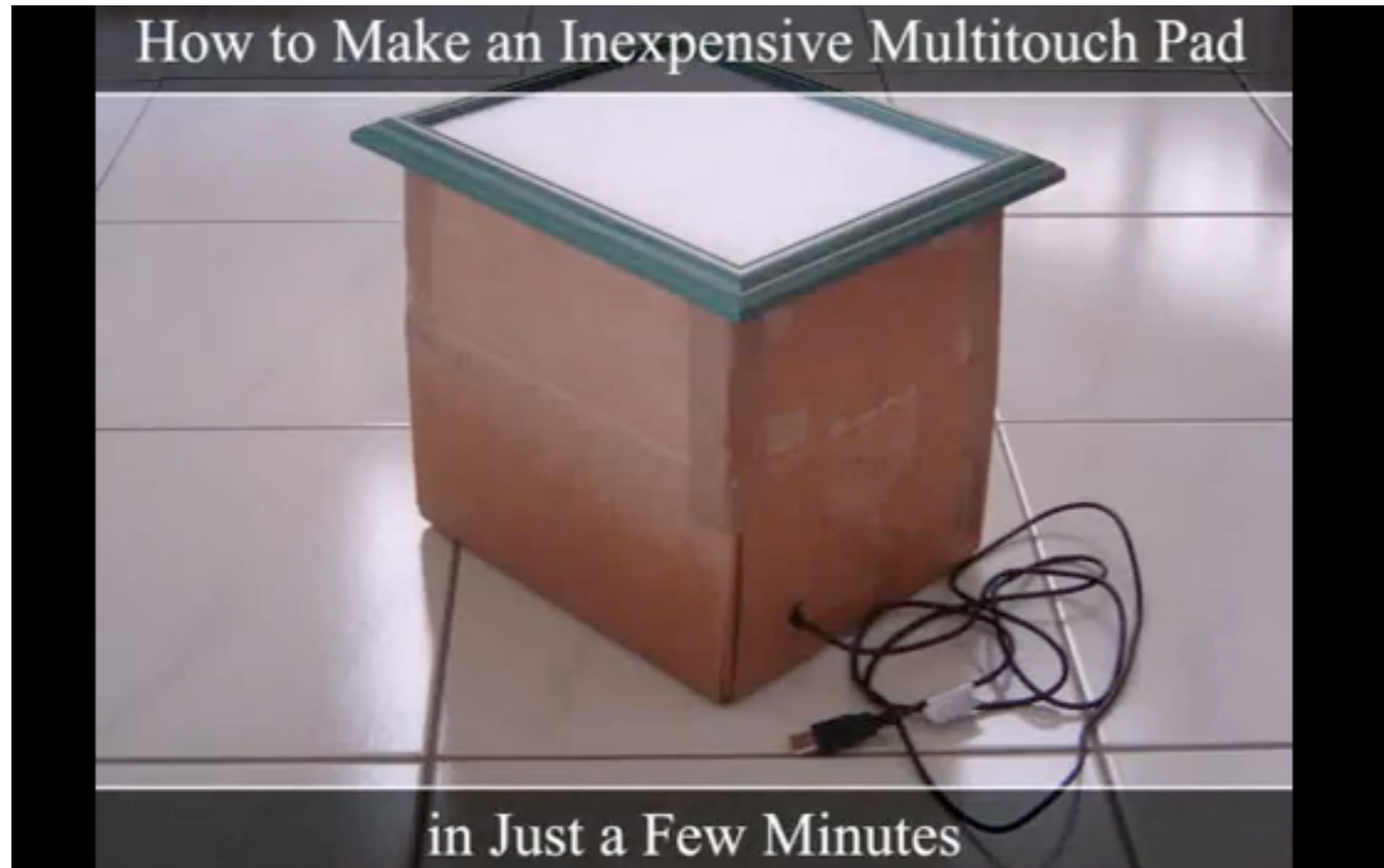


User Interaction: Intro to Multi-Touch

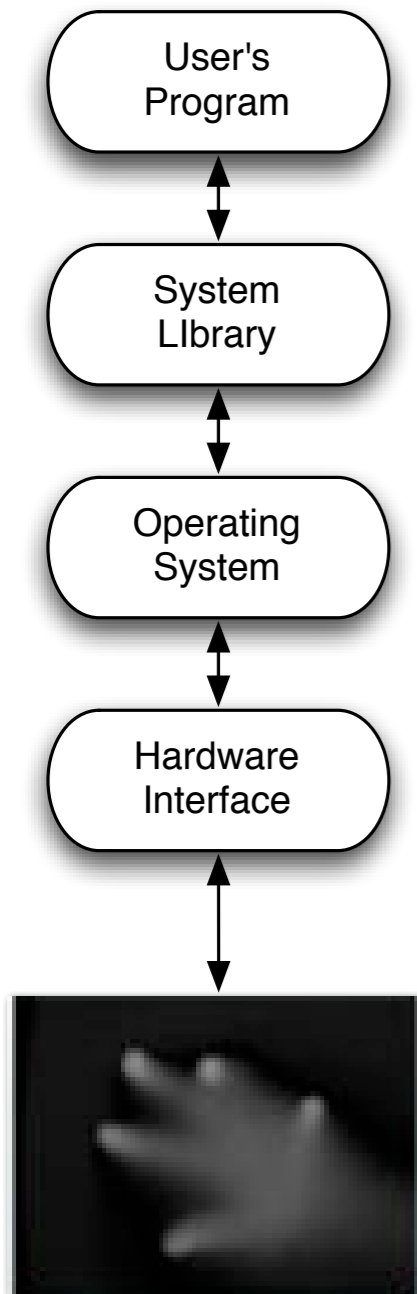
Associate Professor Donald J. Patterson
INF 133 Fall 2013



Getting Multi-Touch up and Running



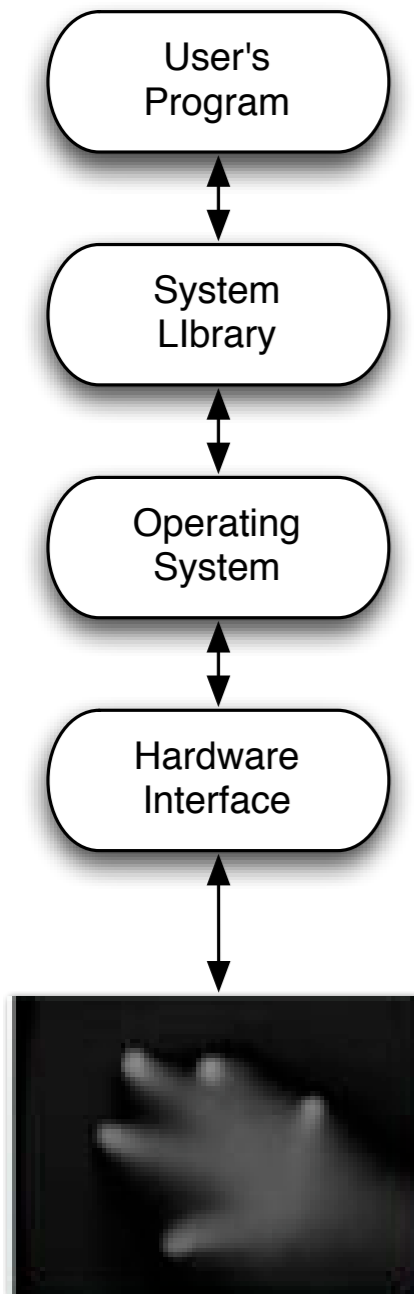
Flash notes



- I had very inconsistent behavior using the Flash stack
- Regardless of Flash security settings I could not get things to work:
 - In Flash Player
 - In a browser
- I could get everything to work consistently using the full Flash program
 - Running flosc-2_0_5.jar on the command line
 - `java -jar ./flosc-2_0_5.jar 3333 3000`
 - Having CCV send output via OSC

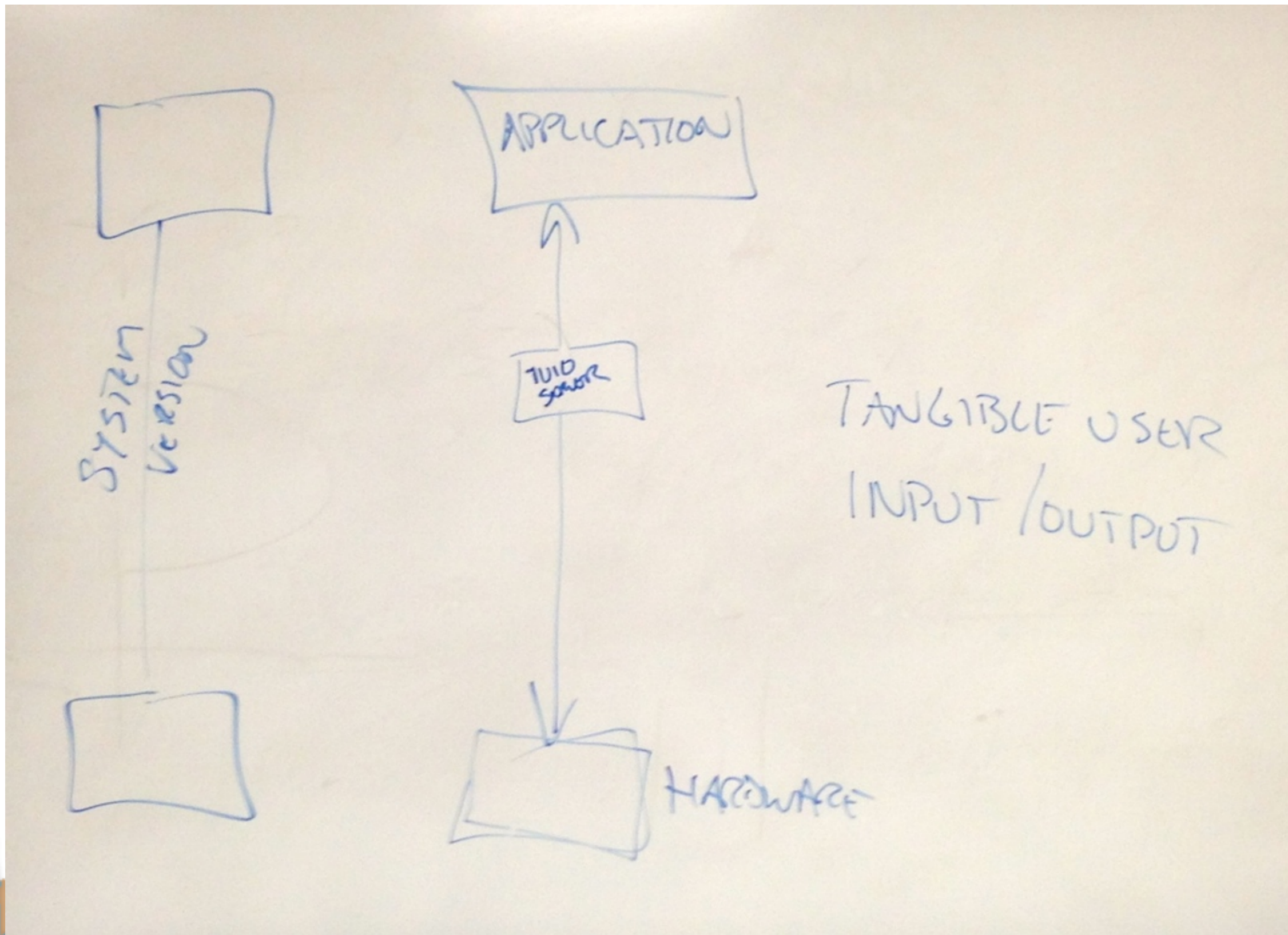


Things you have to worry about

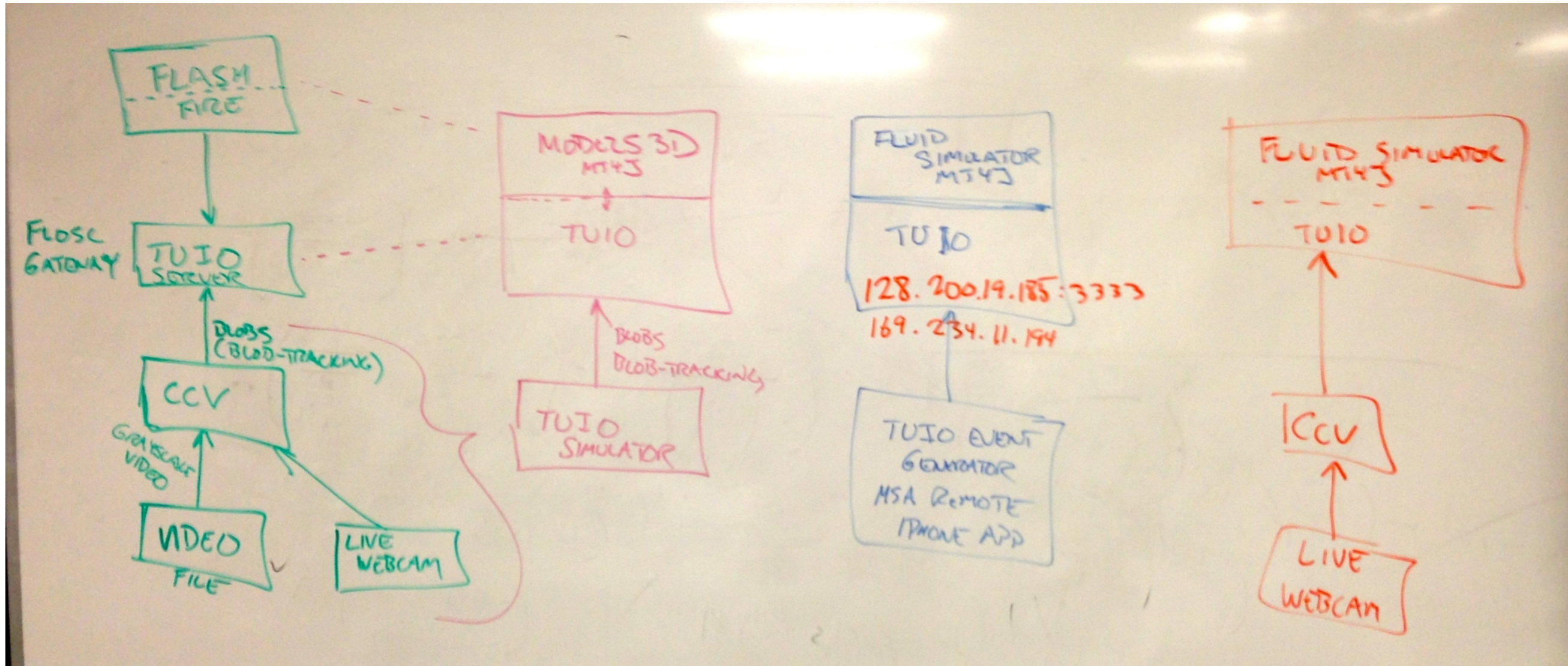


- Is your operating system 32-bit or 64-bit?
 - Your java virtual machine should match
- What Java version are you running?
 - Most recent is 1.7
 - MT4J on a Mac needs Java 1.6 JRE in Eclipse
- On Mac you have to make CCV executable
- Download flosc for demoing here
 - <https://code.google.com/p/flosc/>
- Which version of CCV?
 - 1.5 for Window
 - 1.2 for Mac

