

I-CubeX

A sensor toolkit for developing
interactive media applications

by Axel Mulder

Contents

1. What is I-CubeX ?
2. I-CubeX Hardware
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<http://ICubeX.com>

Sensor technologies

- Piezo-resistance (FSR, strain gauge)
- Piezo-electricity (also PIR)
- Ultrasound TOF
- RF TOF (radar)
- Bio-potentials (EMG, EEG, EOG)
- Hall effect
- Electro-magnetic field (capacitance, inductance)
- Electro-optical (camera, LED)
- Microwave radiation

I-CubeX basics

Let me show you that live ...

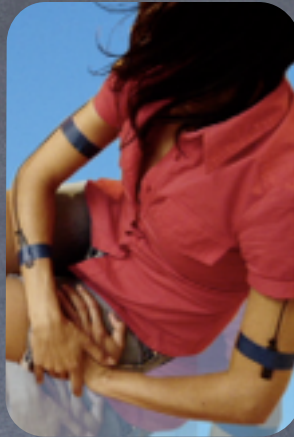


See also <http://icubex.com/about>

I-CubeX applications



Music



Dance



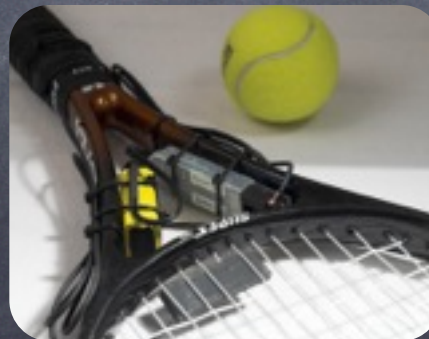
Installation Art



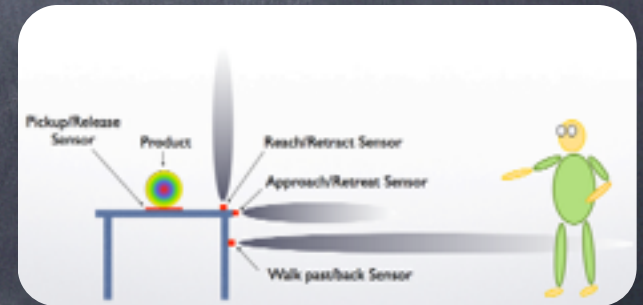
Exhibit Design



Game Dev



Biomechanics



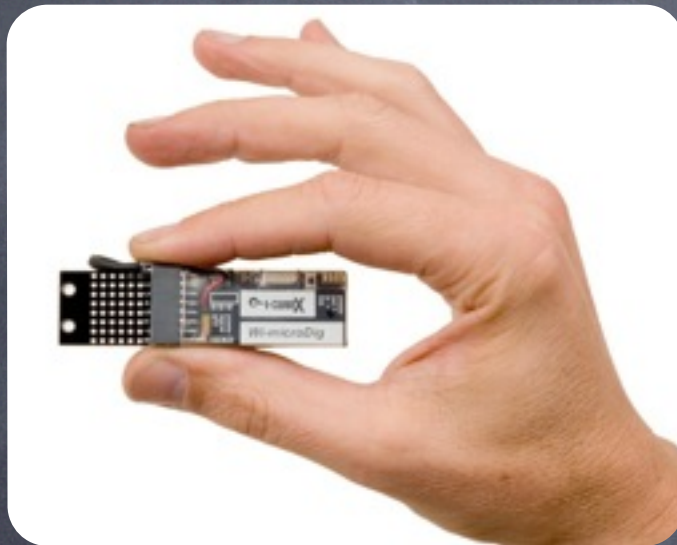
Behaviour Research

Interfaces

- Wi-microDig: Bluetooth, 8 inputs
- USB-microDig: USB, 8 inputs
- Digitizer: MIDI, 32 hi-res inputs
- Shield: for Arduino interfaces

