Andante: A Mobile Musical Agents Infrastructure

Leo Kazuhiro Ueda
Fabio Kon

{lku, kon}@ime.usp.br

Department of Computer Science
Institute of Mathematics and Statistics (IME)
University of São Paulo
Brazil

Outline

- Introduction

- Mobile Agents

- Mobile Musical Agents

- Andante architecture

- Sample applications

- Related work

- Future work

Introduction

- New forms of music composition and performace

- Mobile Agents

- Mobile Musical Agents

- Build an infrastructure to create applications (the Andante infrastructure)

- Attract the interest of composers and researchers

Mobile Agent

- Computer program capable of migrating from one machine to another

- Transfers its code and state

- Heterogeneous network

- Can decide itself to migrate

- May react to changes on the host environment

- Recently explored concept

- Provides different approaches to known problems

Mobile Musical Agent

- Mobile agent that participates in a process to create music

- They gather themselves in hosts in a network

- Analogy: musicians playing on a stage

- Each agent can perform one or more of the following actions:

  - Encapsulate an algorithm

  - Interact with other agents and/or real musicians

  - React to sensor

  - Migrate

Mobile Musical Agent

- Example
  - Distributed music
    - Room with several computers connected by a network
    - Each computer equipped with motion sensors and hosts a few agents
    - Agents communicate to each other and play a distributed music piece
    - A specific agent receives information from the sensor in order to follow someone who walks around the room

Andante

- Offers an infrastructure which can be used to build and run applications based on mobile musical agents

- Intended to run on different operating systems (such as Linux, MacOS, and Windows)

- Also create a community where composers and researchers collaborate do develop the system

- This work comprises the inital implementation of the infrastructure and a sample application
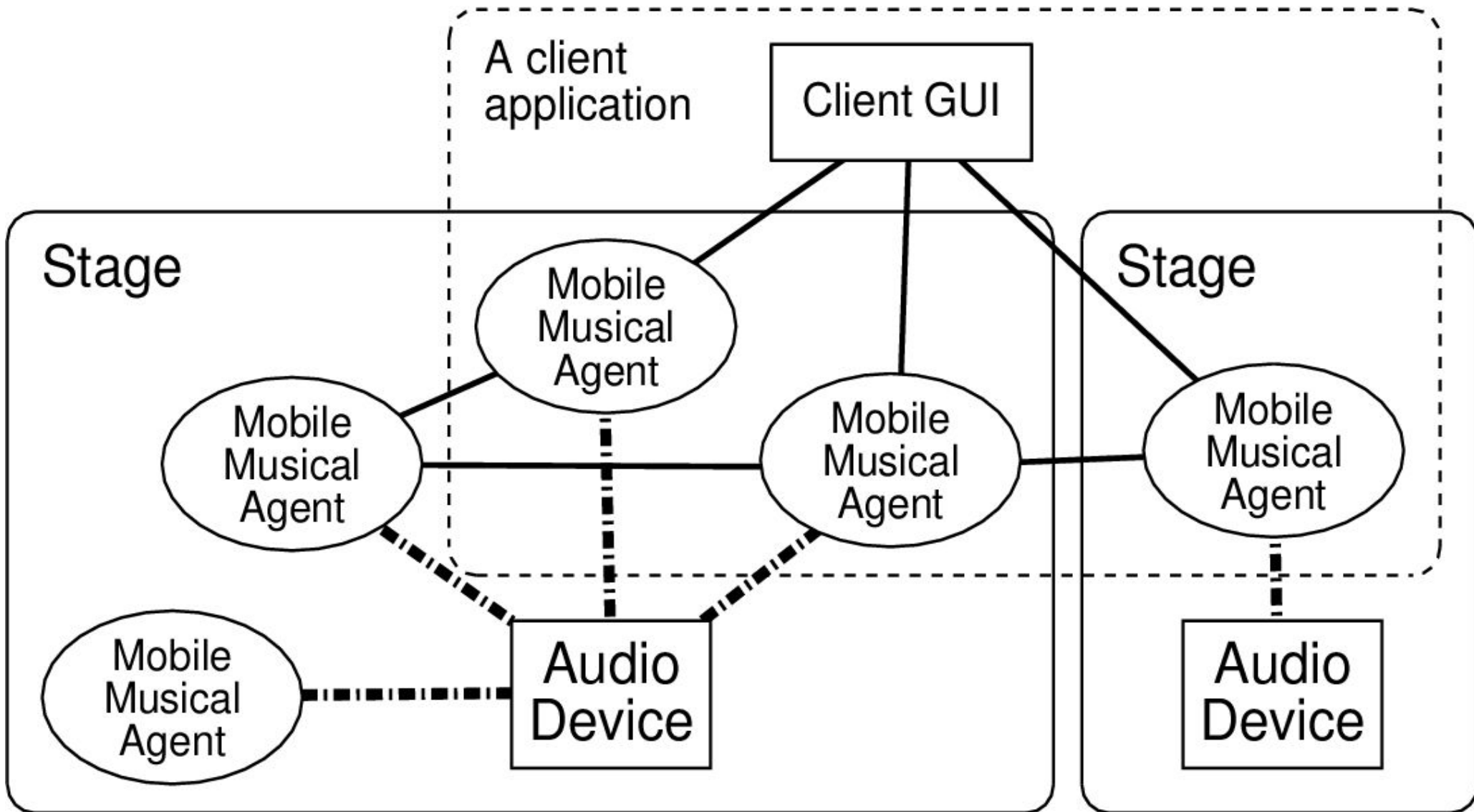
Used Technologies