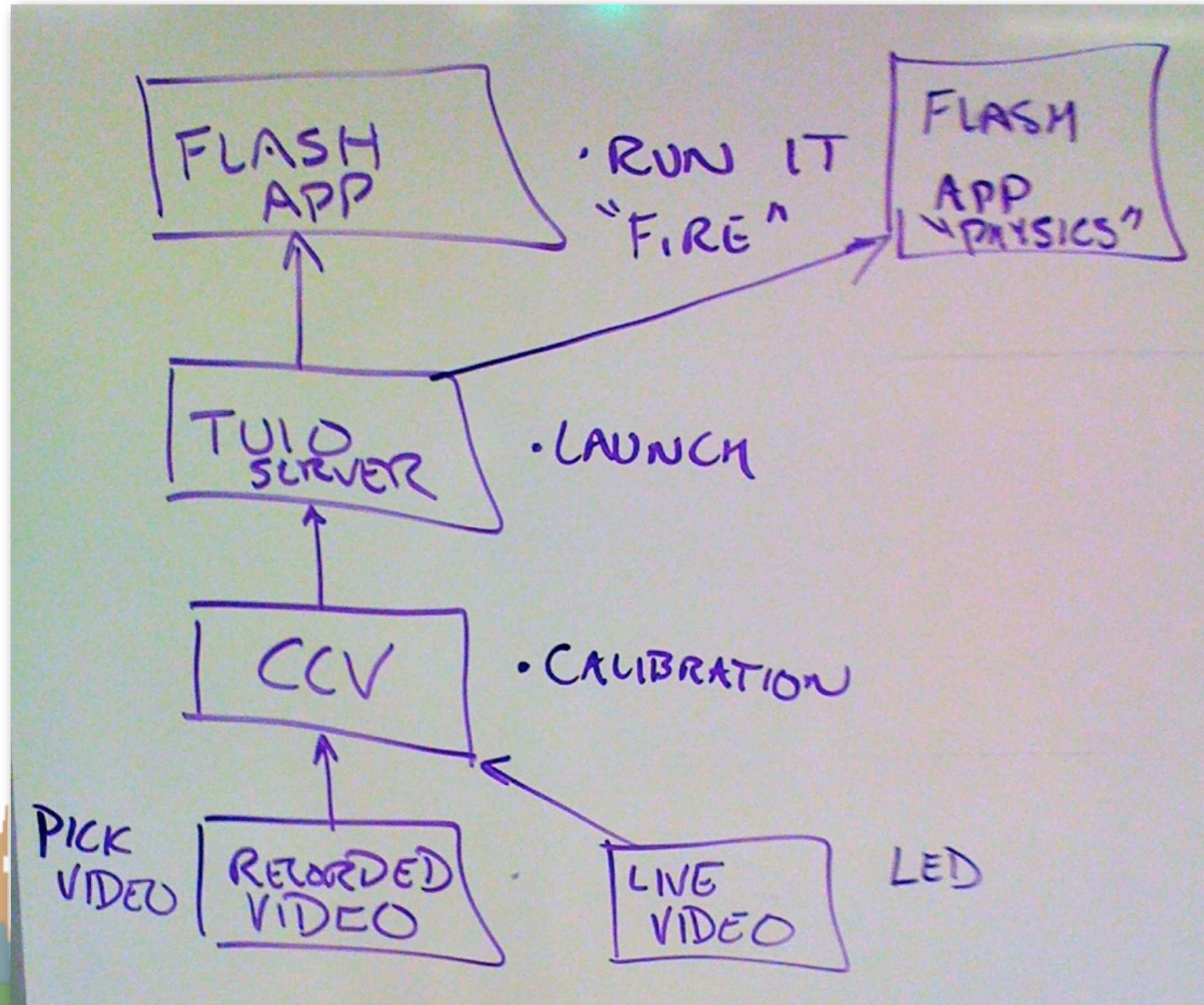
Getting Multi-Touch up and Running



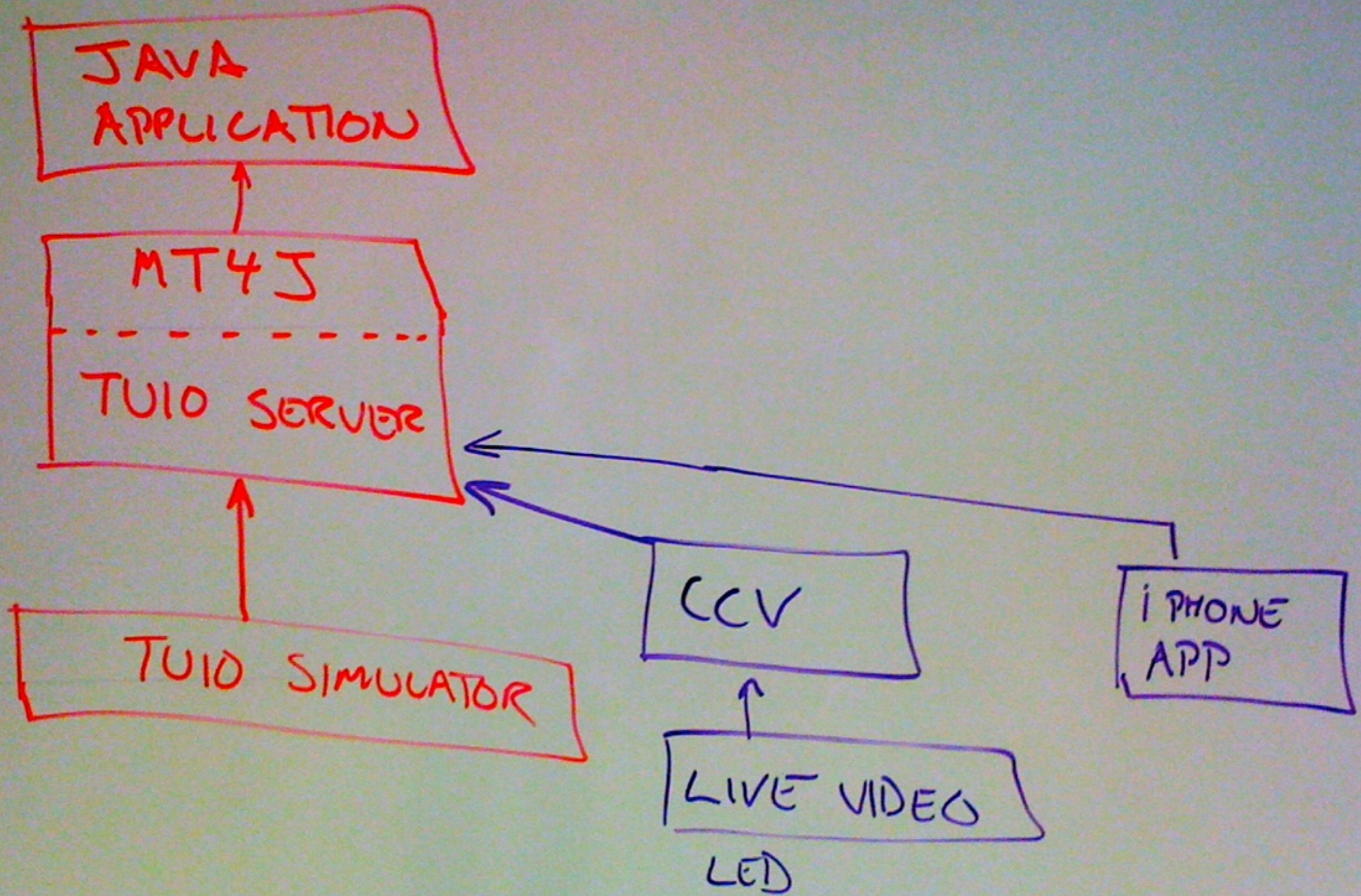
Getting Multi-Touch up and Running



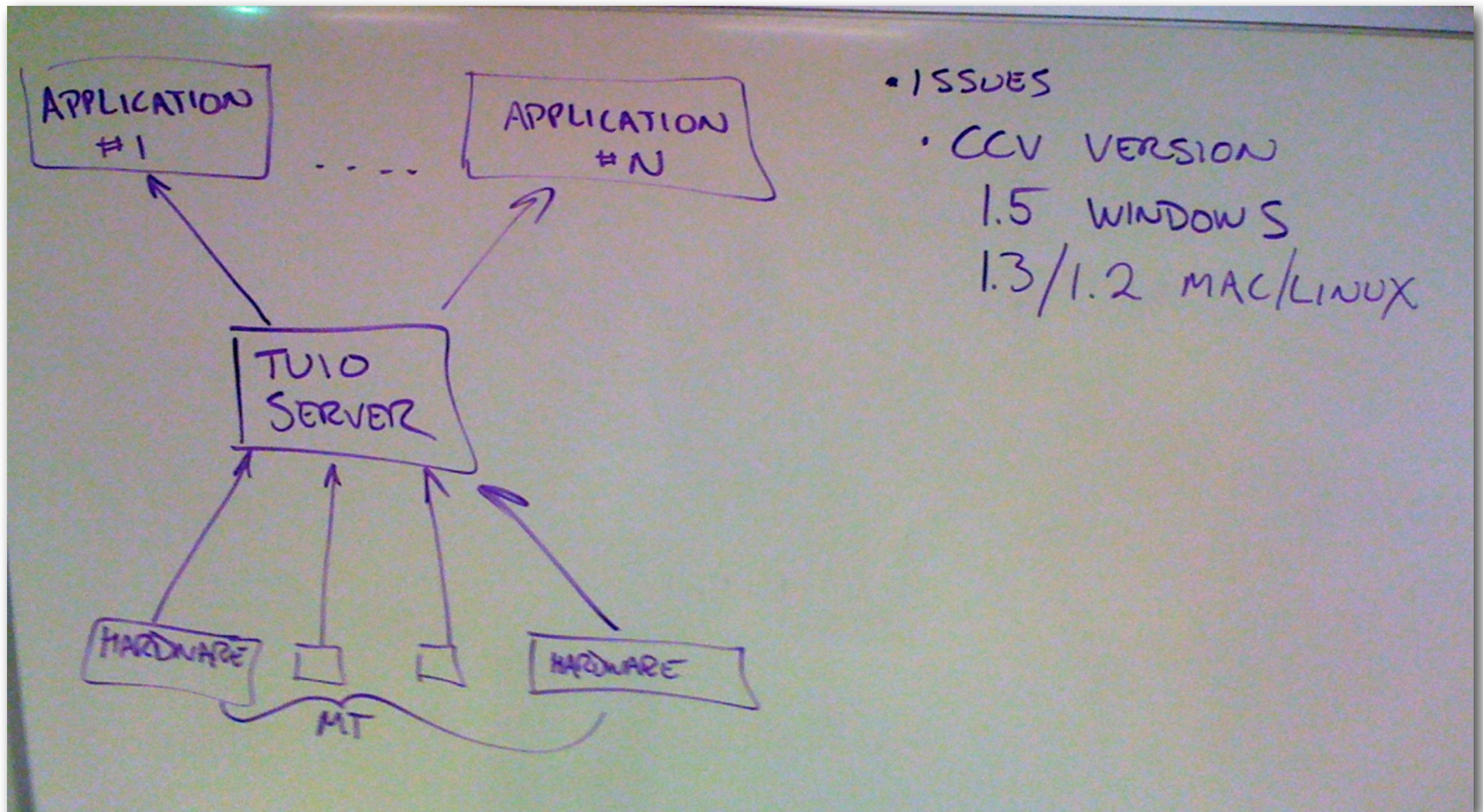
Getting Multi-Touch up and Running



Getting Multi-Touch up and Running



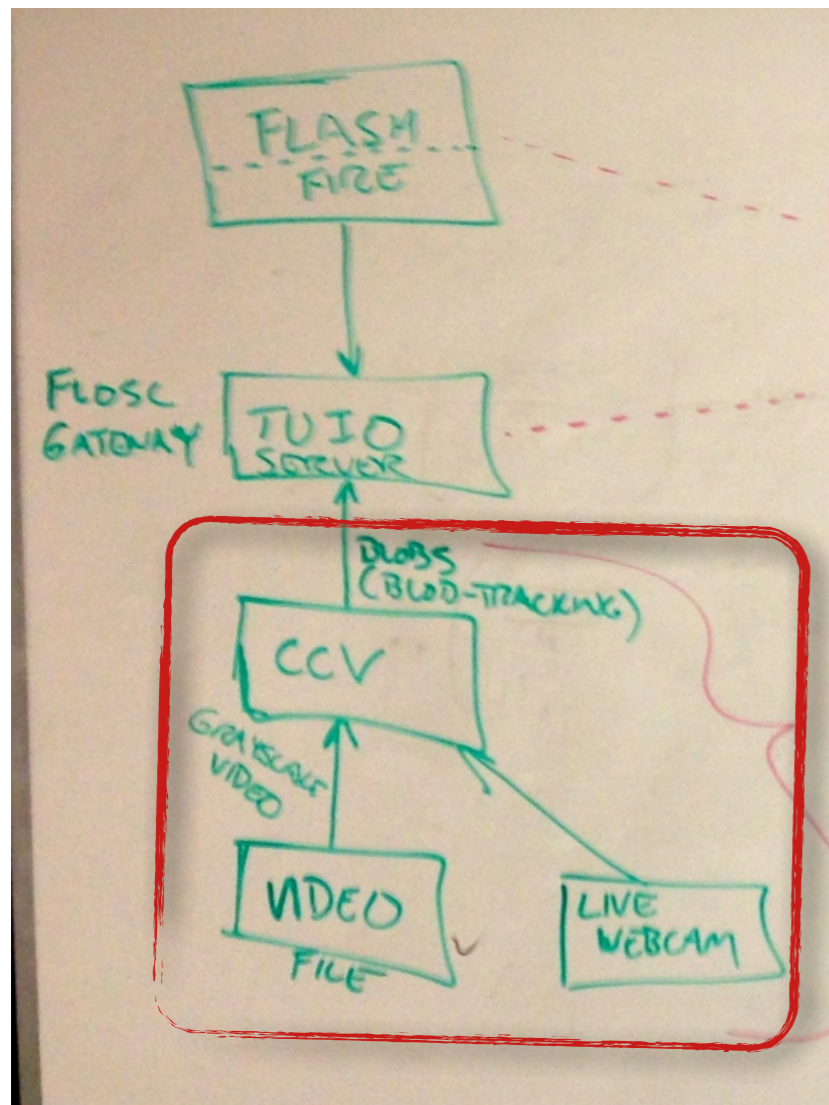
Getting Multi-Touch up and Running



Review Task #21



How to do what we did in class



- Download Community Core Vision
- <http://ccv.nuigroup.com/>

The screenshot shows the 'Downloads' page of the Community Core Vision website. The page has a navigation bar with links for 'CCV - About', 'Features', 'Screenshots', 'Tutorials', 'Downloads', and 'License'. The main content area is titled 'Downloads' and lists several categories:

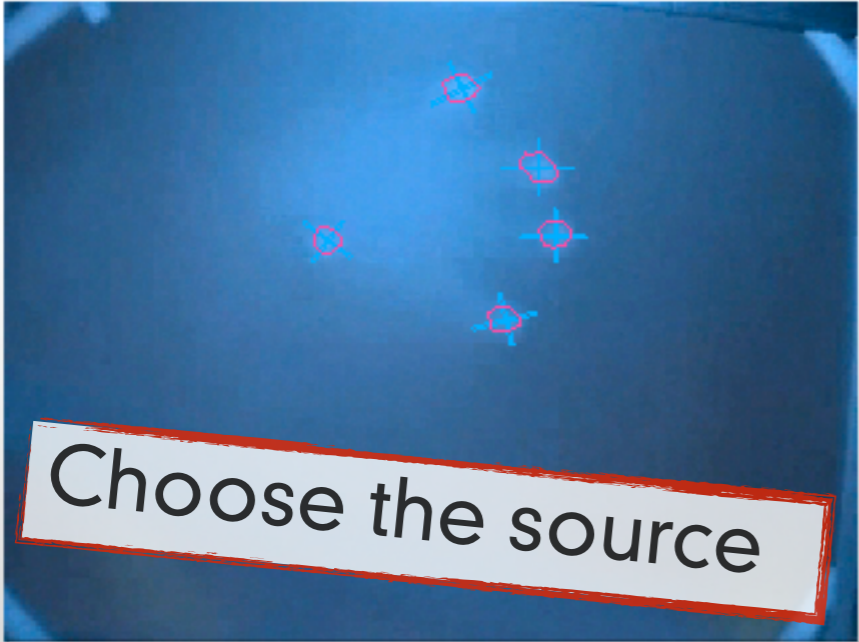
- Linux**: Ubuntu/Debian
- Mac**: Leopard OS X 10.5 (PPC/Intel)
- Windows**: Windows XP/Vista
- Flash**: Example Clients
- Source Repository**: NUI Code SVN
- Tools**: Sample Test Videos, TUJO Simulator - Java

At the bottom of the page, there is a note: 'Please submit any bugs you may find on CCV's project page'.