Wi-microDig

Wireless sensor interface

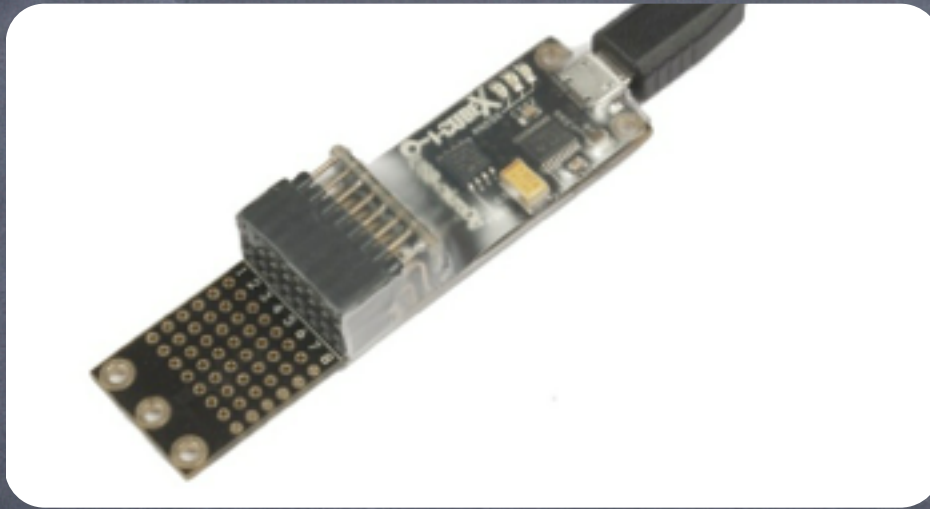


8 inputs, 10 bit resolution, 5760 Hz sample rate (max)

100 meter range (Bluetooth class 1), I²C capable

USB-microDig

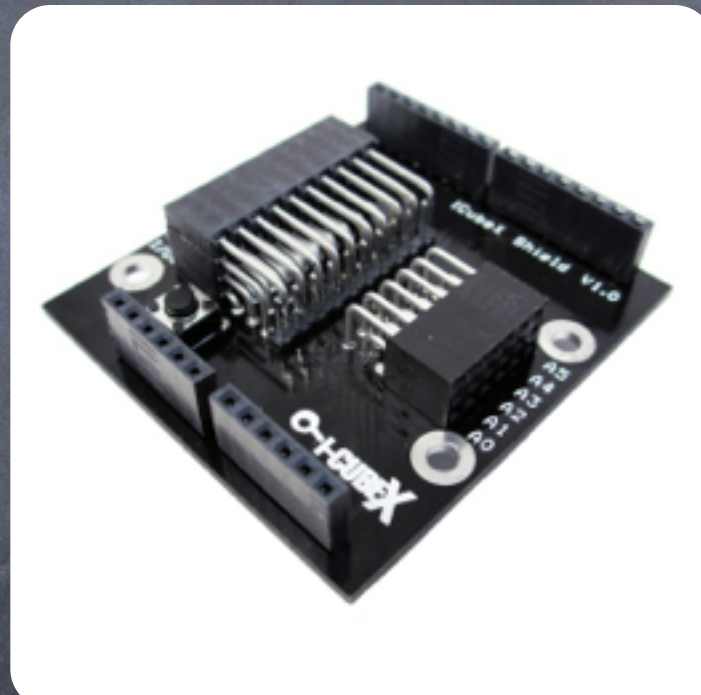
USB sensor interface



8 inputs, 10 bit resolution, 6250 Hz sample rate (max), I²C capable

Shield

Adapter board for Arduino



6 analog inputs, 10 digital inputs/outputs

Sensors

- Contactforce, Buttons
- Knobs, Sliders
- Distance, Position
- Acceleration, Orientation
- Biopotential
- Environment

Contactforce, Buttons

- Touch
- TouchMicro-3
- TouchMicro-5
- TouchMicro-10
- TouchMini
- TouchMiniOn
- TouchStrip
- TouchStripOn
- TouchGlove
- TapTile
- ReachOn

TouchMicro-10, -3

force sensor



Response curve approximates human perception of force.



