I-CubeX
A sensor toolkit for developing interactive media applications

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Sensors, Interfaces & Software since 1995
I-CubeX basics

See also http://icubex.com/about
I-CubeX applications

Music

Dance

Installation Art

Exhibit Design

Game Dev

Biomechanics

Behaviour Research
Interfaces

- USB-microDig: USB, 8 inputs
- Wi-microDig: Bluetooth, 8 inputs
- Digitizer: MIDI, 32 hi-res inputs
- ArduinoShield: for Arduino
- PiShield: for Raspberry-Pi
USB-microDig
USB sensor interface

Use the USB-microMIDICable to connect with MIDI devices directly.

8 inputs, 10 bit resolution, 6250 Hz sample rate (max), I²C capable
USB-microDig Firmware v7.2

- Analog Sensors -

Use lookup tables for analog sensors, eg. for linearization or for setting the response curve.

Convert signals varying around a center value to a value from zero: useful for eg. GForce3D, Magnetic3D, BioVolt.

Measure time between or frequency of signal peaks or each signal peak and its reset threshold: eg. measure heartbeat BPM with a BioVolt, time between taps on a Touch sensor, frequency of jabs with a GForce3D sensor.
USB-microDig Firmware v7.2
- Digital Sensors -

- Use digital (I\textsuperscript{2}C) sensors such as the Orient3D in standalone mode.
- More efficient protocol for digital (I\textsuperscript{2}C) sensors in host mode.
- Use multiple digital (I\textsuperscript{2}C) sensors on one USB-microDig.
Set actuator outputs to PWM signals: eg. for RC servo control, or dimming of LEDs.

Map (multiple) sensor input(s) to an actuator output: trigger/dim LEDs, control servos or any other device connected to the actuator outputs in standalone mode directly with (analog or digital) sensors; no need for software on a computer to map inputs to outputs.

Various other communication protocol improvements.
Wi-microDig

Wireless sensor interface

8 inputs, 10 bit resolution, 5760 Hz sample rate (max)
100 meter range (Bluetooth class 1), I^2C capable
ArduinoShield
Adapter board for Arduino

6 analog inputs, 10 digital inputs/outputs
iCubino sketch enables Arduinos to be used with I-CubeX software.
PiShield
Adapter board for Raspberry-Pi

8 analog inputs, 4 digital I²C ports
SensePlay platform

- Embedded interactive media platform
- Raspberry-Pi: compact, low cost, standalone
- Hardware sensor interface + software system
- HD video, audio, sensor input
- Simple user interface: USB media-based content loading

See also www.Sense-Play.com
Sensors

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

Touch

TouchMini

TouchMicro-10

TouchMicro-05
ReachClose, ReachFar

distance sensors

0.1 - 1.5 m range
approx. 50 Hz update rate

1.0 - 5.5 m range
approx. 50 Hz update rate
Flash, SeeLaser

trigger beam
GForce3D-6
acceleration sensor

1.5g or 6g acceleration, 4 mg resolution
-180° to +180° inclination

Use Wearability straps to mount on body.
BioEmo

“mood” sensor
Software Apps

- Connect
- EditorX
- Link
- SensePlay
- SensorX, BioEmo, MuscleTrainer, GForce3D-6, Orient3D, MoveAlong, MoveAround
EditorX
Link
SensorX
Software plugins

- Max plugins: iCube, oCube (MacOS/Windows/Linux), digitizer (MacOS, Windows)
- openFrameworks C/C++ API (MacOS/Windows/Linux)
- Ableton Live plugin: Dig4Live (MacOS/Windows)
- EyesWeb plugin (Windows)
iCube

Max object for decoding and processing I-CubeX sensor data

Select the serial ports at 1a-c or MIDI ports at 1d-g...
then click commands at 2, 3 and 4.

double-click the patch to view the full command list description

Command List

4. Connect 1-4 (4) present 0, 0 interval 10 0
3. Turn virtual output 1 through 3 on or off
2. Command list
1. Connect

iCube takes 4 optional arguments. The first number indicates the number of virtual outputs in this case 4. The second argument is the Sysex Device ID of a connected digitizer in order to work. If you enter only one number, that number will be used for both numbers. The iCube object will default to 6 virtual outputs and the Sysex Device ID will default to 0 if no firware is specified. iCube assume default digitizer specs (minimum 32 inputs, maximum 128 outputs). iCube outputs in the front window. It can be set simply by typing "I" ( immediately after iCube). The fourth argument ("Q") is a list of optional arguments. iCube takes three arguments. The first argument is the Sysex Device ID which must match the Sysex Device ID of a connected digitizer.

oCube

Max object for controlling I-CubeX actuator outputs

Select the MIDI ports at (1a-c) or serial ports at (1d-f)...

click the patch to learn about outputting pulse automatically

The oCube takes three optional arguments. The first argument is the Sysex Device ID which must match the Sysex Device ID of a connected digitizer. If no number is entered the Sysex Device ID will default to 0. The second argument (a string of max 100 characters) can be used to identify messages from the oCube. If not present the Sysex Device ID will default to 0. The third argument specifies whether the digitizer outputs are assumed to be on (1) or off (0) at the time the oCube object is loaded. If no value is entered it will default to 0.

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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.

In Windows, you must set the in and out MIDI ports.

I-CUBE

Digitizer v2.1

Actuator Outputs

USB-microDig 0000

OFF OFF OFF OFF OFF OFF OFF OFF OFF

Sensors

Reset All Inputs On

Sampling Interval 100 ms

OFF OFF OFF OFF OFF OFF OFF OFF OFF
I-CubeX API

Open source C++ Library for interfacing with I-CubeX digitizers and sensors.

Platform support for

• Windows
• Mac OS
• iOS
• Linux (desktop, raspberry Pi)
• Android (experimental)

McGill

Input Devices and Music Interaction Laboratory (www.idmil.org)
openFrameworks Addon

ofxICubeX

- openFrameworks addon for I-CubeX
- allows "oF"-like access to API features
Middleware Framework for Acquisition, Processing, Rendering of movement-related data across a network

Centralized service registry, modules for processing input, feature detection, processing, output rendering

Multiple ways of interfacing: Service/Client, Adapters, I/O ports

Built on top of Yarp platform (www.yarp.it)

Hands-on tutorial will expose I-CubeX sensor data to network