LoopBack Requirements

Owen Strain — CS190

Description of Project

A networked music making program that lets multiple users use loops and samples to create songs in real-time.

LoopBack would allow several users to create songs by layering several loops on top of each other. It would use a library of loops so that the only data that must be streamed is metadata about the sound (which loops are playing, volume, speed, timing). No actual audio streaming is needed, greatly reducing bandwidth requirements.

Songs could either be created traditionally by dragging loops onto a timeline and then listening to the result or they could be created in real-time in segments. In the segmented mode, a segment would play in a loop while users add to it and edit it, so that you would hear your changes more or less instantly. When they decide a segment was finished, they could commit it and move to the next segment.

Features

- Create songs using loops and samples
- Intuitive GUI for fast manipulation of loops
- Traditional timeline-based editing mode
- Segmented editing mode
- Networked song creation by multiple users
- Playback of songs and export to WAV / MP3

Advanced / Version 2.0 Features

- Loop editor/creator (MIDI-based)
- Sample editor/creator (MP3-based)
- Online repository of Creative Commons licensed loops that users can upload and share.
- Effects that could be added in real-time (reverb, etc).
- Full multitrack recording / sequencing, ability to combine loops and recorded tracks (e.g. vocals).

Components / Divibility

- **Abstract audio layer:** internal representation of the song in terms of loops, timing, speed, and volume information. File format and network protocol would be designed around this representation.

- **Hard audio layer:** composites together the loops into the actual audio stream. Can play abstract audio from the network or from a saved session.
- **Networking layer:** transmits abstract audio over the network with low-latency (either UDP or TCP). Allows for transmitting incremental changes (e.g. "add loop 5 starting at 74ms playing at 80% speed").
- **User interface:** Interface somewhat inspired by FL Studio and Apple's GarageBand and similar products. Would need a new interface for segment mode and would need controls for fast editing (extensive keyboard shortcuts, less mousing).

Users

- Hobbyists who want to experiment with making songs
- Anyone who has used GarageBand or FL Studio but wants to collaborate on songs with their friends

  One could imagine having song-making competitions between multiple teams, where the teams have a certain amount of time to collaborate on a song over the network

Challenges

Networking component

The faster the networking works, the more usable the program will be. Coming up with a protocol to quickly transmit the type of information needed will be a challenge.

UI Design

An intuitive user interface will be very important, because if it takes a user too long to figure out a task, it will slow down the other person/people the user is working on the song with.

Sound

Writing optimized code to combine the various tracks for output will be a challenge, because it must be done in real-time or sound quality will suffer gaps and stutters.