How to do what we did in class

Community Core Vision

Source Image



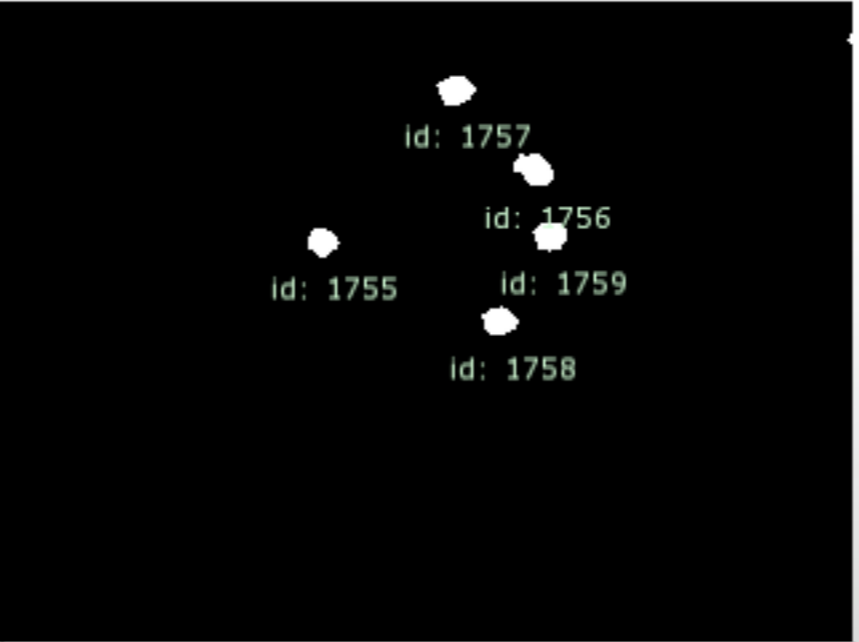
Choose the source

Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12

MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11

MAX BLOB SIZE: 172

Source Properties

CAMERA SETTINGS (V)

FLIP VERTICAL (J)

FLIP HORIZONTAL (H)

GPU Properties

GPU MODE (G)

Communication

SEND TUJO OSC (T)

SEND TUJO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Calc. Time [ms]: 5

Video [Res]: 320 x 240

Video [fps]: 30

Sending OSC messages to:
Host: 127.0.0.1
Port: 3333

Press spacebar to toggle fast mode

~ |tbeta.nuigroup.com

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3

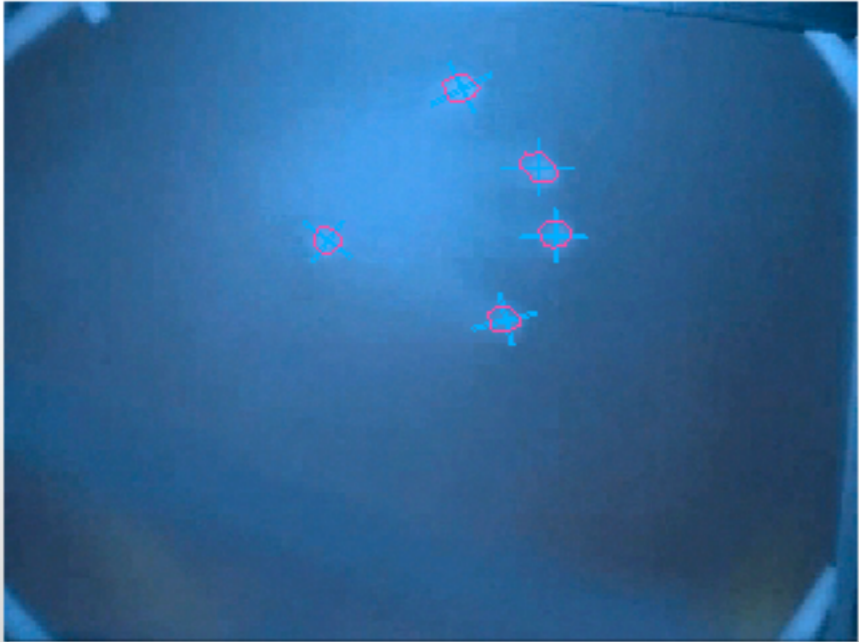
Amplify

AMPLIFY: 35

How to do what we did in class

Community Core Vision

Source Image

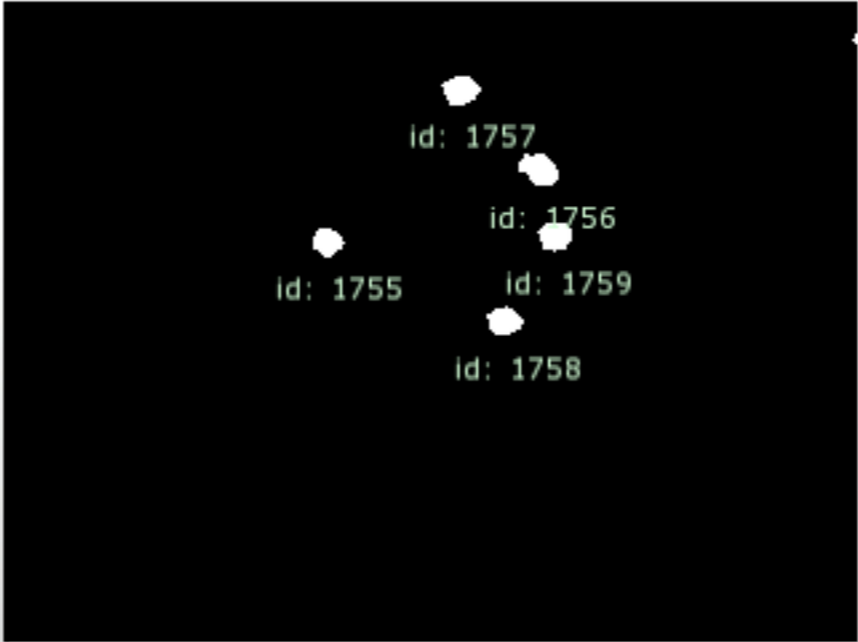


Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12 MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11 MAX BLOB SIZE: 172

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3

Amplify

AMPLIFY: 35

Source Properties

CAMERA SETTINGS (V)

FLIP VERTICAL (J)

FLIP HORIZONTAL (H)

GPU Properties

GPU MODE (G)

Communication

SEND TUIO OSC (T)

SEND TUIO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Calc. Time [ms]: 5

Video [Res]: 320 x 240

Video [fps]: 30

Sending OSC messages to:

Host: 127.0.0.1

Port: 3333

Press spacebar to toggle fast mode

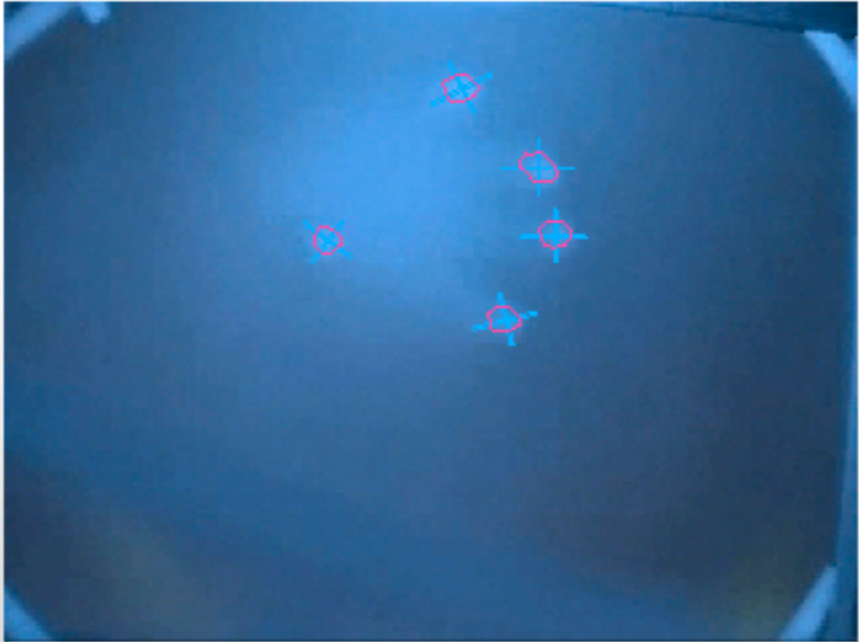
~ |tbeta.nuigroup.com

Subtract static background

How to do what we did in class

Community Core Vision

Source Image

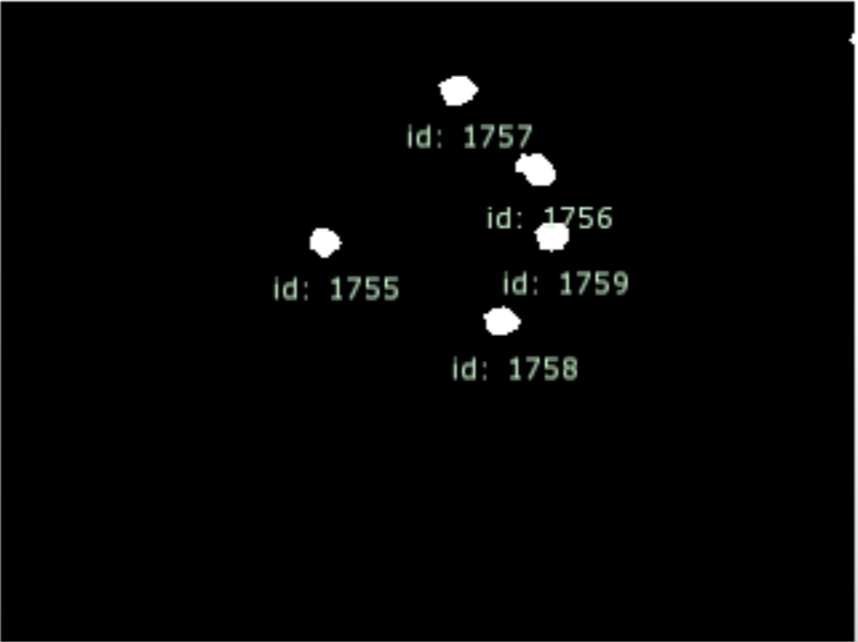


Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12 MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11 MAX BLOB SIZE: 172

Source Properties

CAMERA SETTINGS (V)

FLIP VERTICAL (J)

FLIP HORIZONTAL (H)

GPU Properties

GPU MODE (G)

Communication

SEND TUIO OSC (T)

SEND TUIO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Calc. Time [ms]: 5

Video [Res]: 320 x 240

Video [fps]: 30

Sending OSC messages to:
Host: 127.0.0.1
Port: 3333

Press spacebar to toggle fast mode

~ |tbeta.nuigroup.com

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3

Amplify

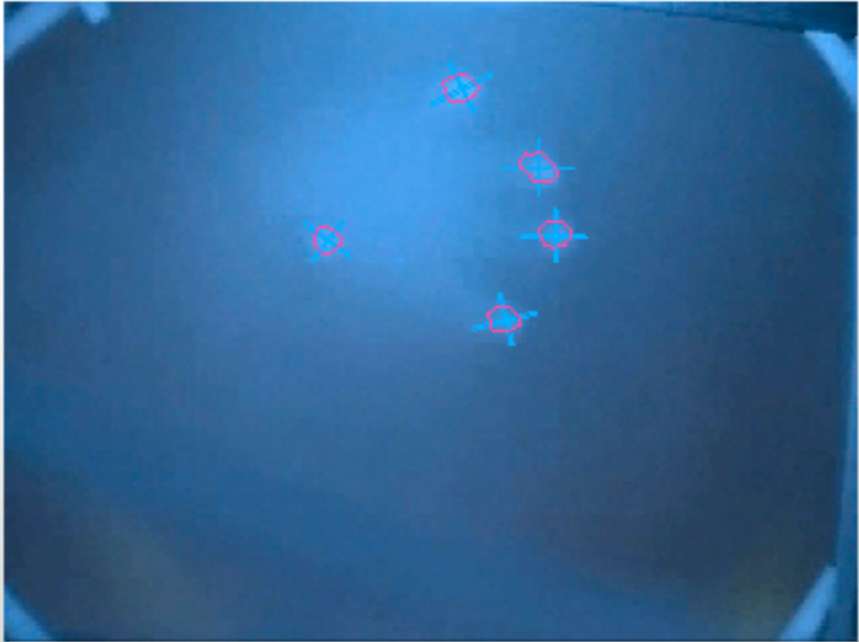
AMPLIFY: 35

Smooth the video

How to do what we did in class

Community Core Vision

Source Image

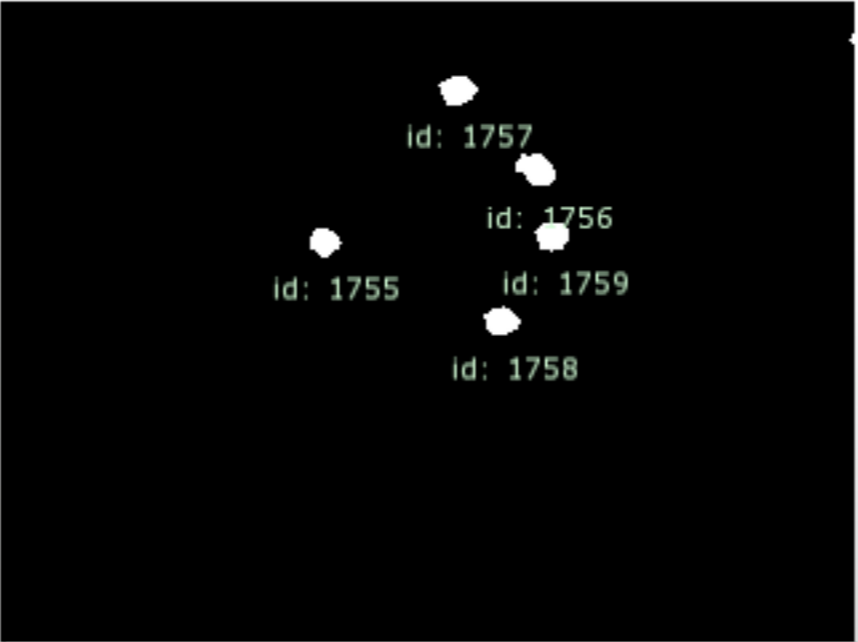


Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12 MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11 MAX BLOB SIZE: 172