Knobs, Sliders

- Turn
- Push
- Push2D
- Slide-50, -170, -500
- SlideRound, -Wide

Distance, Position

- Magnetic + magnet
- Reach
- ReachClose, ReachFar
- Advance-645
- Flash + SeeLaser
- MoveAlong, -Around, -On
- ReachOn
- BendMicro, -Mini, -Short

ReachFar

distance sensor



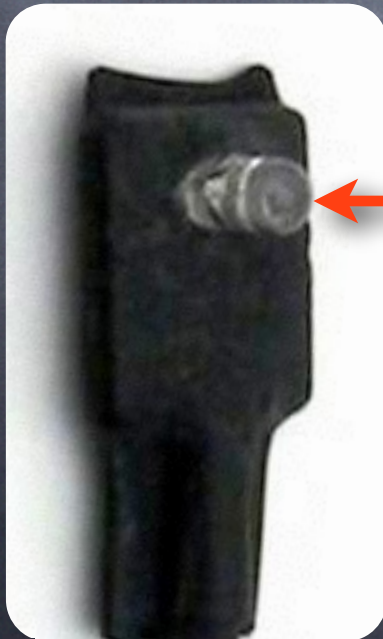
1.0 – 5.5 m range

50 Hz update rate

Flash, SeeLaser

motion trigger

Flash



SeeLaser-Red
SeeLaser-IR



Acceleration, Orientation

- Bang
- Vibe
- GForce3D-6
- Orient3D

GForce3D-6

acceleration sensor



1.5g or 6g acceleration, 4 mg resolution

-180° to +180° inclination

BioPotential sensors



BioVolt: EEG, EOG, (facial) EMG, EKG



BioEmo: GSR

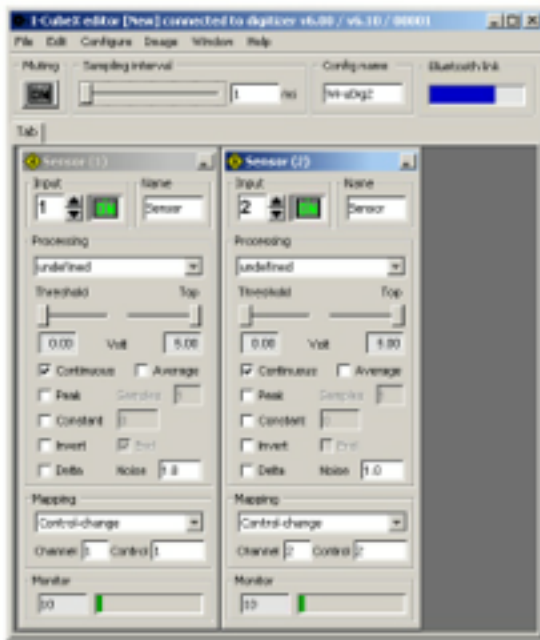
Environment

- Air
- Hot
- Humid
- Light
- Loud
- Magnetic

Software

- Connect (MacOS), BlueMIDI (Windows)
- Editor (MacOS/Windows)
- Link (MacOS/Windows)
- Keys (Windows)
- Sensor apps (MacOS/Windows): BioVolt, BioEmo, MuscleTrainer, GForce3D-6, Orient3D, ReachClose, MoveAlong, MoveAround, TouchSensors
- SensePlay (MacOS/Windows)