- Java
  - Platform independence
  - Java Swing and Sound API
- CORBA
  - To allow the use of other languages in the future
- Aglets
  - Mobile agent system support for Java

Architecture

- *Stage* hosts *agents*

- *Agents* perform actions in a *Stage*

- *Audio Device* allows agents to produce sound

- *External program* provides human interaction with the agents

Architecture

Technical Issues

- Uses the Java Sound API

- Based on MIDI, although we plan to use other technologies (Csound, MAX/MSP)

- Latency problem: Tritonus implementation

Application: NoiseWeaver

- Sample application that takes advantage of the Andante infrastructure

- Plays stochastic music

- One kind of agent that generates a melody
  - Pitch, intensity, and duration are determined by number generators based on $1/f^b$ noises
  - Parameters determine the way the melody is generated

- Graphical interface to control parameters

- Metronome to synchronize agents

NoiseWeaver
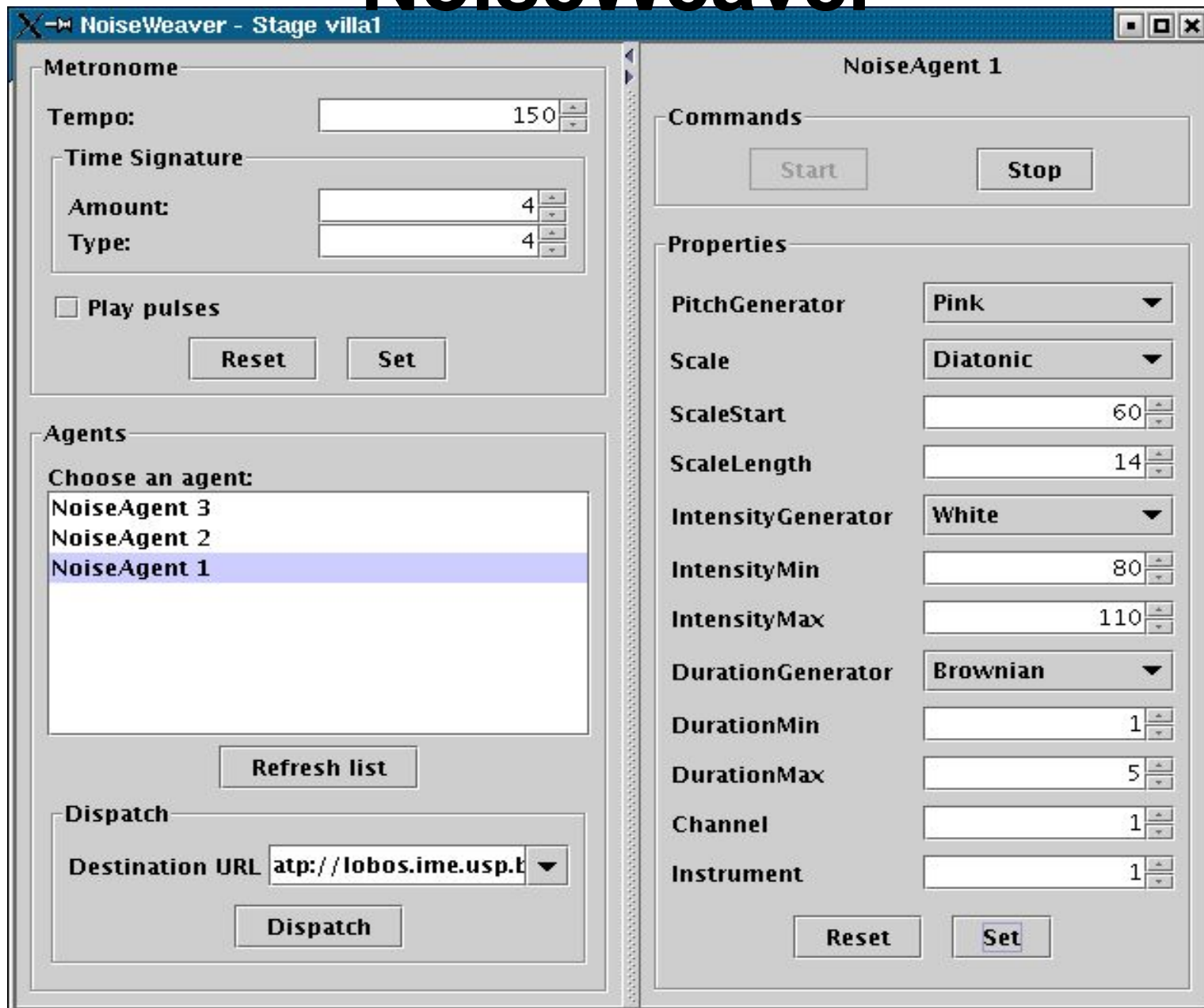
Related Work

- *Musical Agents* -Fonseka, J. R. (2000)

  - Algorithmic composition

  - Agents collaborate

- Simulations with agents (Artificial Life)

  - Miranda, E. R. (2002). Mimetic development of intonation. In *Proceedings of the 2nd International Conference on Music and Artificial Intelligence (ICMAI 2002)*. Springer Verlag - Lecture Notes on Artificial Intelligence.

Future Work

- Refinement of the system

- Csound and MAX/MSP audio devices

- Interaction with composers

- New applications that explore the mobility of the agents

- Musical pieces

Andante website:
http://gsd.ime.usp.br/andante