Source Properties

CAMERA SETTINGS (V)

FLIP VERTICAL (J)

FLIP HORIZONTAL (H)

GPU Properties

GPU MODE (G)

Communication

SEND TUIO OSC (T)

SEND TUIO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Calc. Time [ms]: 5

Video [Res]: 320 x 240

Video [fps]: 30

Sending OSC messages to:
Host: 127.0.0.1
Port: 3333

Press spacebar to toggle fast mode

~ |tbeta.nuigroup.com

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3

Amplify

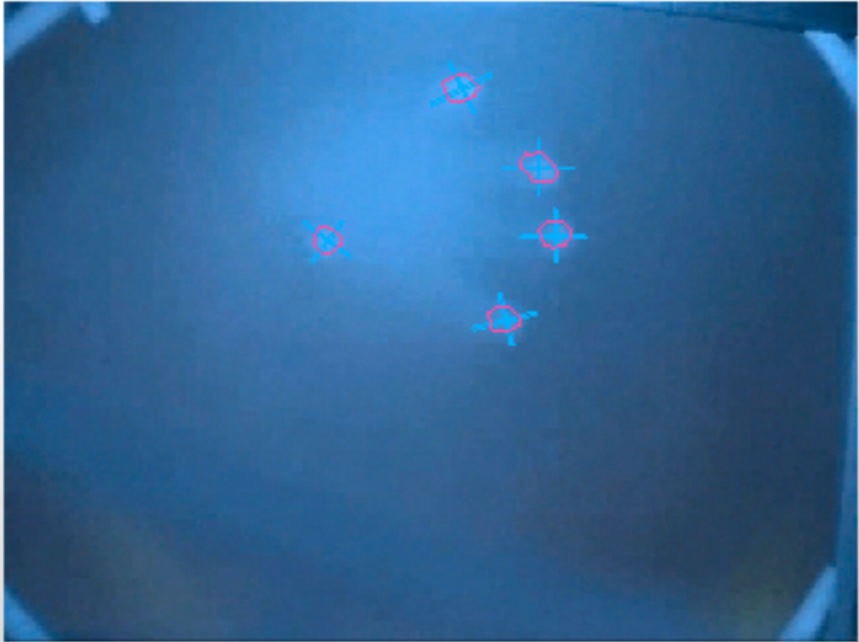
AMPLIFY: 35

Eliminate "static"

How to do what we did in class

Community Core Vision

Source Image

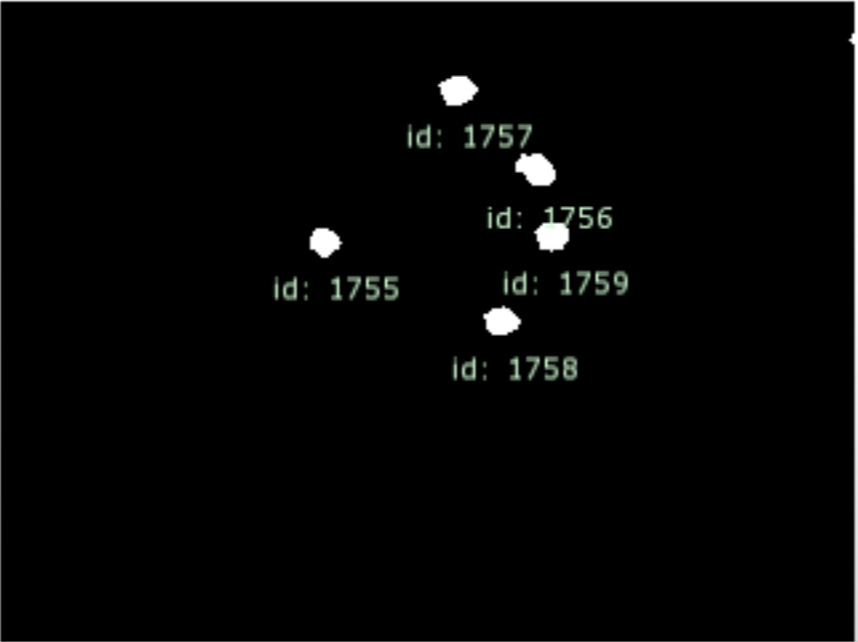


Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12 MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11 MAX BLOB SIZE: 172

Source Properties

CAMERA SETTINGS (V)

FLIP VERTICAL (J)

FLIP HORIZONTAL (H)

GPU Properties

GPU MODE (G)

Communication

SEND TUIO OSC (T)

SEND TUIO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3

Amplify

AMPLIFY: 35

Calc Time [ms] 5

video [Res]: 320 x 240

Video [fps]: 30

Sending OSC messages to:
Host: 127.0.0.1
Port: 3333

Press spacebar to toggle fast mode

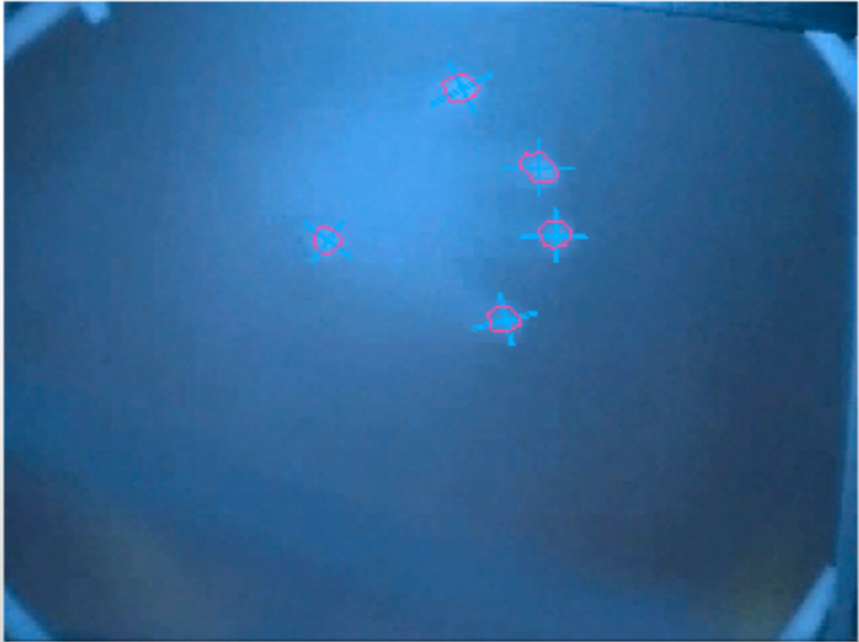
~ |tbeta.nuigroup.com

Boost the signal

How to do what we did in class

Community Core Vision

Source Image

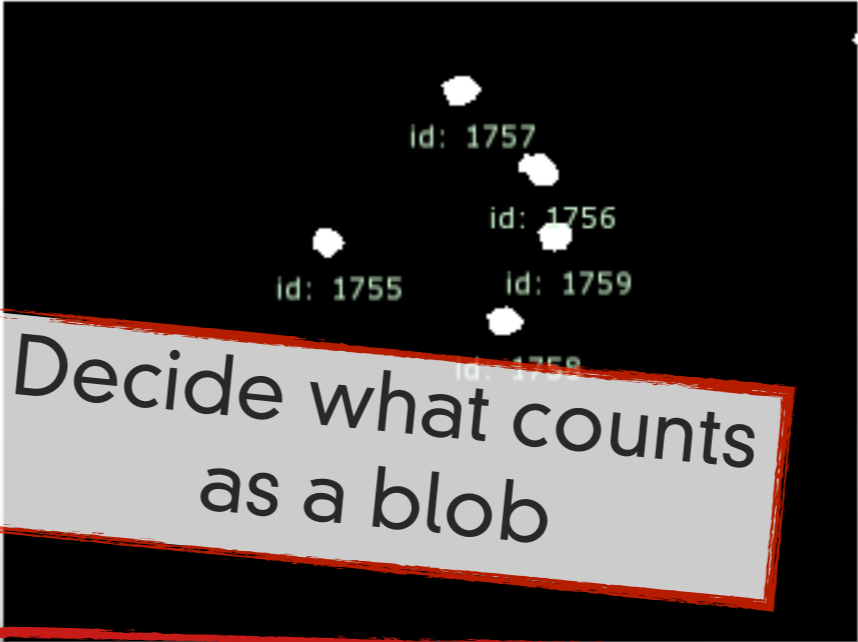


Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12 MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11 MAX BLOB SIZE: 172

Source Properties

CAMERA SETTINGS (V)

FLIP VERTICAL (J)

FLIP HORIZONTAL (H)

GPU Properties

GPU MODE (G)

Communication

SEND TUIO OSC (T)

SEND TUIO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Calc. Time [ms]: 5

Video [Res]: 320 x 240

Video [fps]: 30

Sending OSC messages to:
Host: 127.0.0.1
Port: 3333

Press spacebar to toggle fast mode

~ |tbeta.nuigroup.com

Decide what counts as a blob

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3


Amplify

AMPLIFY: 35

How to do what we did in class

Community Core Vision

Source Image

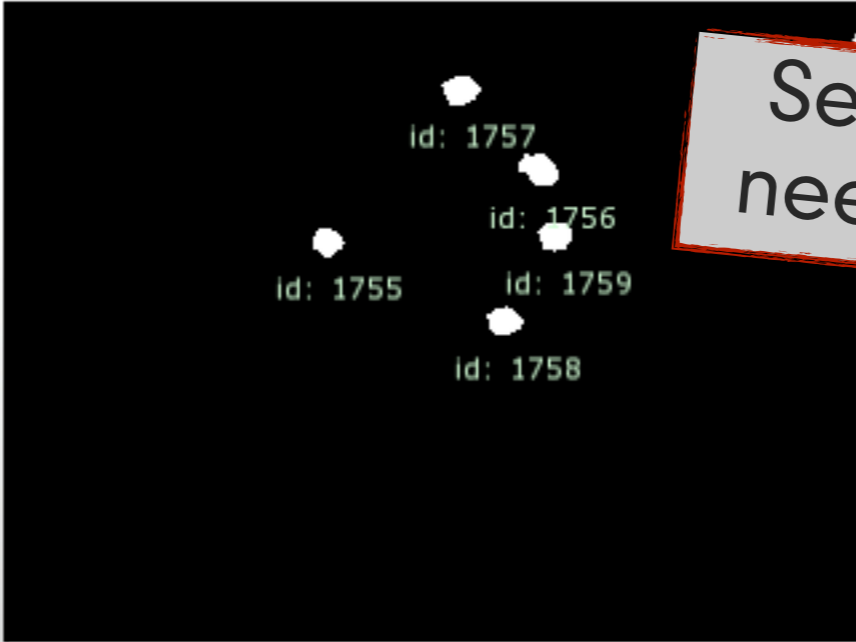


Source Image SHOW OUTLINES (O) SHOW IDS (I)

USE CAMERA PREVIOUS CAMERA NEXT CAMERA

USE VIDEO

Tracked Image



Tracked Image TRACK DRAW BLOBS

IMAGE THRESHOLD: 12

MOVEMENT THRESHOLD: 0

MIN BLOB SIZE: 11

MAX BLOB SIZE: 172

Source Properties

CAMERA SETTINGS (V)

GPU MODE (G)

Communication

SEND TUJO OSC (T)

SEND TUJO TOP | FOR FLASH (F)

SEND HEIGHT & WIDTH

Calibration

ENTER CALIBRATION (C)

Files

SAVE SETTINGS (S)

Background

REMOVE BG (B)

DYNAMIC SUBTRACT

LEARN SPEED: 1

Smooth

SMOOTH: 1

Highpass

BLUR: 29

NOISE: 3

Amplify

AMPLIFY: 35

Calc. Time [ms]: 5

Video [Res]: 320 x 240

Video [fps]: 30

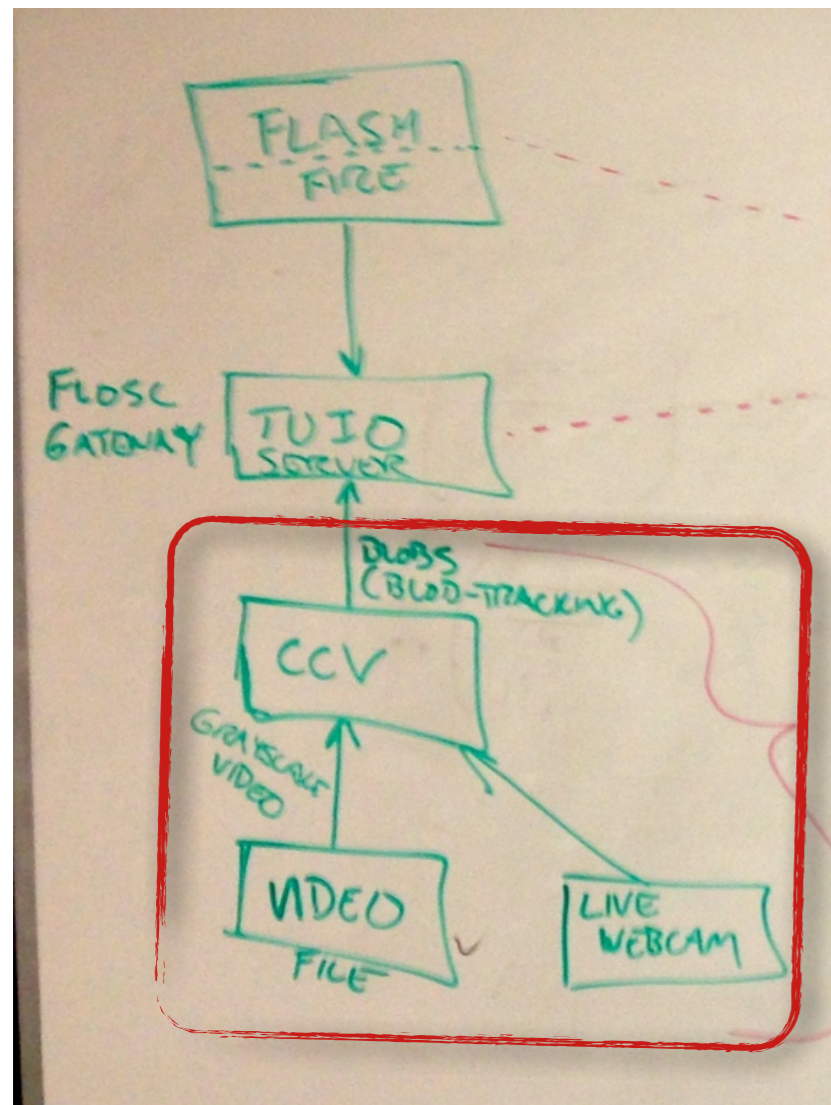
Sending OSC messages to:
Host: 127.0.0.1
Port: 3333