Editor

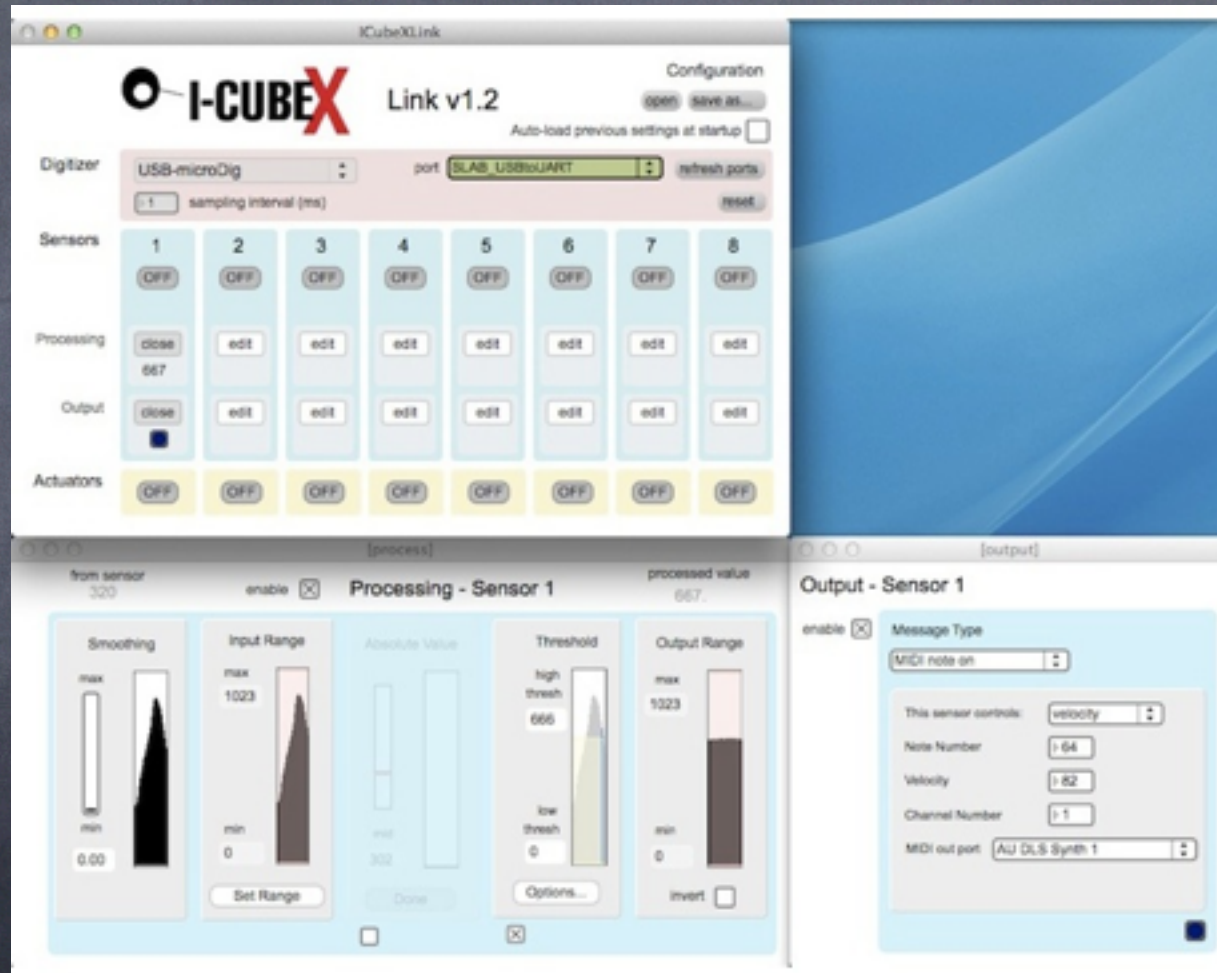


Windows

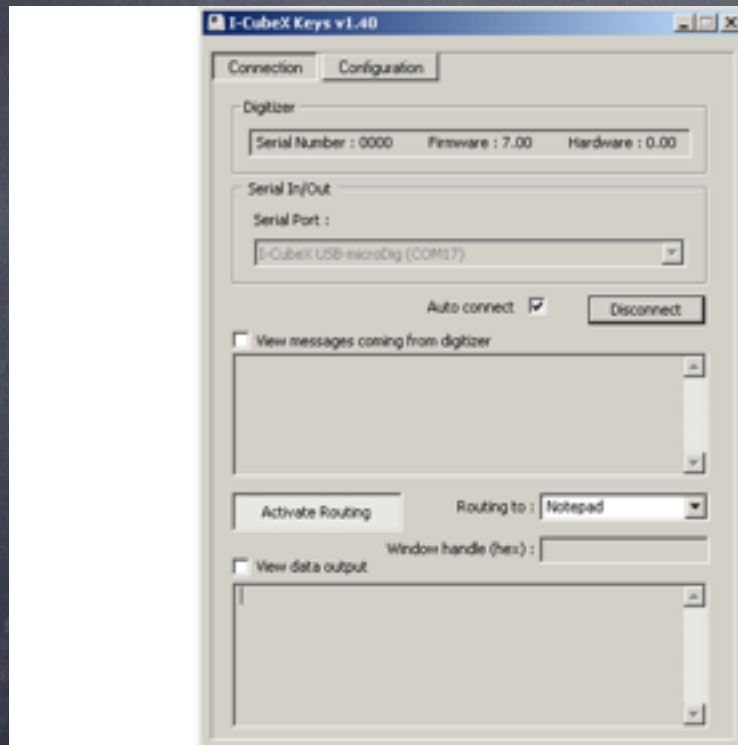


MacOS

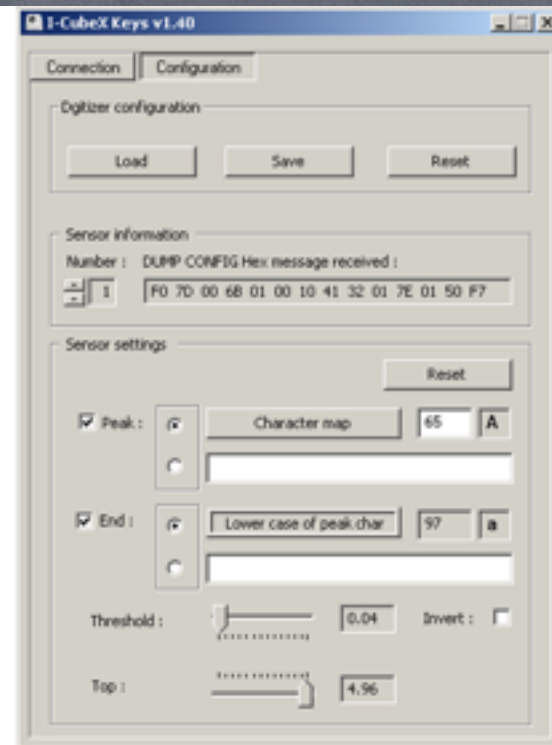
Link



Keys

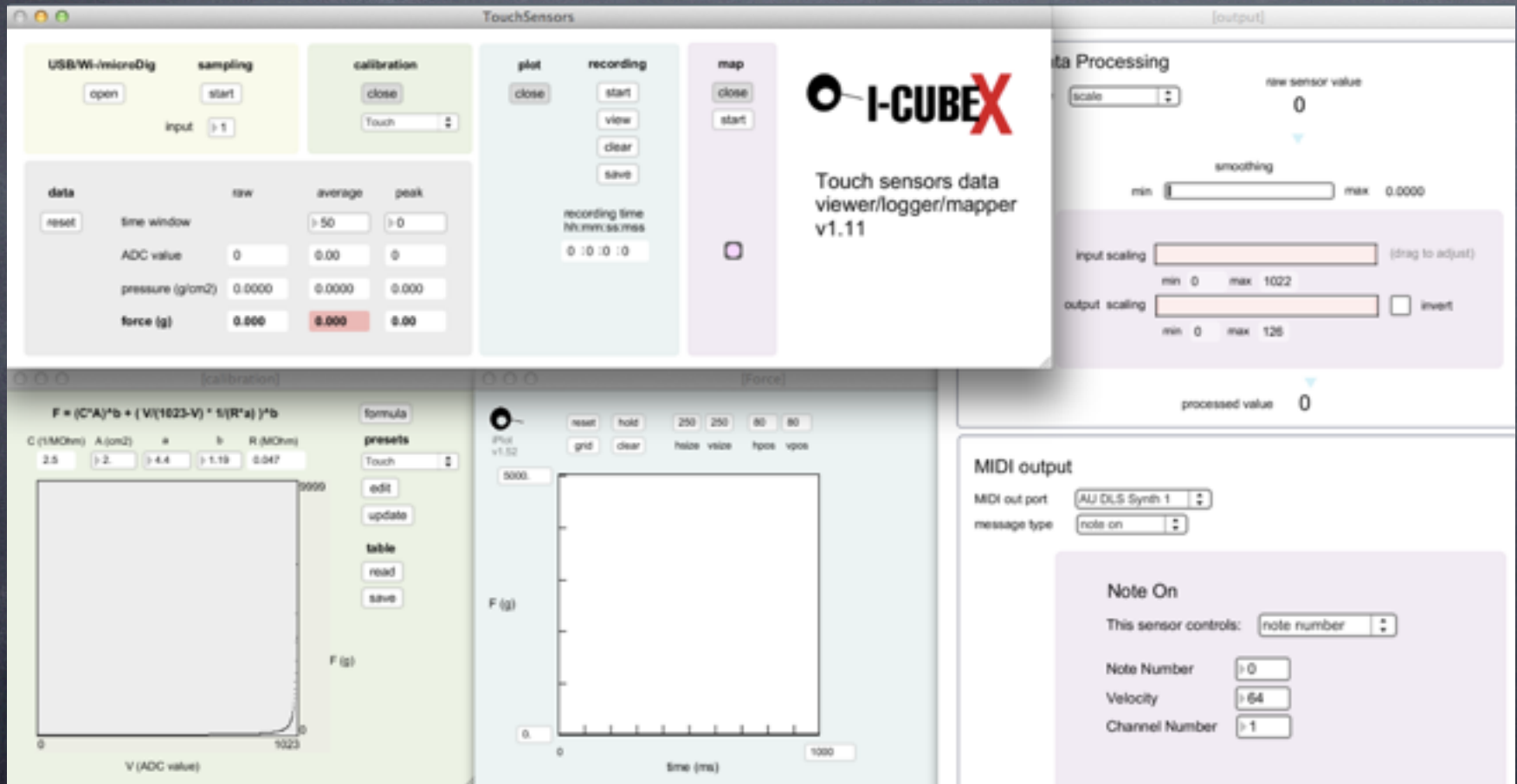


Connection



Configuration

TouchSensors



SensePlay

senseplay

SensePlay v0.64

Connection

SLAB_USBtoUART

refresh ports

Settings

Only play 1 media file at a time

interval

100

ms

reset

save

load

☐

Restart video after

5

minutes

Source 1

input number

1

raw value:

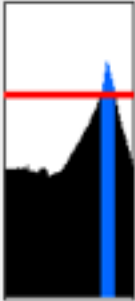
44

smoothing: 24

Trigger

Threshold

70



Trigger when crosses ☒ above ☐ below

+

Add new source

Audio

Start

source1

Stop

Choose Source

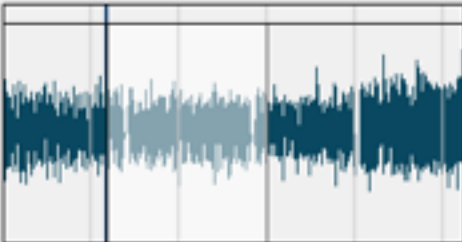
Volume

0.2

Choose Source

Trigger Enable

Choose Source



Filename

"Yemaya 1,2,3,5.mp3"

