A Jazz Session System for Interplay among All Players
— VirJa Session —
(Virtual Jazz Session System)

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1. Introduction

What is Important in Jazz Session?
- Interplay
  All players improvise together while reacting to other players’ performances with no leader-follower relationship
- Multimodal Interaction
  Communicate by musical sounds and additional visual information such as gestures

Our Goal
- Build a computer system that enables interplay among humans and computers
- Simulate the actual interaction that occurs among human players

Related Work
- Jazz session / Automatic accompaniment
  - Generate several accompaniment parts together
  - Only react to the soloist’s performance
  - Fixed leader-follower relationship
- Mention interaction among computer players
  - Only focus on the music-listening process
  - Not generate musical performance

2. Jazz Session Model for Interplay

Jazz Session Model
- All players can listen and react to all other players
- Interact without fixed leader-follower relationship
- Computer players play a kind of solo

Imagine: All Players are Human Players
- Useful for remote sessions in which players are not in the same physical location
- Exchange musical information through computer networks

Imagine: All Players are Computer Players
- Effective when various designers implement different computer players with various characteristics
- Designers’ substitutes interact with each other

Virtual Jazz Trio
- Computer players are executed as separate processes
- Player 2 listens to Player 3 as well as Player 1
- Player 2 and 3 interact with each other
3. VirJa Session (CG and Camera)

- VirJa Session
  - All players communicate both by listening to other players by seeing each others’ bodies and gestures.

- Features
  - Multimodal interaction among all players using both auditory and visual information
    - Human Player: See computer players on CG
    - Computer Player: See human player by camera
      - By computer player via network
  - For players:
    - Feel the presence of other players as if they were actually playing together
      - Cooperate well through visual information
  - For audiences:
    - Feel the presence of all players as if they were attending a live concert

- Visualization of Computer Players on CG
  - Motions
    1. Playing musical instruments according to his sounds
    2. Keeping time to musical beats by foot-tapping or rocking his body
    3. Making two kinds of gestures
    4. Nodding to show that he understood a gesture
    5. Turning his eyes to another player

- Scenario
  - Song form: combination of song parts
    - Theme → piano solo → bass solo
      - Four verses (piano / drums) → theme (reprise)

4. Computer Bassist and Drummer

- Music Listening
  - Musical primitives
    - Chord note, Tension note, Scale note
      - Substitute chord note, Theme note, Loud note, High note, Many notes
  - Intention parameters
    - Excitement, Rhythm emphasis, Tension, Chord emphasis
      - Chord substitution, Theme reprise
  - Leadership percentage
    - Determine how much he tries to lead the session

- Session Understanding
  - Consider the whole musical relationships among players
  - Determine how much he tries to lead the session

- Performance Improvising
  - Select databases
    - Combine patterns
  - Choose Pitch/Loudness/Rhythm Patterns from Databases

5. Implementation

- Environment
  - SGI Indigo2
    - Impact x 1
    - Extreme x 2
  - Ethernet
  - MIDI
  - RMCP
    - (Remote Music Control Protocol)
    - Communication protocol on the UDP/IP based on the server-client model

- RMCP Servers and Clients
  - RMCP MIDI Receiver
    - Take the human player’s performance as input
  - RMCP Player Server
    - Understand and improvise musical performance
  - RMCP Beat Provider
    - Keep the tempo of the whole performance
  - RMCP Sound Server
    - Output sounds of the computer players’ performances
  - RMCP Animation Server
    - Display each computer player through CG animation
  - RMCP Camera Analyzer
    - Recognize the human player’s gestures through camera
6. Experiments and Results

☐ Conditions
- Four-beat jazz standard ‘Take the "A" Train’
- Theme, Chord progression, Key signature provided
- Tempo: 187-230 M.M., constant

☐ Results
- Achieve a jazz session in which all players interacted without the fixed leader-follower relationship
- CG animation gave the pianist a greater feeling of being at a live performance
- Achieve multimodal interaction using sounds and gestures

☐ CG output (bassist and drummer)

7. Conclusion

☐ Summary
- VirJa Session: Virtual Jazz Session System
- All players listen to the other players see each others’ bodies and gestures
- Improvise without fixed leader-follower relationship
- Interact using both musical sounds and gestures
- Implemented on distributed workstations

☐ Future Work
- Upgrade the system
  Follow tempo changes
  Support other configurations:
  piano trio in which all players are computer players sessions with different numbers of players
- Remote jazz session
  Our implementation facilitates remote jazz session
- Freeware distribution (JAVA / VRML version)
  http://www.info.waseda.ac.jp/muraoka/members/goto/PROJ/virja.html