Press spacebar to toggle fast mode

~ |tbeta.nuigroup.com

Settings you may need to mess with

How to do what we did in class



- There is also a configuration file for CCV
 - config.xml
 - GUI settings can be typed in this file
 - It may get overwritten from the GUI

How to do what we did in class

```
<?xml version="1.0" ?>
<CONFIG>
  <!--////////////////////////////////////
  YOU CAN MANUALLY EDIT THE FEATURES BELOW
  //////////////////////////////////----->
  <!--// CAMERA SETTINGS // -->
  <CAMERA_0>
    <USECAMERA>1</USECAMERA>
    <DEVICE>1</DEVICE>
    <WIDTH>320</WIDTH>
    <HEIGHT>240</HEIGHT>
    <FRAMERATE>120</FRAMERATE>
  </CAMERA_0>
  <!--// NETWORK COMMUNICATION SETTINGS //-->
  <NETWORK>
    <LOCALHOST>127.0.0.1</LOCALHOST>
    <TUIO>0</TUIO>
    <TUIOPORT_OUT>3333</TUIOPORT_OUT>
    <TUIOFLASHPORT_OUT>3000</TUIOFLASHPORT_OUT>
  </NETWORK>
  <!--// VIDEO SETTINGS // -->
  <VIDEO>
    <FILENAME>test_videos/RearDI.m4v</FILENAME>
  </VIDEO>
  <!--// BLOB SETTINGS // -->
  <BLOBS>
    <MAXNUMBER>20</MAXNUMBER>
  </BLOBS>
  //////////////////////////////////
```



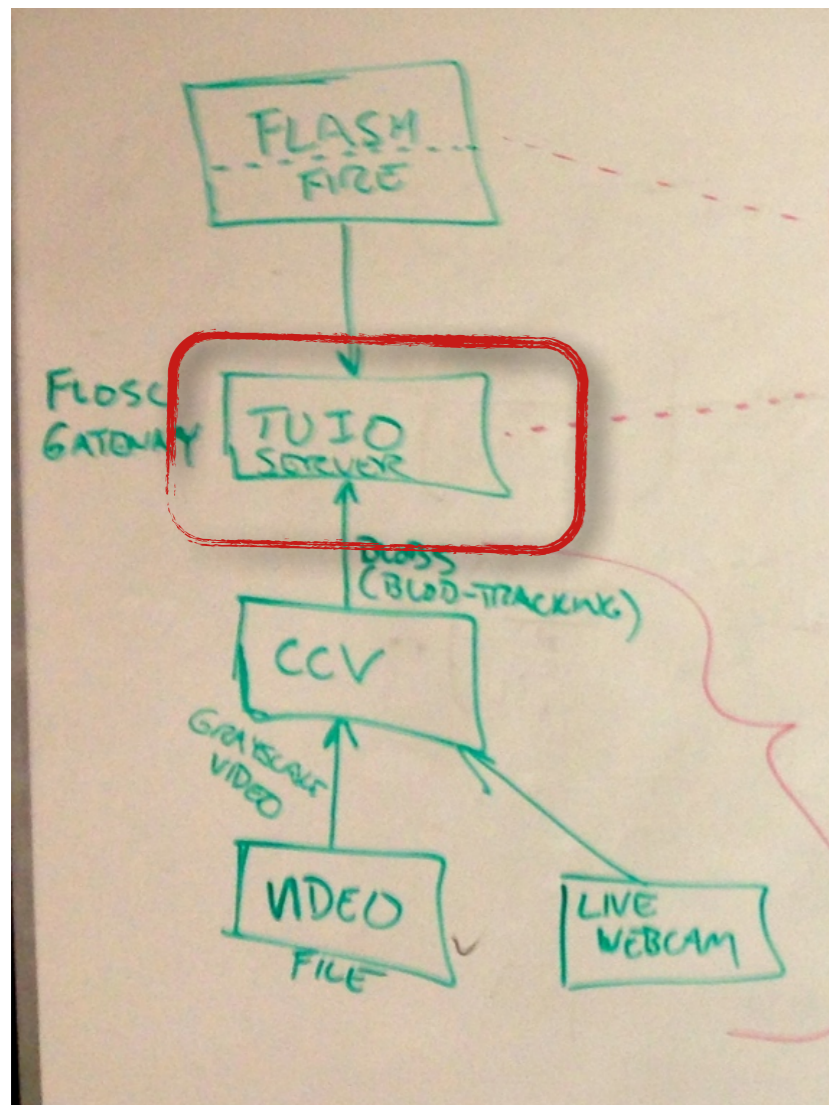
How to do what we did in class

```
<!--//////////////////////////////////////>

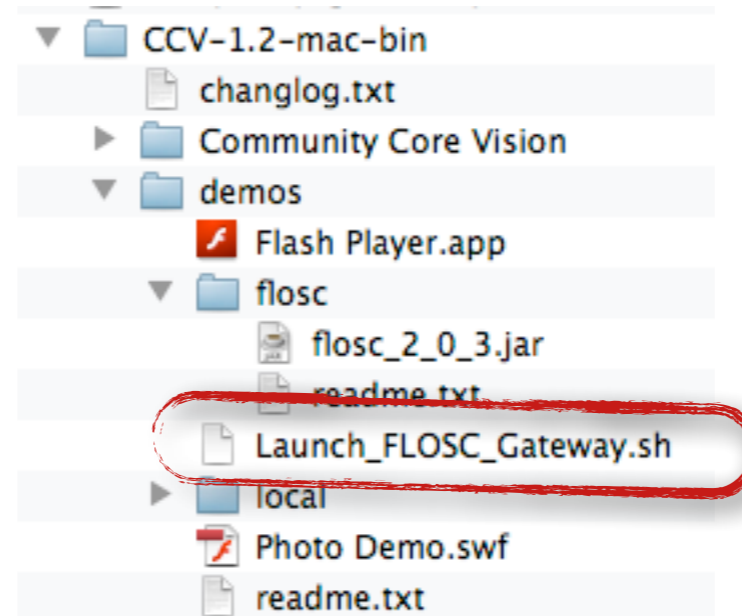
    DO NOT EDIT THE VALUES BELOW

////////////////////////////////////// -->
<APPLICATION>
  <TITLE>Community Core Visision</TITLE>
  <VERSION>1.2.0</VERSION>
</APPLICATION>
<WINDOW>
  <WIDTH>950</WIDTH>
  <HEIGHT>600</HEIGHT>
</WINDOW>
<BOOLEAN>
  <PRESSURE>4</PRESSURE>
  <LABELS>1</LABELS>
  <OUTLINES>1</OUTLINES>
  <LEARNBG>0</LEARNBG>
  <TUIO>1</TUIO>
  <VMIRROR>0</VMIRROR>
  <HMIRROR>0</HMIRROR>
  <HIGHPASS>1</HIGHPASS>
  <AMPLIFY>1</AMPLIFY>
  <SMOOTH>0</SMOOTH>
  <GPU>1</GPU>
  <DYNAMICCBG>1</DYNAMICCBG>
  <SNAPSHOT>0</SNAPSHOT>
  <MINIMODE>0</MINIMODE>
  <HEIGHTWIDTH>1</HEIGHTWIDTH>
  <OSCMODE>1</OSCMODE>
  <TCPMODE>0</TCPMODE>
  <TRACKDARK>1</TRACKDARK>
</BOOLEAN>
<INT>
  <MINMOVEMENT>2</MINMOVEMENT>
  <MINBLOBSIZE>11</MINBLOBSIZE>
  <MAXBLOBSIZE>86</MAXBLOBSIZE>
  <!--// FILTERS SETTERS //-->
  <THRESHOLD>43</THRESHOLD>
  <HIGHPASSBLUR>40</HIGHPASSBLUR>
  <HIGHPASSNOISE>8</HIGHPASSNOISE>
  <HIGHPASSAMP>35</HIGHPASSAMP>
  <SMOOTH>1</SMOOTH>
  <BGLEARNRATE>450.099976</BGLEARNRATE>
</INT>
</CONFIG>
```

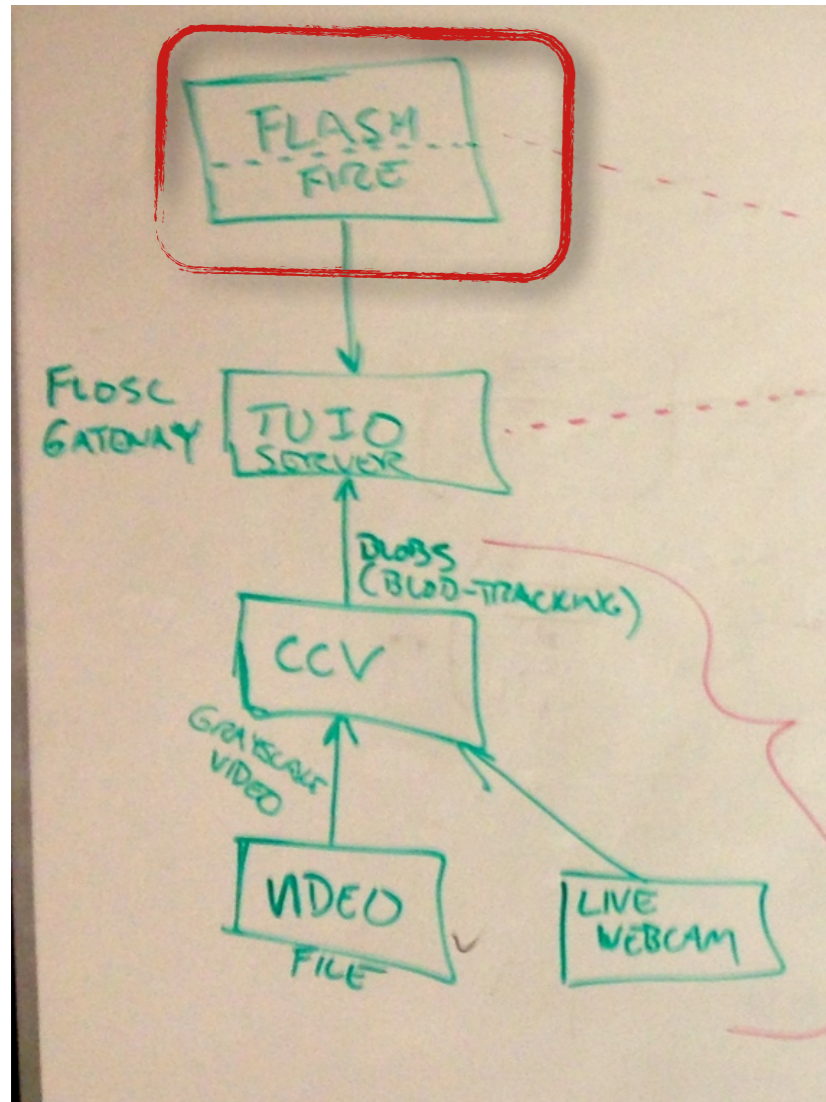
How to do what we did in class



- For Flash Demos run the TUJO server standalone



How to do what we did in class



- Download Flash Demos
- <http://ccv.nuigroup.com/>

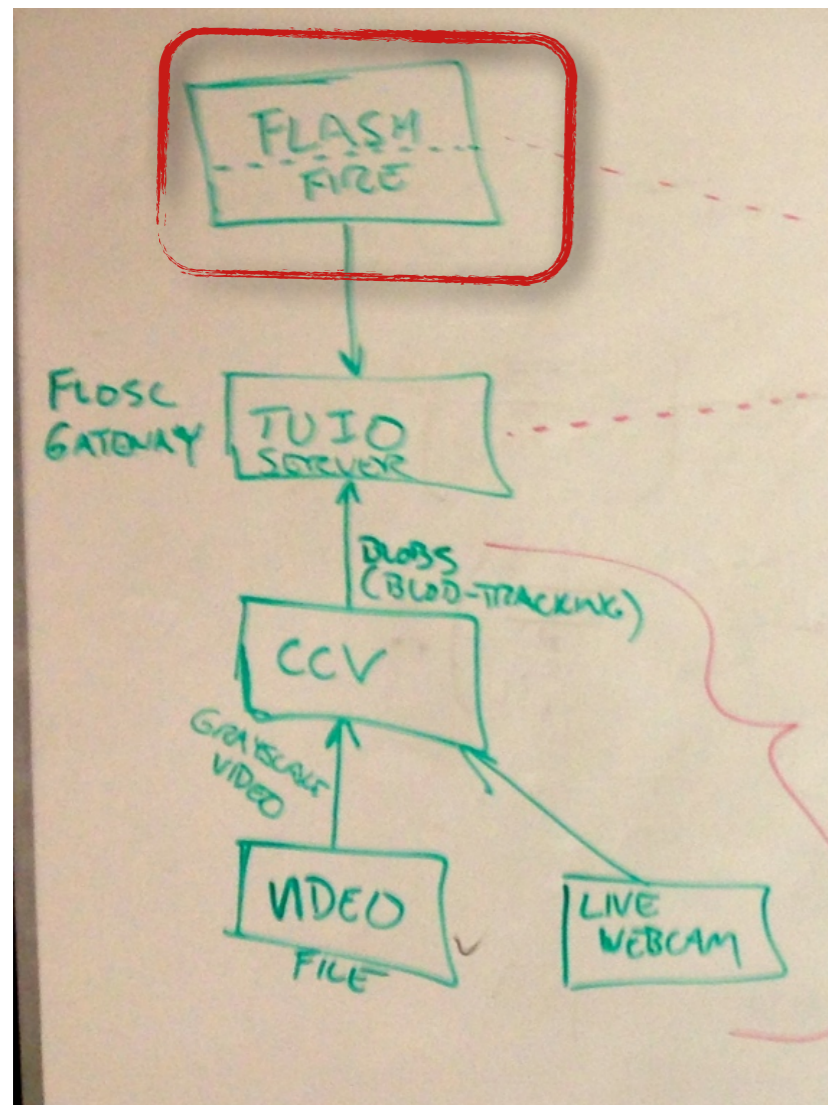
CCV - About Features Screenshots Tutorials **Downloads** License

