Io

a small programming language

Purpose

briefly show lo's Lua roots

present overview of lo

get your feedback

working together

Some history

interested in dynamic OO languages since 1990

did NeXTstep/ObjC and Python development

found Lua - a great language

used Lua on Yindo project

A new language

liked Lua's size and speed but...

willing to trade off for greater simplicity

wanted a pure OO language

Lua and lo

small

simple

highly dynamic

multi-platform

multi-state

BSD/MIT licensed

designed for embedding

incremental garbage collection

syntax that script writers can deal with

Lua

faster

smaller

more mature

larger community

Io

pure OO

no globals

code is data

lazily evaluated arguments

simpler, more consistent syntax and semantics

Io overview

simple	prototype-based object model
	all actions are messages
	simple and consistent syntax
dynamic	all messages are dynamic
	code is data and runtime modifiable
concurrent	all objects can be actors
	actors use coroutines
	futures supported
and...	bundled with extensive official bindings

The language

no keywords

no statements (only expressions)

expressions are composed only of messages

supports lexically scoped blocks

objects can have multiple parents

Message Syntax

Lua	Io
a:b()	a b
a:b(c)	a b(c)
a:b(c, d)	a b(c, d)

Operators

expression	compiles to
a * 2 * b	a *(2) *(b)

Assignment

expression	compiles to
a := 2	setSlot(“a”, 2)
a = 2	updateSlot(“a”, 2)

This separation allows self to be implicit

Loops

while(x < 10, ...)

for(i, 1, 10, ...)

loop(...)

10 repeatTimes(...)

Conditions

```
a := if(b == 1, c, d) // conditions are expressions


if(a == b) then(
    ...
) elseif(...) then(
    ...
)
```

Enumeration

```
someList := list(“a”, 2.3, “foo”)
someList foreach(i, v,
    writeln(i, “ : ”, v)
)

// foreach also works on Maps, Strings, Buffers, etc
```

Blocks and Methods

```
foo := method(a, a + b) // object scoped

foo := block(a, a + b)  // lexically scoped
```

Scoping

no globals

variables are local by default

Expressions

```
a := people select(person, person age < 30)
```

```
names := people map(i, person, person name)
```

“Macro” Example

```
glChunk := method(
    glPushMatrix
    sender doMessage(thisMessage argAt(0))
    glPopMatrix
)

glChunk(glTranslated(1,2,3); glRectd(0,0,100,100))
```

Objects

```
Account := Object clone do(
    balance := 0
    deposit := method(amount,
        balance = balance + amount
    )
)
```

Example

```
account := Account clone

account deposit(10.00)

writeln(“balance:”, account balance)
```

Everything is an Object

```
Number double := method(self * 2)

100 double
==> 200
```

Introspection

```
Number double := method(self * 2)

Number getSlot("double") code
==> "method(self *(2))"
```

Concurrency

url := URL with(“http://www.google.com”)

url fetch	// sync message
f := url @fetch	// future message
url @@fetch	// async message

Futures auto-detect deadlocks

IoVM

Date (high precision, supports dates < 1970)

Duration

List

ImmutableSequence (Strings/Symbols)

Sequence (Buffers)

Map

WeakLink

IoServer

SGMLParser (supports XML and HTML)

Socket (async, libevent, supports async DNS)

Transparent Distributed Objects

Vector (supports SIMD/altivec)

