Audio feedback for gesture recognition

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Project outline

Motivation

Gesture recognition offers the opportunity to add controls to a myriad of sensing devices, particularly on mobile devices with limited control inputs. However, the resulting interfaces are hard to interpret. Adding auditory feedback to indicate the progress and success of gesture recognition could improve the usability of gesture recognition systems.

Aims

This project will develop a software framework for systematically exploring audio feedback options for gesture recognition. This will be a modular visual programming environment that allows various gesture recognisers to be configured and their output processed and fed to audio synthesis devices. The effectiveness of the project in improving gesture usability will be experimentally validated.

Progress

- Language and GUI framework chosen: project will be implemented in Java, using Swing for GUI development.
- Software architecture outlined and basic class structure written.
- Background research conducted on gesture recognition technologies and feedback mechanisms.
- Interfacing to inertial sensing unit in Java completed.
- Initial version of GUI developed, which allows basic signal processing to be applied to mouse input, with interchangable blocks.
- Basic finite state machine gesture recogniser implemented.
- Initial MIDI note based output implemented and working. Limited to pitch mapping.

Problems and risks

Problems

- Inertial sensing unit had unsupported and out-of-date drivers. Some tricky fixes had to be applied to get inputs.
- Many different types of gesture recognition; not clear which ones to focus on.
- Implemented FSM recogniser is not robust.
- Significant latency issues in rendering audio via Java with default audio generation libraries.

Risks

- Many different gesture recognisers to explore. **Mitigation:** will narrow down to three possibilities by start of next semester.
- Unclear how to evaluate success of the project. **Mitigation:** will do background research to investigate how success of audio recogntion has been performed in the research literature.
- Inertial sensing device seems to be unreliable. No clear mitigation available.

Plan

Semester 2

- Week 1-2: develop visual programming interface.
  - **Deliverable:** complete interface that allows components to be added, removed and rearranged.
- Week 3-5: implement three recognisers and test them with a standard recognition task.
  - **Deliverable:** tested recognisers with initial performance metrics and integration with visual programming environment.
- Week 6: research on how to best evaluate performance of final system.
  - **Deliverable:** detailed evaluation plan, with participant numbers, information sheet and analysis plan.
- Week 7-9: final implementation and improvements to audio rendering.
  - **Deliverable: polished software ready, passing basic tests, ready for evaluation stage.**
- Week 9: evaluation experiments run.
  - **Deliverable: quantitative measures of usability and qualitative measures of effectiveness for at least ten users.**
- Week 8-10: Write up.
  - **Deliverable: first draft submitted to supervisor two weeks before final deadline.**