Downloads

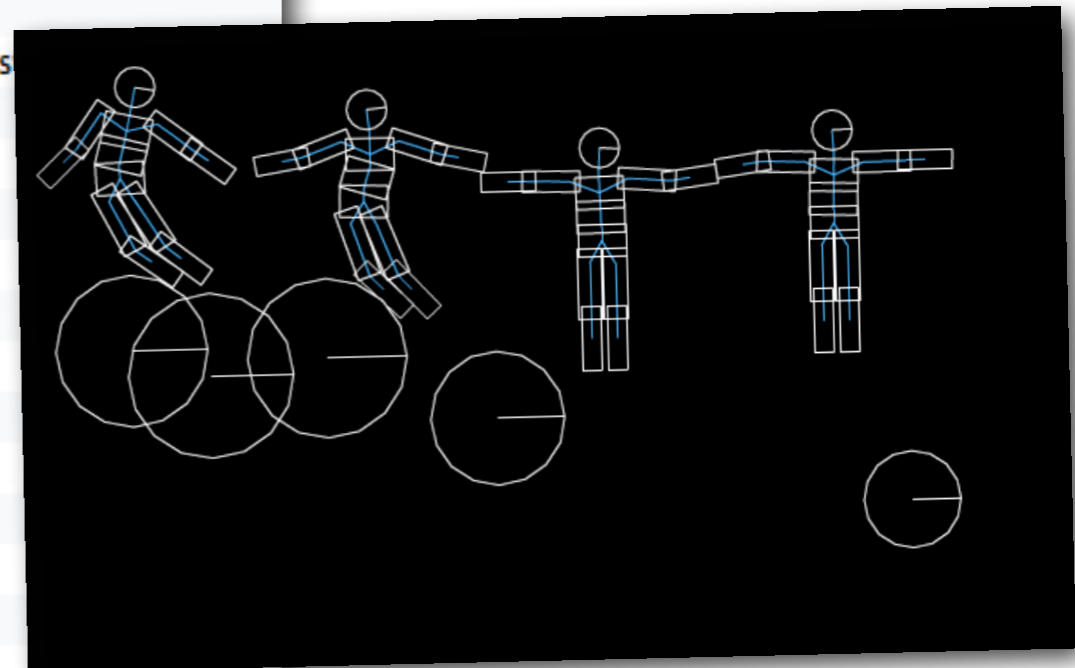
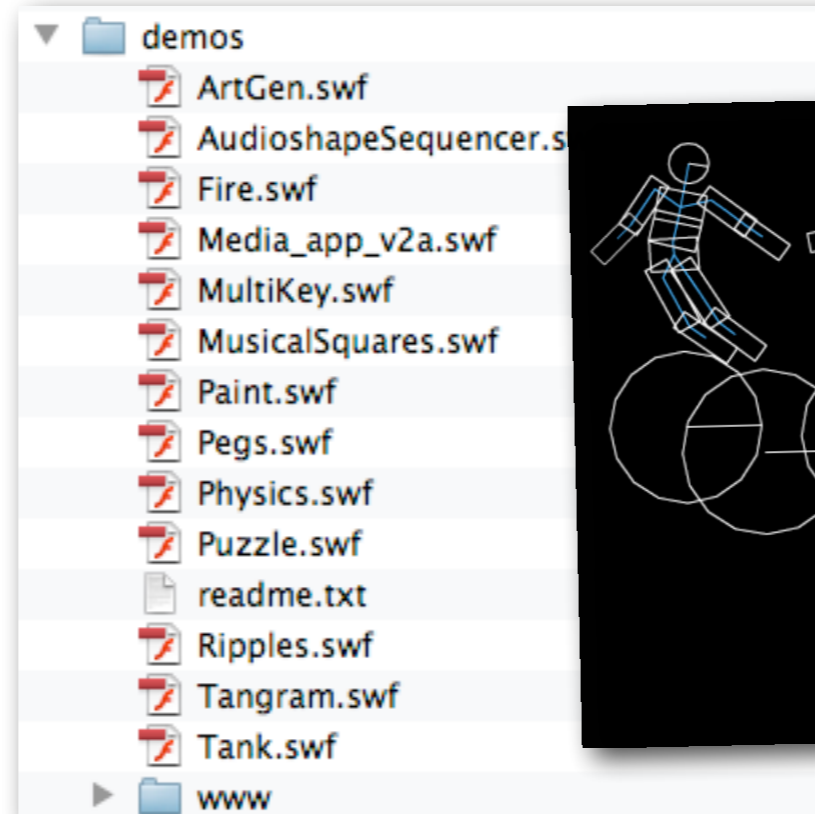
- Linux**
 - Ubuntu/Debian
- Mac**
 - Leopard OS X 10.5 (PPC/Intel)
- Windows**
 - Windows XP/Vista
- Flash** (highlighted)
 - Example Clients
- Source Repository**
 - NUI Code SVN
- Tools**
 - Sample Test Videos
 - TUJO Simulator - Java

Please submit any bugs you may find on CCV's project page

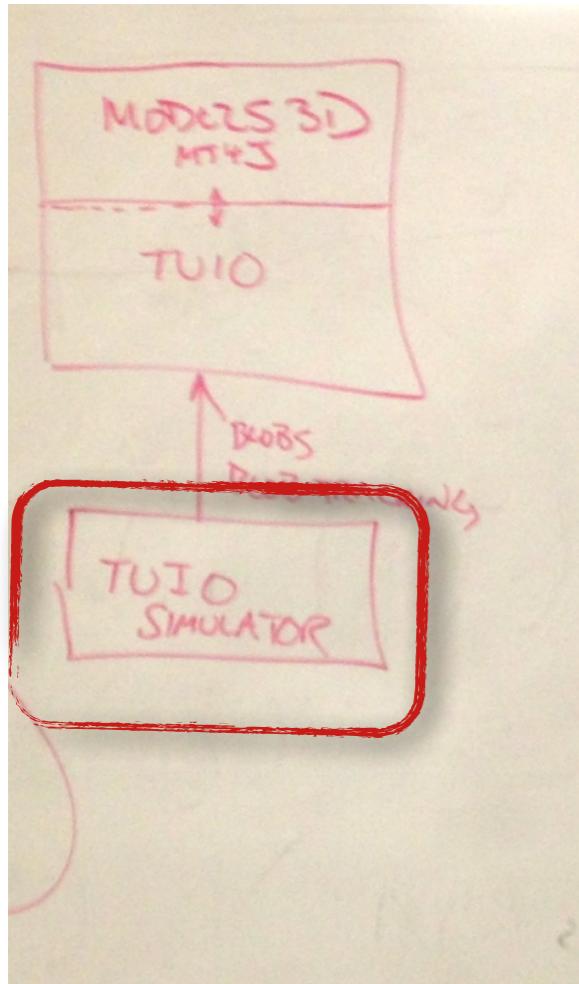
How to do what we did in class



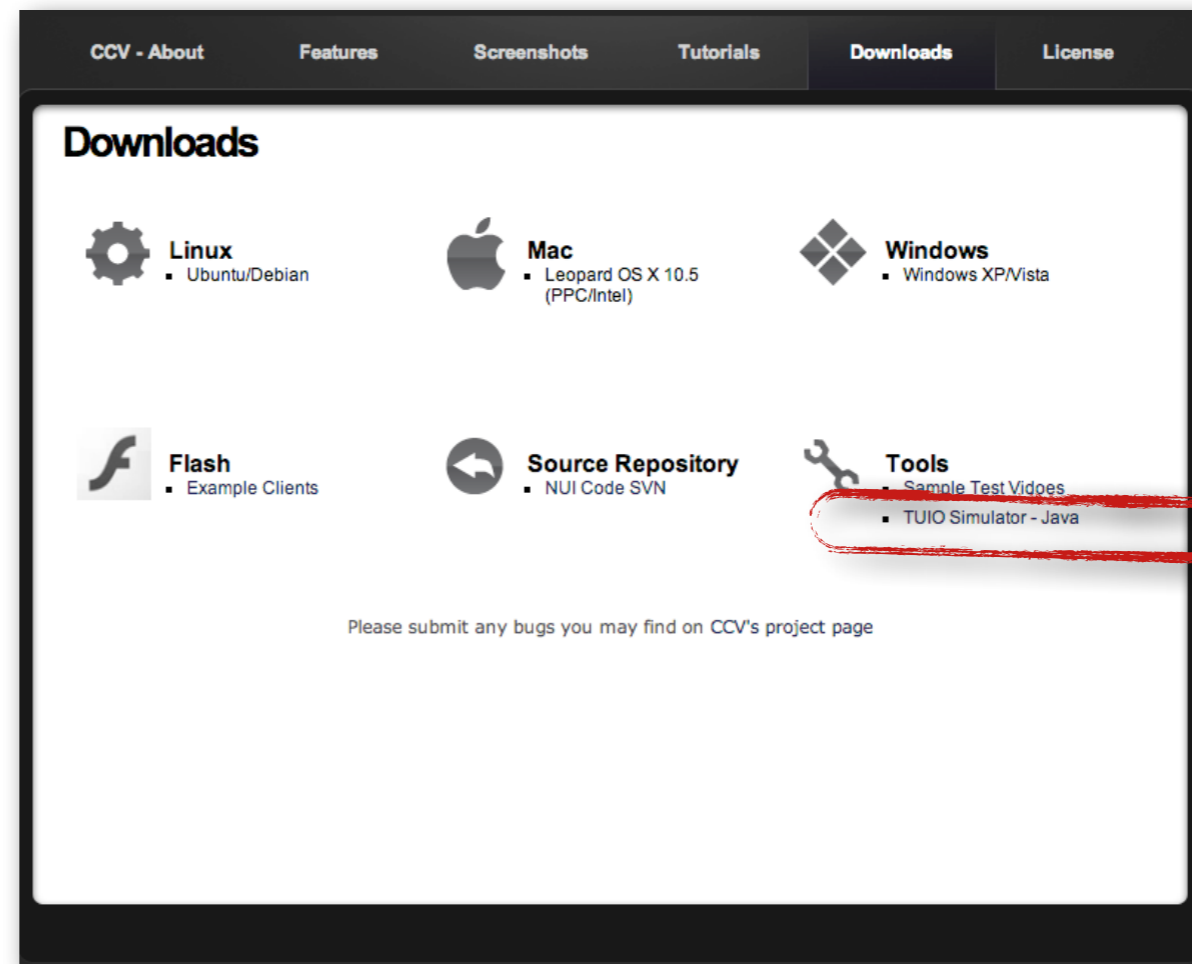
- Download Flash Demos



How to do what we did in class

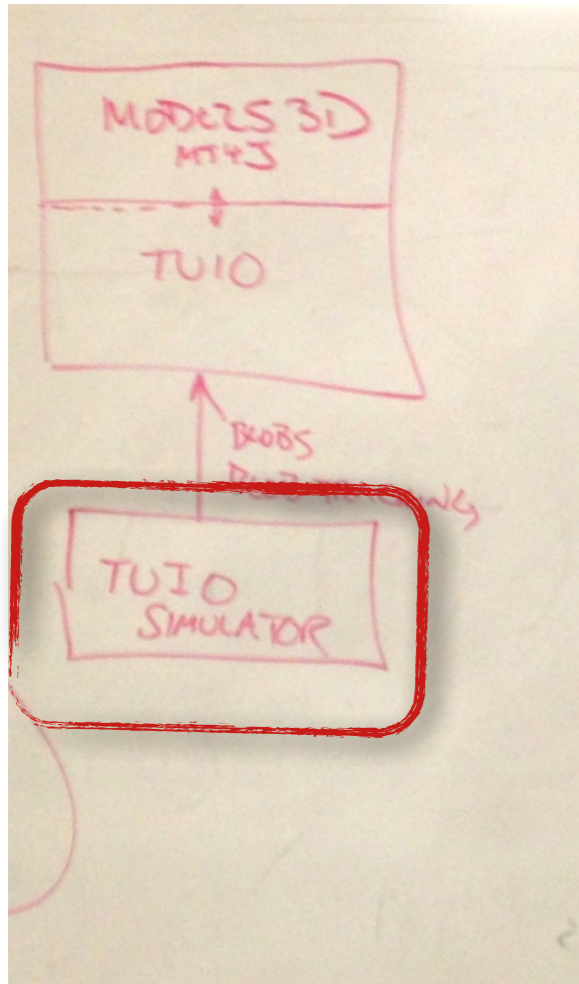


- Download TUIO Simulator

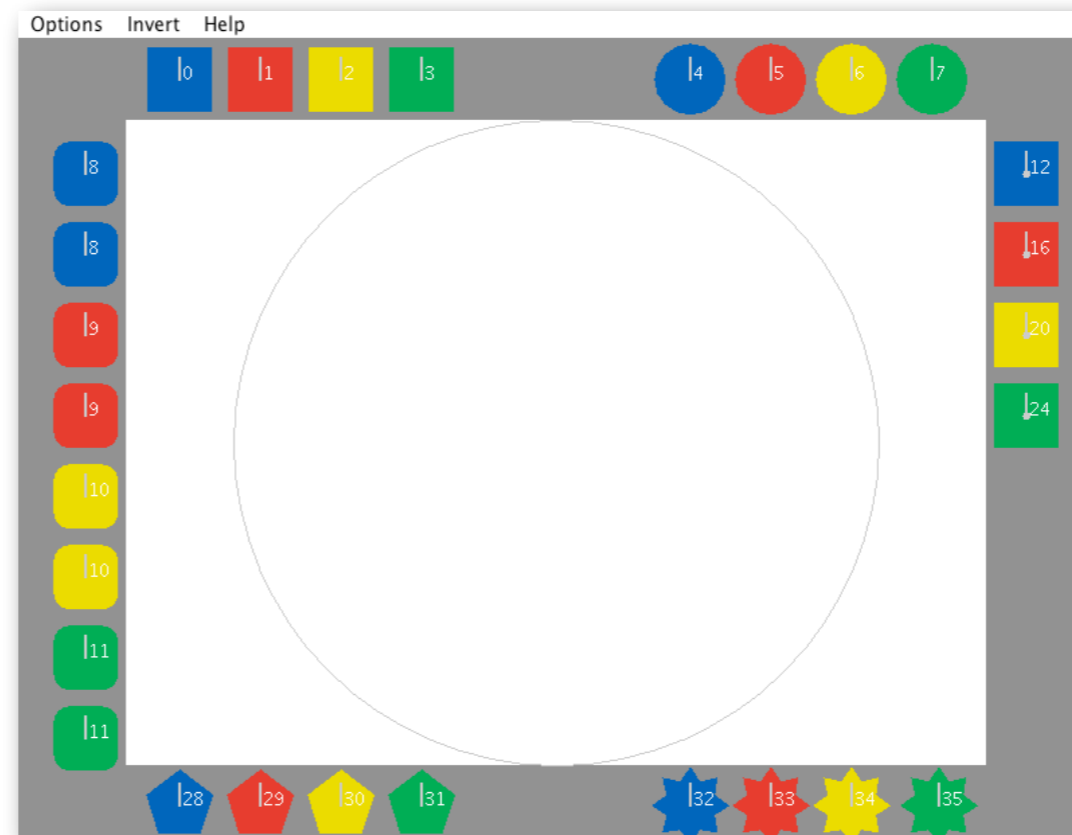


How to do what we did in class

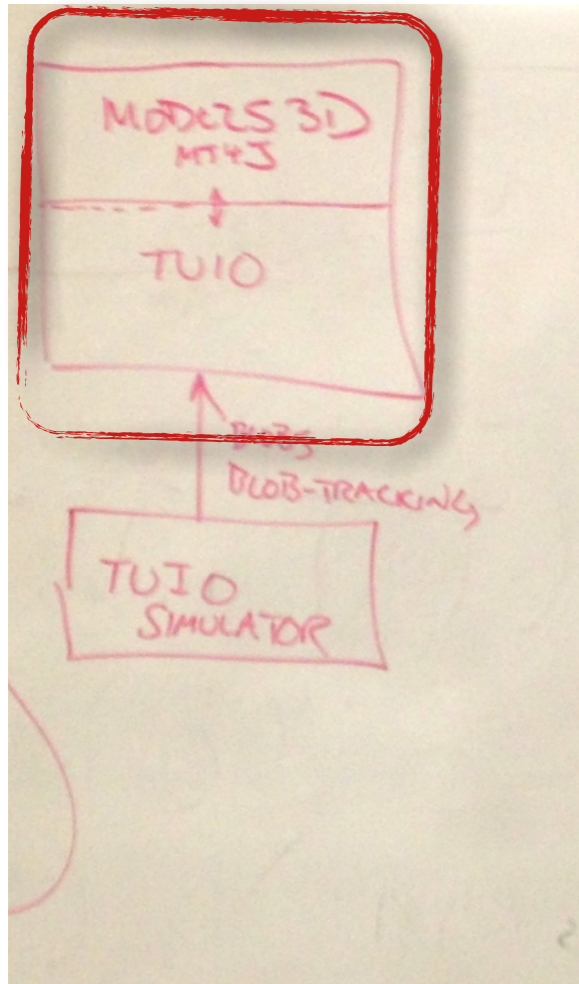
- Run as a java program



```
$ java -jar TuioSimulator.jar  
sending TUIO messages to 127.0.0.1:3333
```