Regex

SQLite3

MD5

Blowfish

CGI, URL

IoDesktop

OpenGL, GLU, GLUT

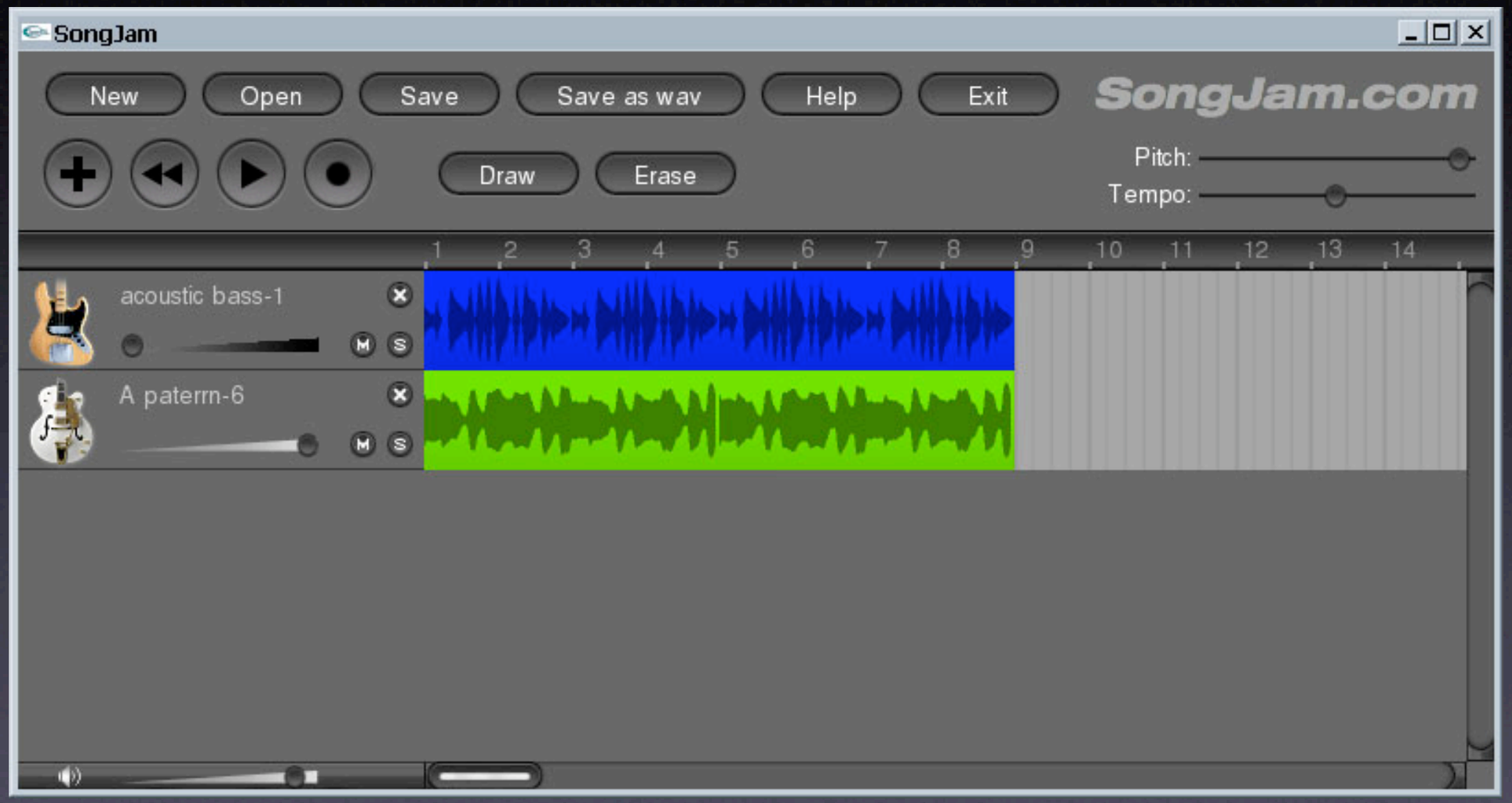
Audio (PortAudio)

