Perceiving musical interaction between digital and acoustic instruments: A case study with the Karlax

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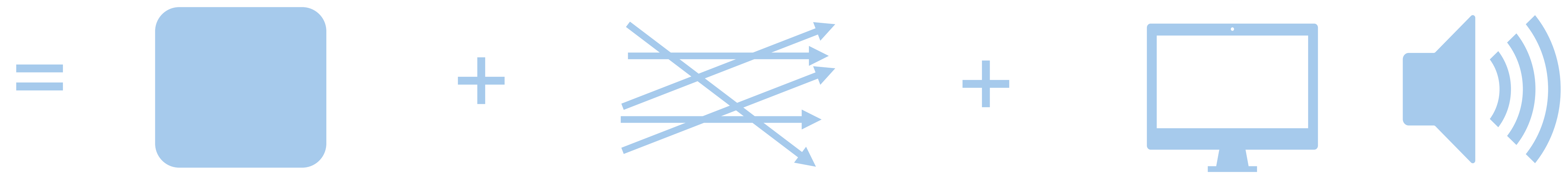
Context

Digital Musical Instrument (DMI) = **Interface** + **Mapping** + **Sound generating system[1]**



Karlax

- Workshops about performing and composing for DMIs at McGill University
- 6 pieces for Karlax + 1 acoustic instrument by 6 composition students
- Musical Interactions between acoustic and digital instruments based on perception (e.g., *Imitating*, *Shadowing*, etc.[2])

- **Research question:**
  - ***What role can DMIs play in mixed pieces with acoustic instruments?***
- ***Interaction: Two-way communication where each part is aware of (and possibly influencing) each other***

Experiment

- Participants: 36 musician participants
- Stimuli: 32 audiovisual excerpts (4 ~ 23 s)
- 8 predefined interaction categories:
  - A1I: As-one-instrument
  - BG: Background
  - C&E: Catch & Expand
  - DC: Disparate contact
  - DdID: Dialogue w/ a different identity
  - FG: Foreground
  - MC: Mimic
  - MD: Mirror dialogue
  - Mul: Mute imitation
- Tasks: free-classification based on perceived interaction + verbal description of the perceived interaction