How to do what we did in class

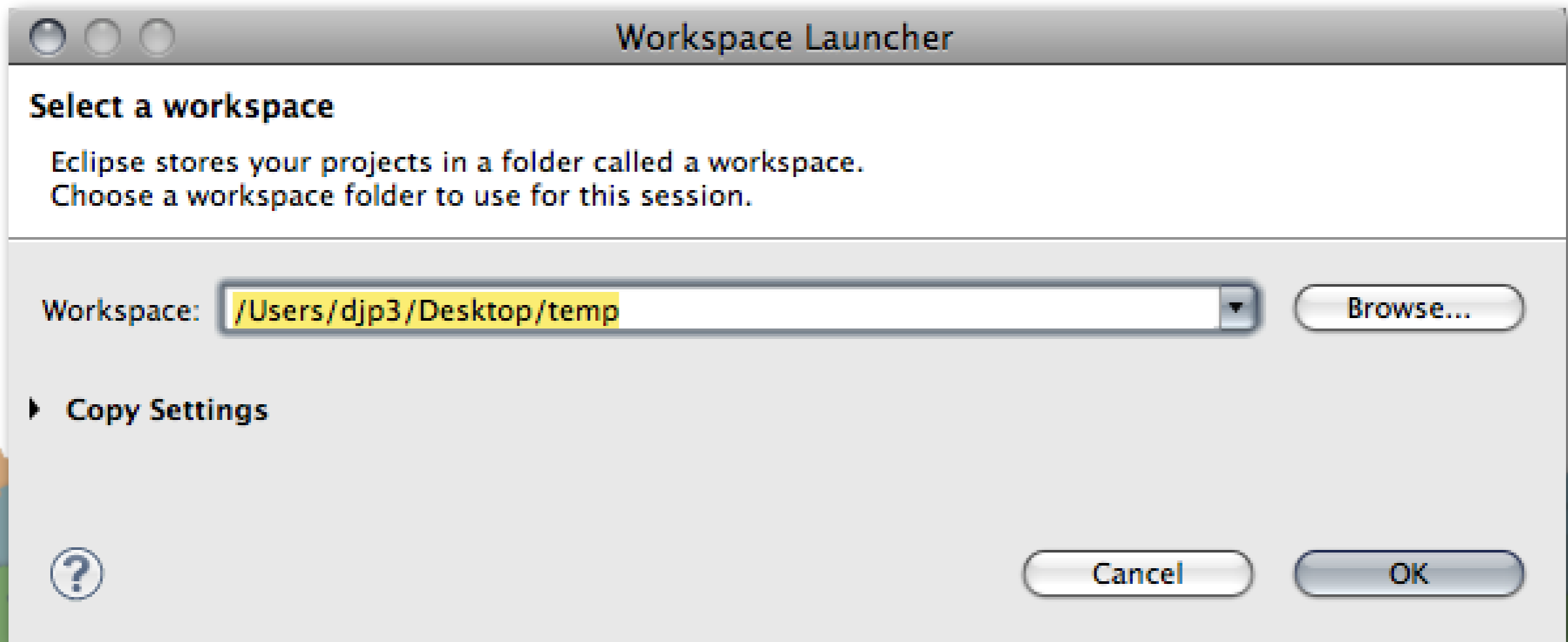


- Setup MT4J in Eclipse



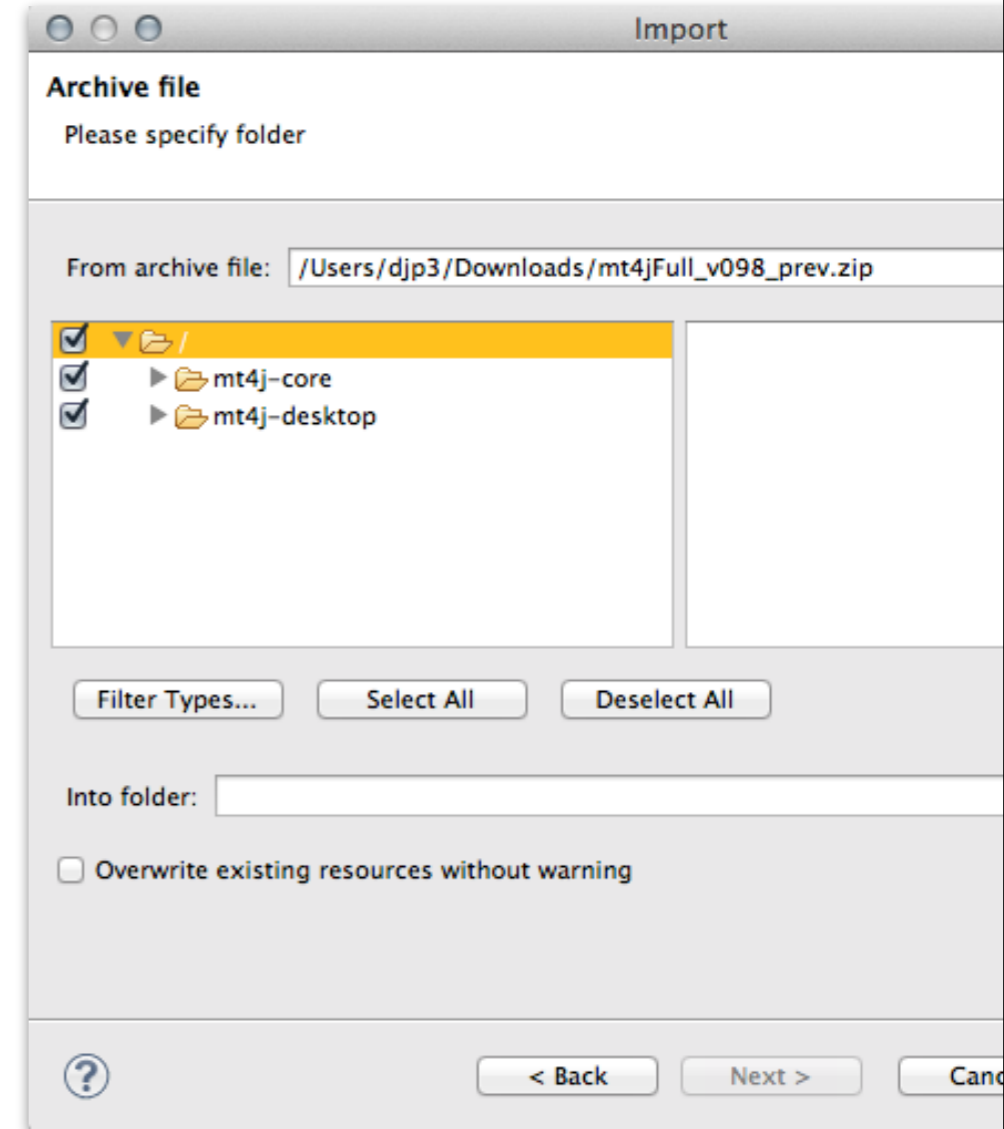
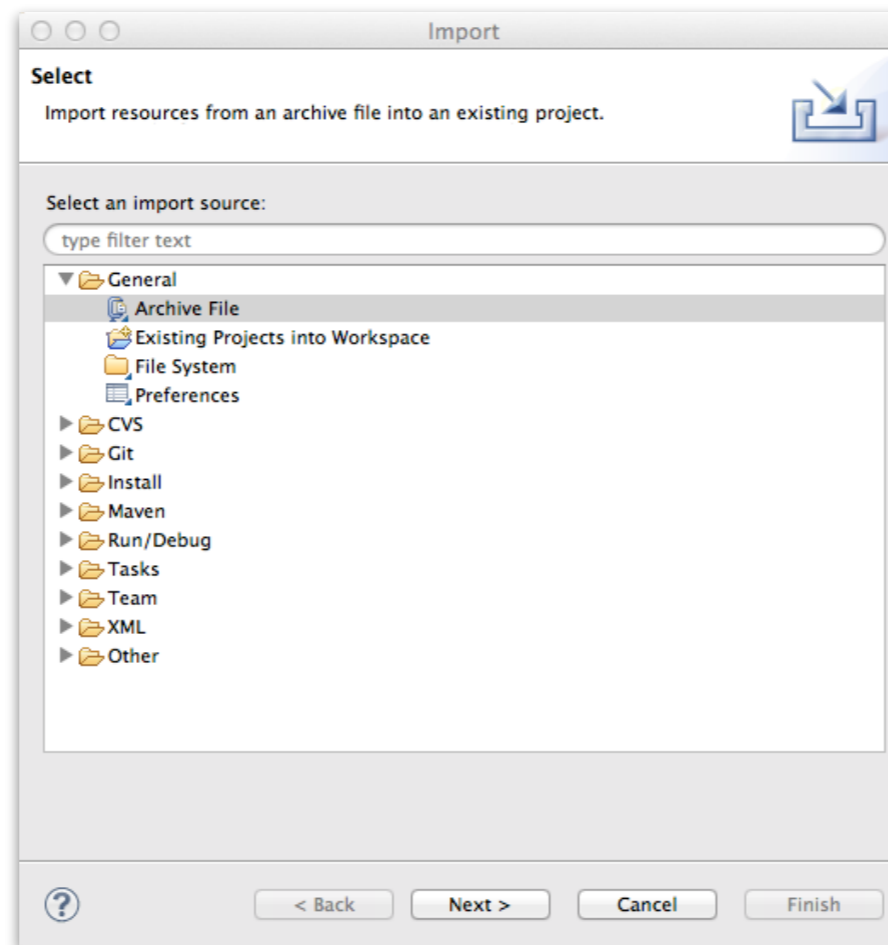
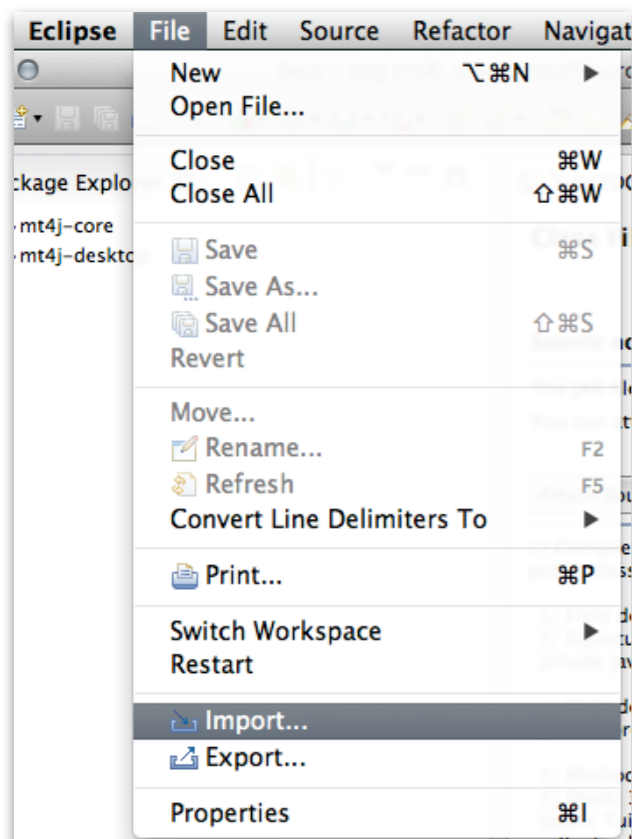
Getting the software going

- Download and Install Eclipse
 - <http://www.eclipse.org/>
- Download MT4J
 - <http://www.mt4j.org/mediawiki/index.php/Downloads>
- Pick a directory and create a new workspace in Eclipse



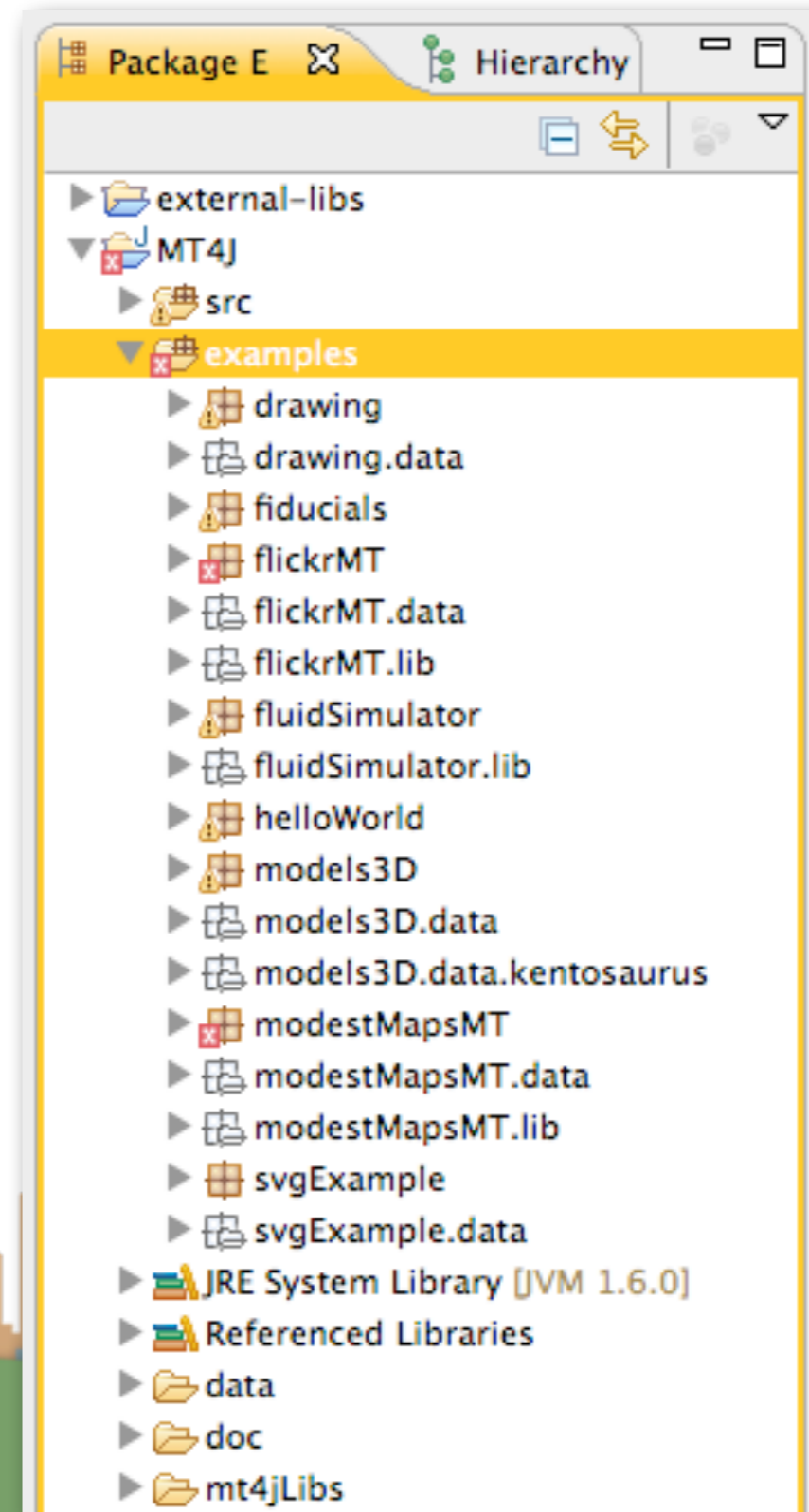
Getting the software going

- Import a new archive Java Project in Eclipse



Getting the software going

- When you run an MT4J program the TUIO server is built in
 - Hello World
 - Test Scene
 - MTGestures
 - Space Scene
 - Fluid Simulator



Getting the software going

- The MT4J page has information on how to use MT4J
 - It's a visualization system
 - It is complicated
 - Start with an example
 - Then modify it

MT4j

wiki search

Main Page

Main Page

MT4j – Multitouch for Java™ – is an open source Java™ framework, created for rapid development of visually rich applications. MT4j is designed to support different kinds of input devices with a special focus on multi-touch support.