Start time

76482

End time

192748

Ignore subsequent triggers for

0

seconds

Load File

Clear

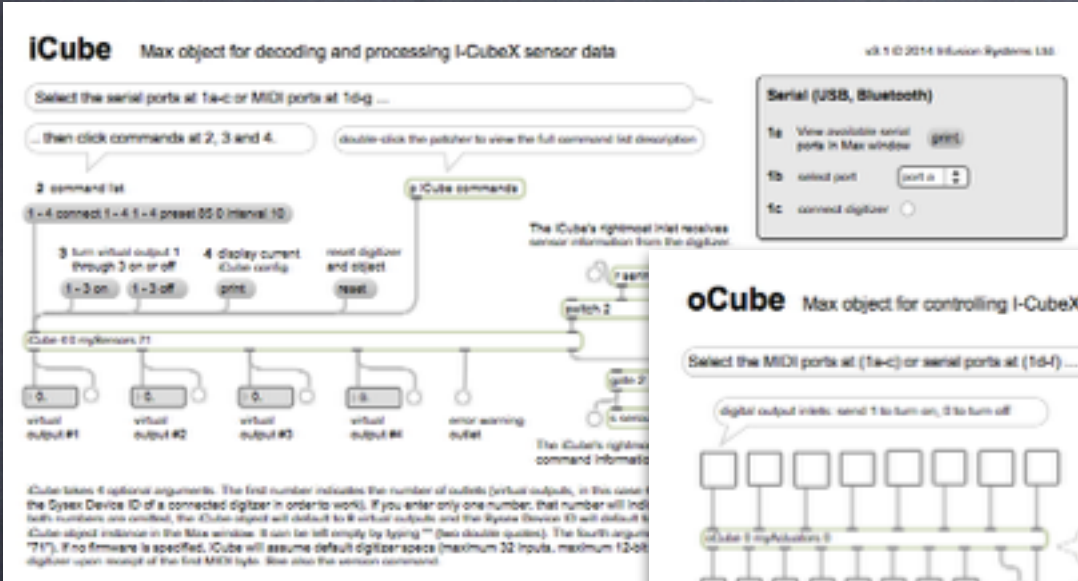
+

Add new output

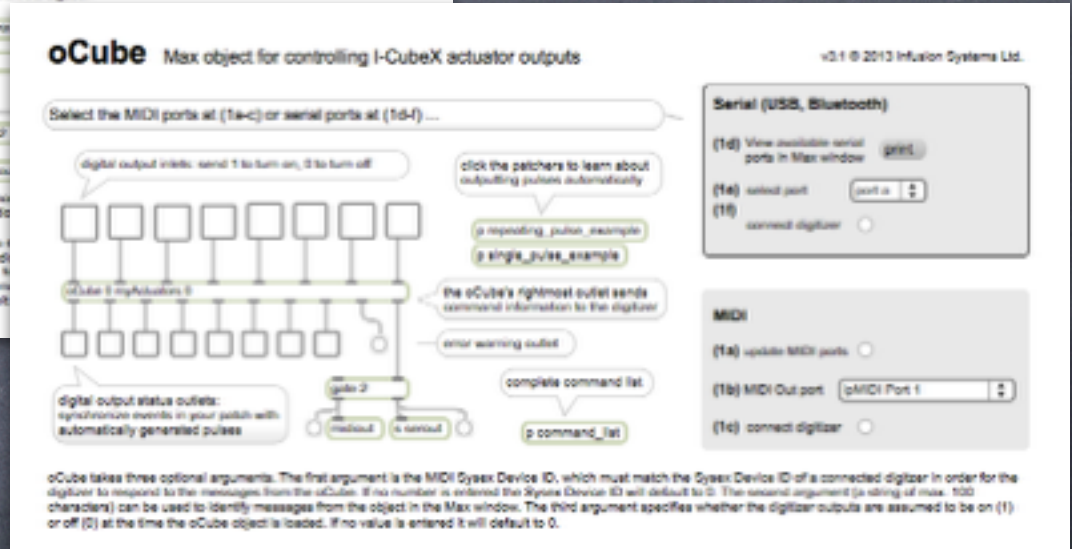
Software

- Max objects: iCube, oCube (MacOS/Windows)
- Max abstractions: digitizer, plot, record (MacOS/Windows)
- Live plugin: Dig4Live (MacOS/Windows)
- EyesWeb plugin (Windows)
- C/C++ API (MacOS/Windows)

