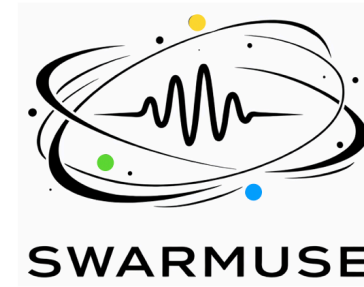


SWARMUSE

Swarm-based Musical Sense-Making: A Sensor-Driven Platform for Embodied and Emergent Music Learning

SWARMUSE operationalizes bio-inspired swarm intelligence as a **pedagogical design paradigm**, translating principles of decentralization, local interaction, and emergent coordination into a sensor-based swarm intelligent learning ecology (SILE) that promotes musical sense-making, the very basis of musical development. Within SILE, musical sense-making unfolds as a self-organizing, embodied, and collectively regulated process.



Swarm-based Musical Sense-Making: A Sensor-Driven Platform for Embodied and Emergent Music Learning

Objectives

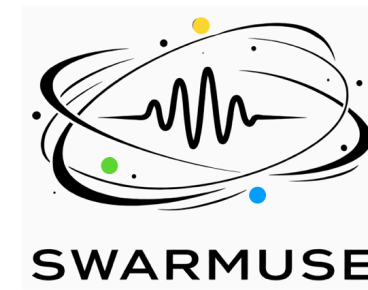
- Develop new pedagogical models of collective, embodied learning
- Investigate how interaction and coordination shape musical understanding
- Design and implement a sensor-based interactive learning environment (SILE)
- Empirically study collective dynamics such as synchronization, divergence, and group coordination
- Explore implications for inclusive, participatory, and creative learning environments

Innovation

SWARMUSE reframes learning as a distributed coordination process rather than an individual acquisition process. It combines:

- Embodied music pedagogy
- Constraint-led learning design
- Interactive technologies (wearables, sound systems)
- Models of distributed coordination inspired by complex systems

This creates a new class of hybrid human–digital learning environments, where group behavior emerges through interaction rather than instruction.

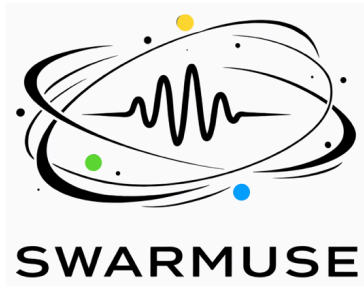


Swarm-based Musical Sense-Making: A Sensor-Driven Platform for Embodied and Emergent Music Learning

Consortium

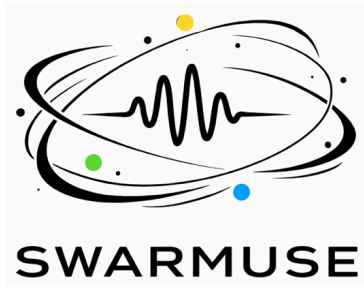
We are looking to build a multidisciplinary consortium including:

- Music education & pedagogy researchers
- Experts in embodied cognition / learning sciences
- Human-computer interaction & interactive systems
- Sensor technologies / wearable computing
- Cultural institutions (e.g., conservatories, arts organizations)
- Creative industry and educational technology partners



Theoretical/Pedagogical Background





Music Pedagogy

Kinemusical Approach

Embodied Music Pedagogy

Non-Linear Pedagogy

Constraint-led approach

Embodied Music Cognition

Active Inference

Dynamical System Theory

Swarm Intelligence

Decentralized control

Local rules → collective behaviour

Self-organisation

Local interaction → order & structure

Local interaction

Respond to local environment

Emergence

Repeated local interactions

Flexibility & Robustness

Stygmyery

Indirect communication:
modify environment

Sonification

Collective behaviour

Participatory sense-making
through collaborative improvisation

Motor behaviour:

