pa-Pi-Pun[1] takes a simple chord progression as an input and then generates a jazzy progression automatically. In general, a specific chord progression pattern that provides a feeling of punctuation and termination is called a cadence (in jazz and pop, a cadence normally consists of a few to several chords). Pa-Pi-Pun arranges the input chord progression, taking into account the flow of harmonic context on a cadence basis.

Pa-Pi-Pun employs case-based reasoning and a deductive object-oriented database for musical knowledge representation. Based upon these techniques, we have developed a new data structure, called the cadence tree, which represents the intention of a performer or a composer in terms of the piece to be arranged by taking hints from an existing music analysis theory, and an algorithm that calculates musical similarity (Fig. 1). In addition, a dedicated GUI (Fig. 2, Context Editor) is implemented in Java and thus Pa-Pi-Pun can be used anywhere through the Internet.

These features give Pa-Pi-Pun capabilities that conventional systems do not have. First, tacit knowledge, such as an individual musician's understanding of the flow of a piece and the fingering patterns of chords, can be explicitly described. Since the Context Editor allows the musician's intention to be transferred to the system, the user can modify the output performance as desired. Finally, a musician selects the case bases to be used, and the system can create a piece and a performance imbued with a deep sense of musical introspection and intuition. We suggest the following applications to fully utilize the technology developed for Pa-Pi-Pun: a jazz arranger that imitates a specific musician, interactive musical games on the Internet, and a creativity-support tool for the professional musician.

In the future, we intend to construct a musical system called the machine musician that will have the same musical ability and intelligence as a human musician. For this purpose, we will tackle the problems of listening, performance, composition, creativity, personality, evolution, and realtime processing.

- [1] Hirata, K., and Aoyagi, T. Pa-Pi-Pun: intelligent jazz harmony creation system that can be interactively used by anyone anywhere, Information Processing Society of Japan, *99-MUS-31 (SIGMUS Vol. 99, No. 68)*, pp. 7–12 (1999).

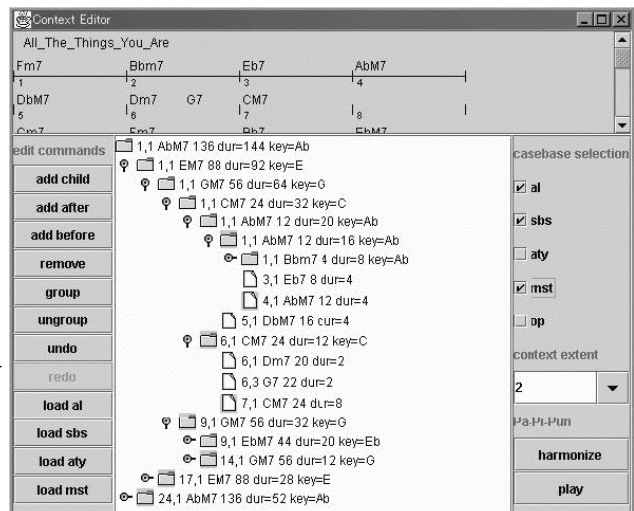
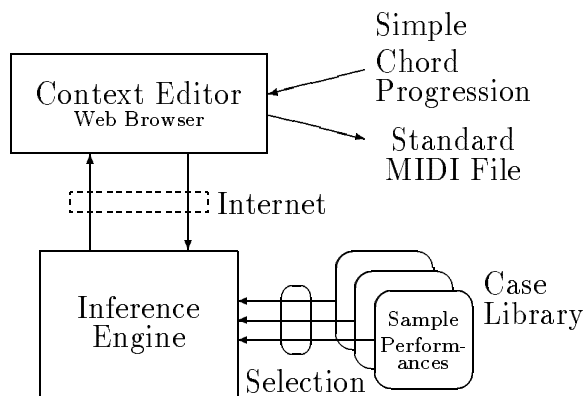


Fig. 1: System Configuration of Pa-Pi-Pun

Fig. 2: Context Editor Window