iCube/oCube



iCube



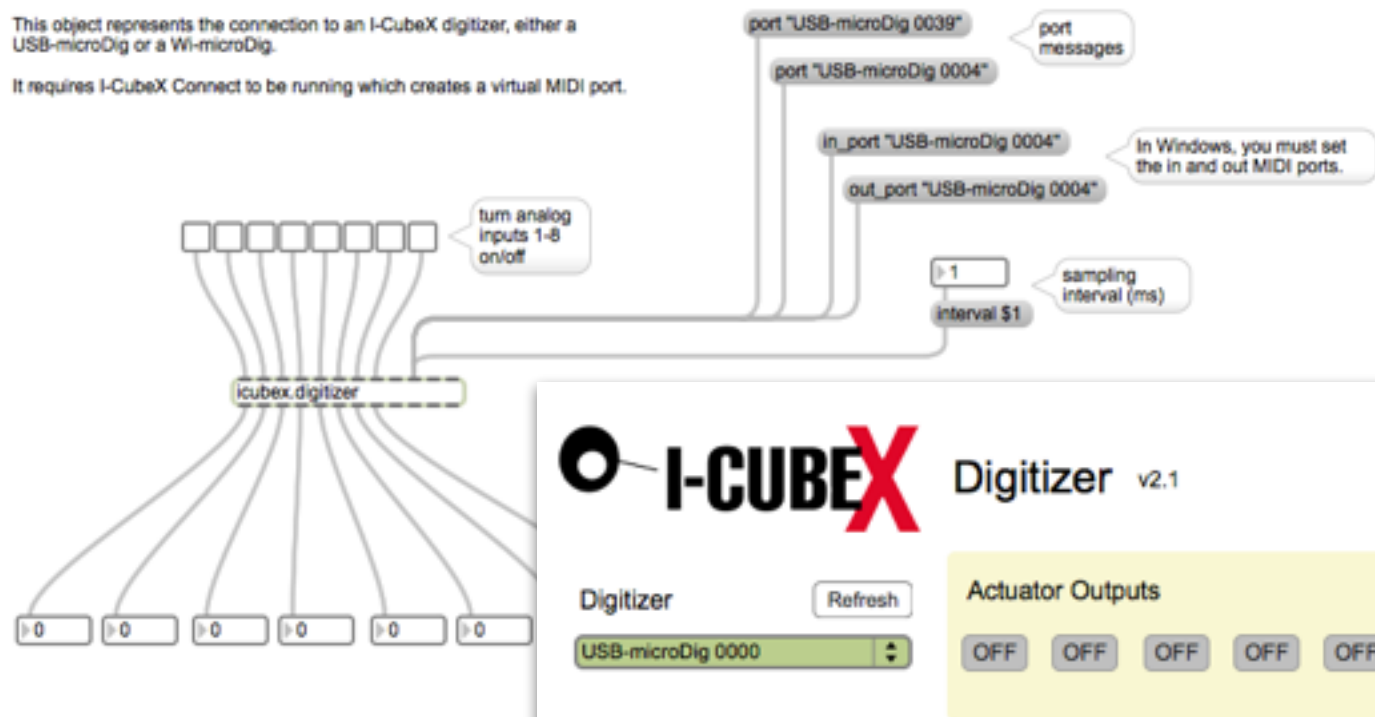
oCube

icubex.digitizer

icubex.digitizer

This object represents the connection to an I-CubeX digitizer, either a USB-microDig or a Wi-microDig.

It requires I-CubeX Connect to be running which creates a virtual MIDI port.



Digitizer v2.1

Digitizer

Refresh

USB-microDig 0000

Actuator Outputs

OFF OFF OFF OFF OFF OFF OFF OFF

Sensors

1 2 3 4 5 6 7 8

Reset

All Inputs On

OFF OFF OFF OFF OFF OFF OFF OFF

Sampling Interval 100 ms