Entrainment

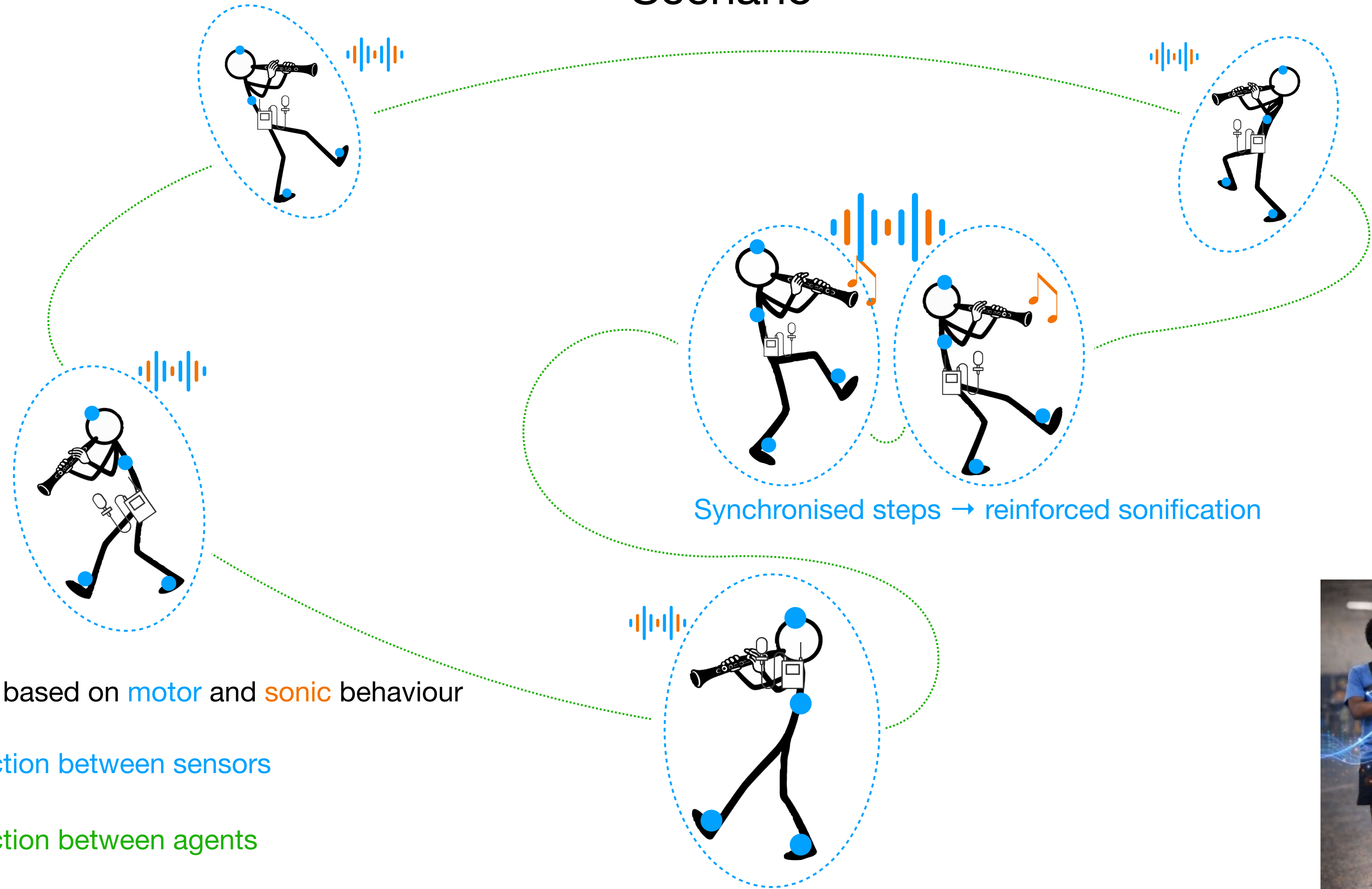
Alignment

Musical behaviour:
Synchronisation, melody, harmony, rhythm

Motor & Musical behaviour

Musical improvisations

Scenario



 sonification based on **motor** and **sonic** behaviour

 local interaction between sensors

 local interaction between agents

 music played by agent (learner)

