Live Music Performance with Android

Group 5
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Project Overview

- Goal
  - Create an Android synthesizer that is usable for live performances
  - Overcome system I/O latency by sequencing music rather than simulating a traditional instrument

Novelty

- A few projects dealt with audio processing
- Most were focusing on specific musical effects, e.g. a set of guitar pedals
- None tackle the problem of a self-contained synthesis package
- No good Android applications for performance

Data flow

1. User input (touch screen)
2. Instrument panel and sequencers
3. Configurable synthesizers and scheduling
4. Audio output

Android Platform

- Fast development pipeline, high processing power
- High input and audio latency
- Unpredictable thread scheduling

So far...

- Basic subtractive synthesizer
  - Transposable oscillators, several waveforms
  - ADSR envelopes
  - An adjustable filter
- 100% in-house C++ code

So far...

- Basic sequencer
  - Switchable octaves
  - Adjustable scales
  - 16-beat loops
- 100% in-house Java code

Production Algorithms

- Instrument Interface - send MIDI instructions from sequencers
- Currently, subtractive synthesizer from chained components
- Passing short buffered samples
- Android audio buffers - system specific, 44.1 kHz sample rate, 16 bit samples

In progress...

- Drum machine
  - With customizable tones
- Reverb
- Circular knobs
  - That are small, labeled, and adjustable by sliding up and down

To do...

- A few more audio elements
  - Compressor, phaser, equalizer, etc.
- Switching between saved loops
  - Secondary loop sequencer
- Saving tone configurations
- Cleaning up the interface

Revised Timeline (weeks)

1. Tempo, UI cleanup, combine instruments
2. Save/load instruments, additional effects
3. Schedule preset loops
4. Polish UI, generate demo loops and instruments
5. Final demo: make music!

References

- Brandt, Eli. "Hard Sync Without Aliasing." <http://www.cs.cmu.edu/~eli/papers/icmc01-hardsync.pdf>.
  - BLEP anti-aliased oscillators
- Zölzer, Udo, “DAFX: Digital Audio Effects.”
  - Second order filter designs

Demo Time!

Questions?