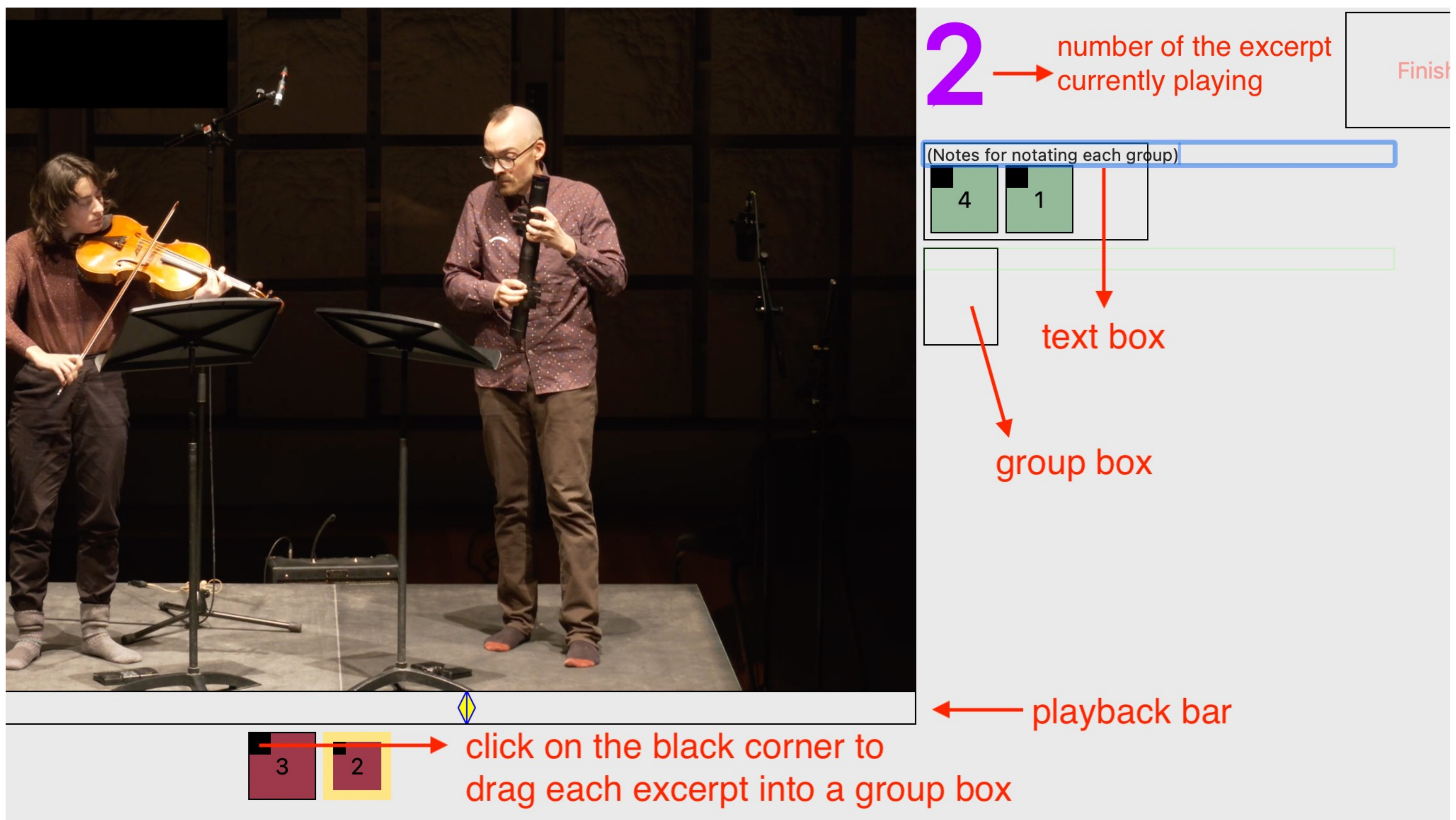


Fig 1. *Interface of the free-classification task.*

Results

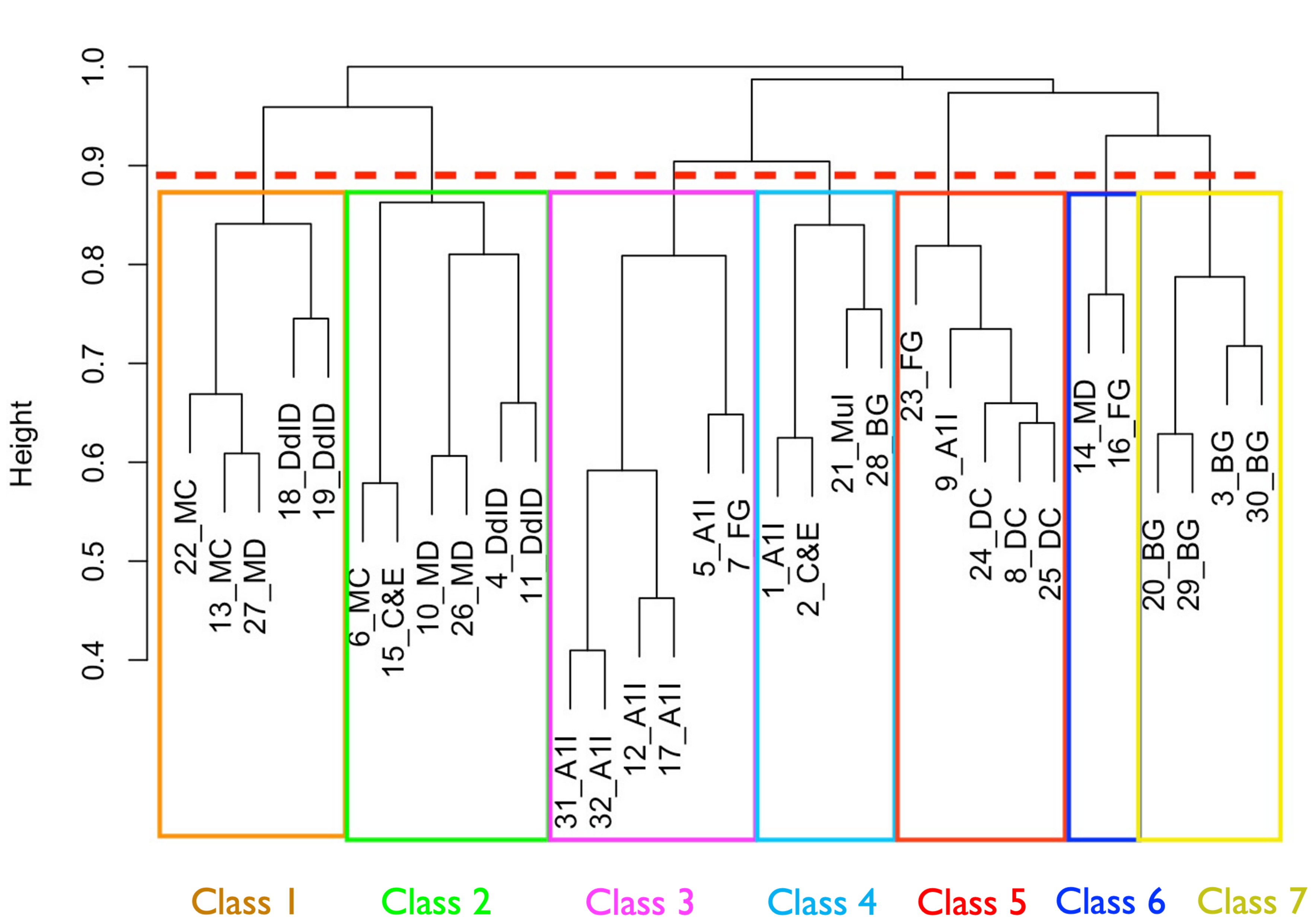


Fig 2. *Hierarchical tree structure of the 32 excerpts based on co-occurrence rate in the same group.*