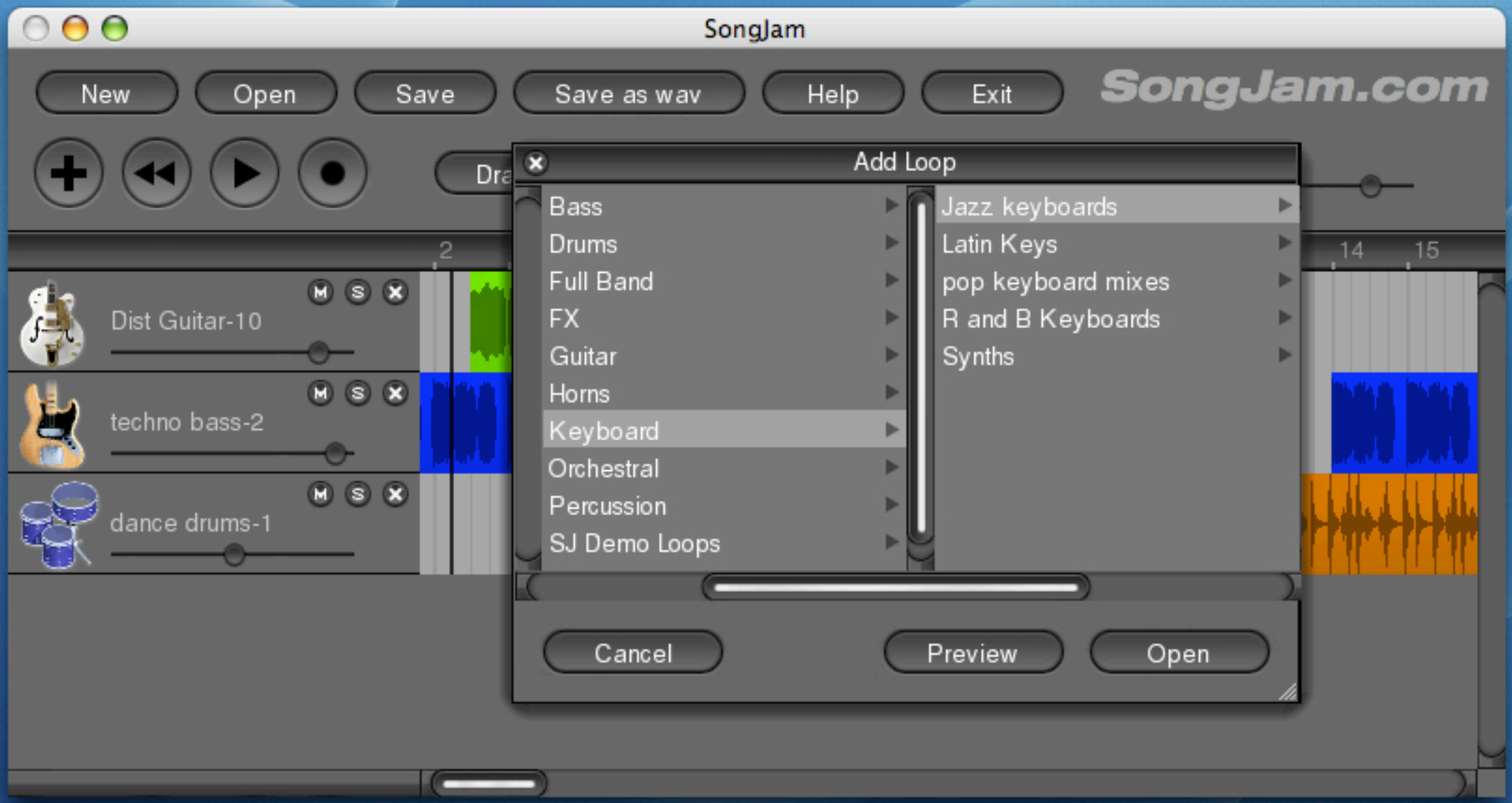
Font (FreeType, caches in texture)

Movie (ffmpeg)

Ion user interface toolkit

Ion example


SongJam
New
Open
Save
Save as wav
Help
Exit
SongJam.com
Draw
Erase
Pitch:
Tempo:
1 2 3 4 5 6 7 8 9 10 11 12 13 14
acoustic bass-1
M
S
A paterrn-6
M
S


SongJam
New
Open
Save
Save as wav
Help
Exit
SongJam.com
Add Loop
Bass
Drums
Full Band
FX
Guitar
Horns
Keyboard
Orchestral
Percussion
SJ Demo Loops
Jazz keyboards
Latin Keys
pop keyboard mixes
R and B Keyboards
Synths
Cancel
Preview
Open
Dist Guitar-10
techno bass-2
dance drums-1
2
14
15

Implementation

Garbage Collector

non-moving, tri-color, write-barrier, generational

Tricks

objects use perfect hashes

lookups done by symbol

objects create hashes on demand

objects are recycled

block contexts are recycled immediately

Platforms

Unix OSX, Linux, *BSD, Irix

Windows Cygwin, Mingw, MSVC

Other Symbian, Syllable, Zeta

What's next?

lo 1.0 by end of 2005

incremental orthogonal persistence

packages

docs for lon

bug tracker

revision control

official wiki

Working Together

bindings

Vector, Image, Movie, Font...

I’m interested to hear your thoughts and suggestions

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iolanguage.com