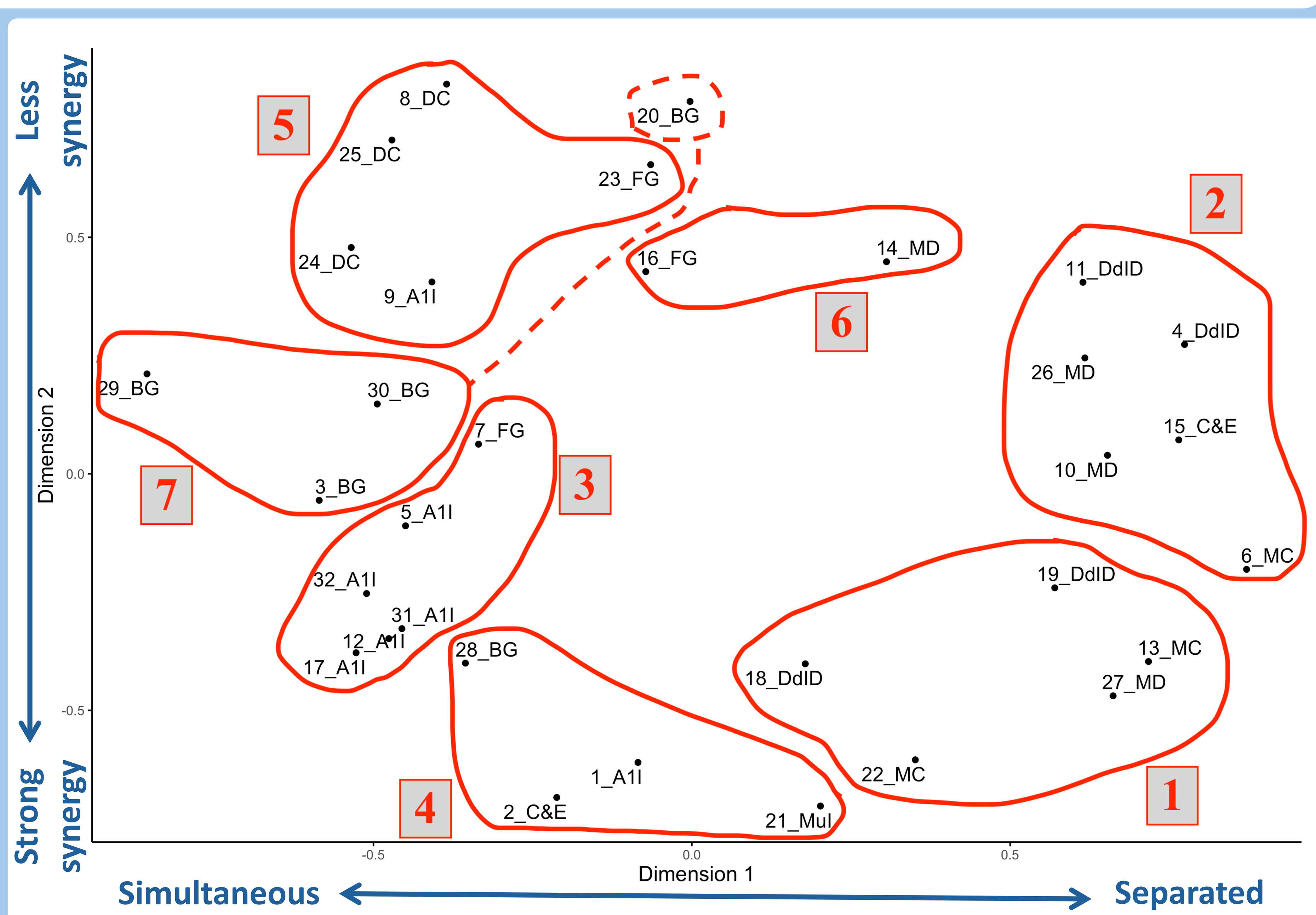


Fig 3. *Multidimensional scaling (MDS) of the 32 excerpts with co-occurrence rate as similarity measure.*

Discussion

- "Dialogue-like" interactions were successfully distinguished from "non-dialogue" interactions, with the nature of "dialogue" seemingly suggested by high degree of temporal separation of playing;
- Three interaction types ("A1I", "BG" and "DC") were robustly identified by participants that well matched the predefined categories;
- MDS suggests two conceptual dimensions underlying participants' perceptions: temporal behavior (simultaneous vs. alternating playing) & sonic/physical synergy (agreement vs. disagreement).

References

1. Miranda, E., Wanderley, M. M.: New Digital Musical Instruments: Control and interaction beyond the keyboard. A-R Editions, Inc. (2006)
2. Lavastre, B., Wanderley M. M.: Interaction strategies in composition for Karlax and acoustic instruments. In: Aramaki, F., Hirata, K., Kitahara, T., Kronland-Martinet, R., Ystad, S. (eds.) Music in the AI Era, CMMR 2021. Lecture Notes in Computer Science, vol. 13770, pp. 163–179, Springer, Cham (2023).