MT4j Features

- can be used for 2D, 3D or 2.5D (pseudo-3D) applications
- cross-platform – currently tested under Windows 7™, XP™, Vista™, Ubuntu Linux and Mac OSX™
- extensible, component based scene graph structure (similar to Java™'s swing framework)
- input abstraction layer – support for all sorts of input devices can be easily added
- supports the new Windows 7™ Touch features natively and all the compliant multi-touch hardware
- supports Apple™'s multi-touch mice and trackpads
- supports the TUIO protocol, which is provided by finger and object tracking software such as Reactivision, CCV or Touché
- flexible multitouch gesture system – you can define your own multitouch gestures
- the most common multitouch gestures are already included and can be registered modularly with any component for a pluggable behaviour changeable at runtime
- software or hardware accelerated graphics rendering (using OpenGL)
- includes many graphical objects e.g.: rectangles, round rectangles, ellipses, polygons, lines, triangle meshes, spheres, cubes, etc. with support for textures, gradients, fill- and outline color
- includes prebuilt UI components e.g.: buttons, text, lists, sliders and a multitouch enabled keyboard
- support for loading and fast rendering of vector graphics from Scalable Vector Graphics (SVG) files
- supports bitmap and vector fonts (SVG and True Type Fonts)
- imports 3D objects from .3ds and .obj files with textures and creates normals for smooth shading
- precise picking/selection of all geometric objects in 2D or 3D space – most gestures are supported in 3D
- animation support
- built on top of Processing, which allows you to use its many features and libraries
- test your multitouch application by using one – or even multiple mice connected to your pc (Windows, Linux)
- MT4j is open source and released under the GPL License.

Quick Links

- Downloads
- Documentation
 - Installation
 - How to Start?
 - Developer's Guide
 - Code Snippets
 - Examples
 - Architecture Overview
 - API Reference
- FAQ (Frequently Asked Questions)
- Blog

News

MT4j on Android
04.04.11., 10:58, read / post comments

MT4j interim Release (v 0.98)
04.04.11., 08:50, read / post comments

Our workshop in Berlin, Germany
01.04.11., 08:16, read / post comments

MT4j Roadmap
16.11.10., 05:30, read / post comments

Showcase: MT4j – Android Edition: First Alpha Verison

MT4j - Android Edition, Demo: First Alpha Ver... More info

Multi-Touch Shell example

Running three MT-apps

Watch more Videos

Powered by MediaWiki contact

Home of MT4j

Universität Stuttgart
Institut für Arbeitswissenschaft und
Technologiemanagement IAT

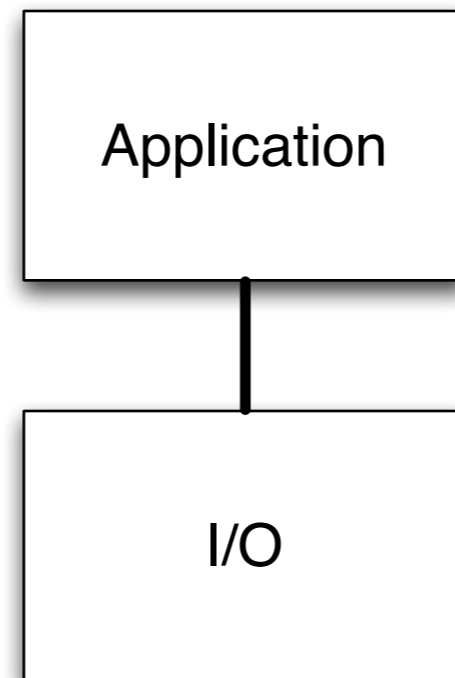
Fraunhofer IAO

NUI Group

Visit the NUI Group Community

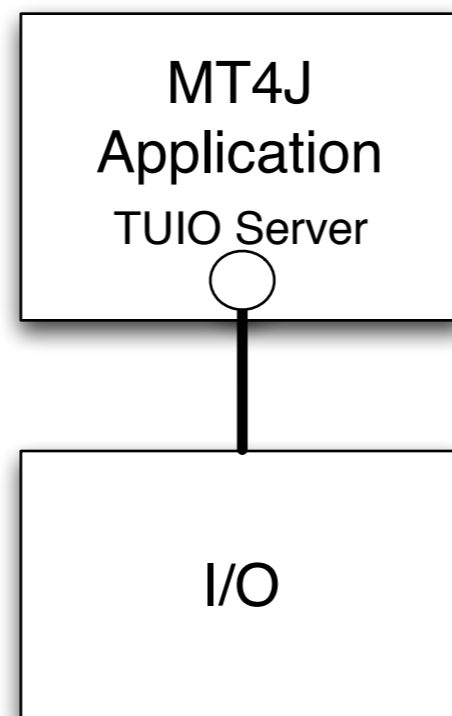
How to go about doing Task #21

- Get an end-to-end demo running with off the shelf stuff
- Then slowly replace the pieces with your implementations



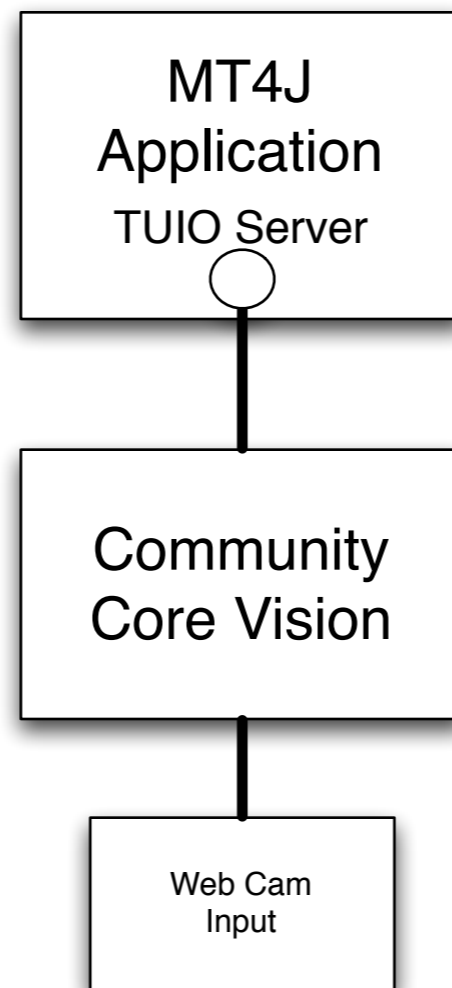
How to go about doing Task #21

- Get an end-to-end demo running with off the shelf stuff
- Then slowly replace the pieces with your implementations



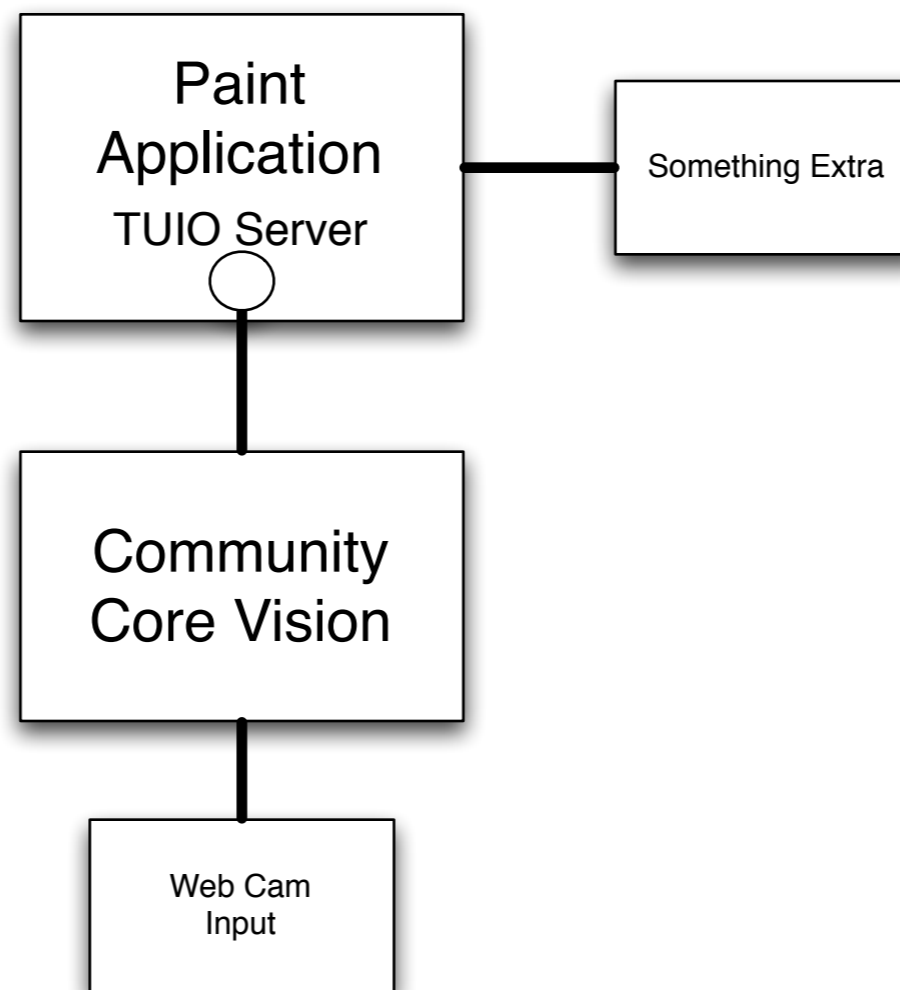
How to go about doing Task #21

- Get an end-to-end demo running with off the shelf stuff
- Then slowly replace the pieces with your implementations



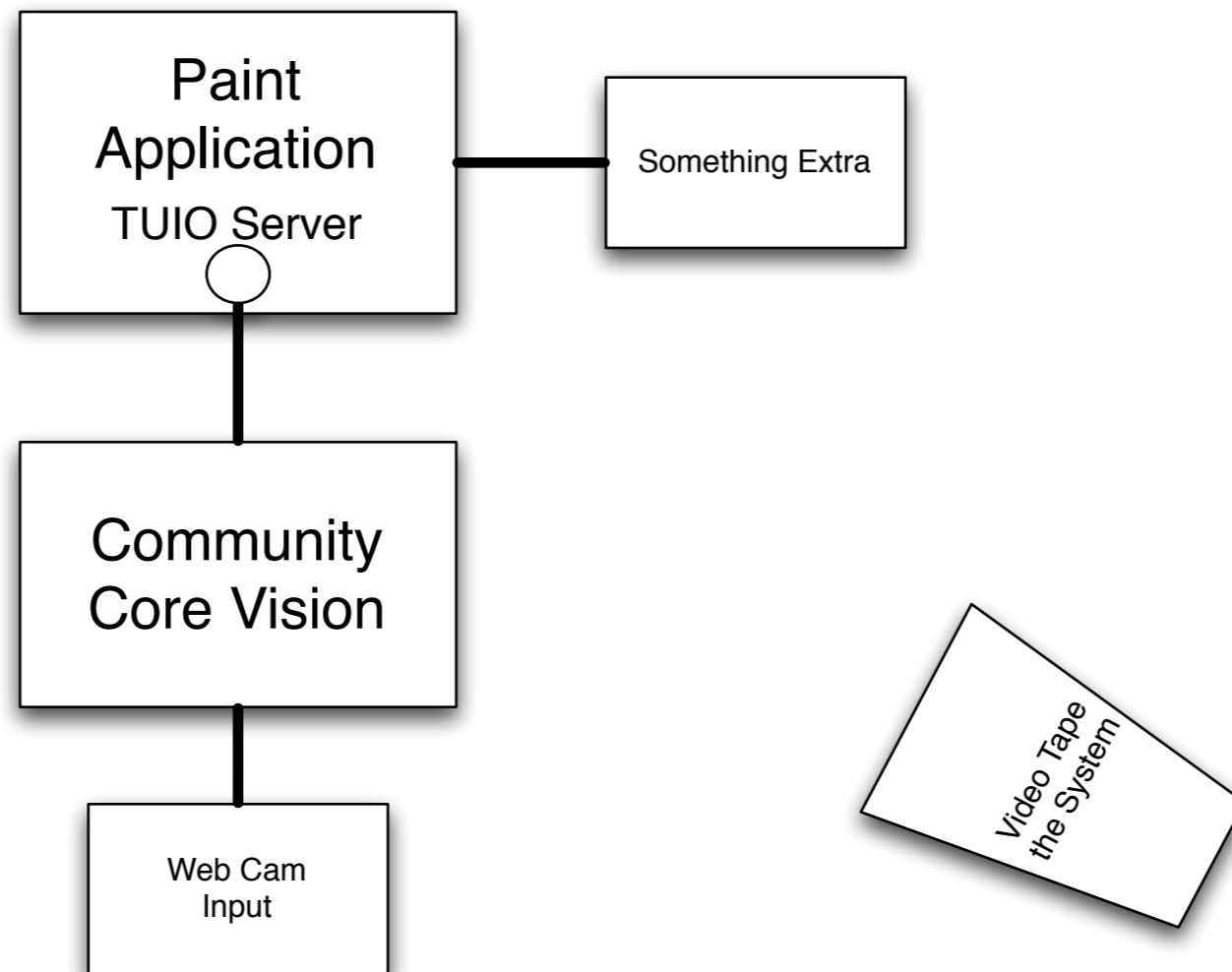
How to go about doing Task #21

- Get an end-to-end demo running with off the shelf stuff
- Then slowly replace the pieces with your implementations



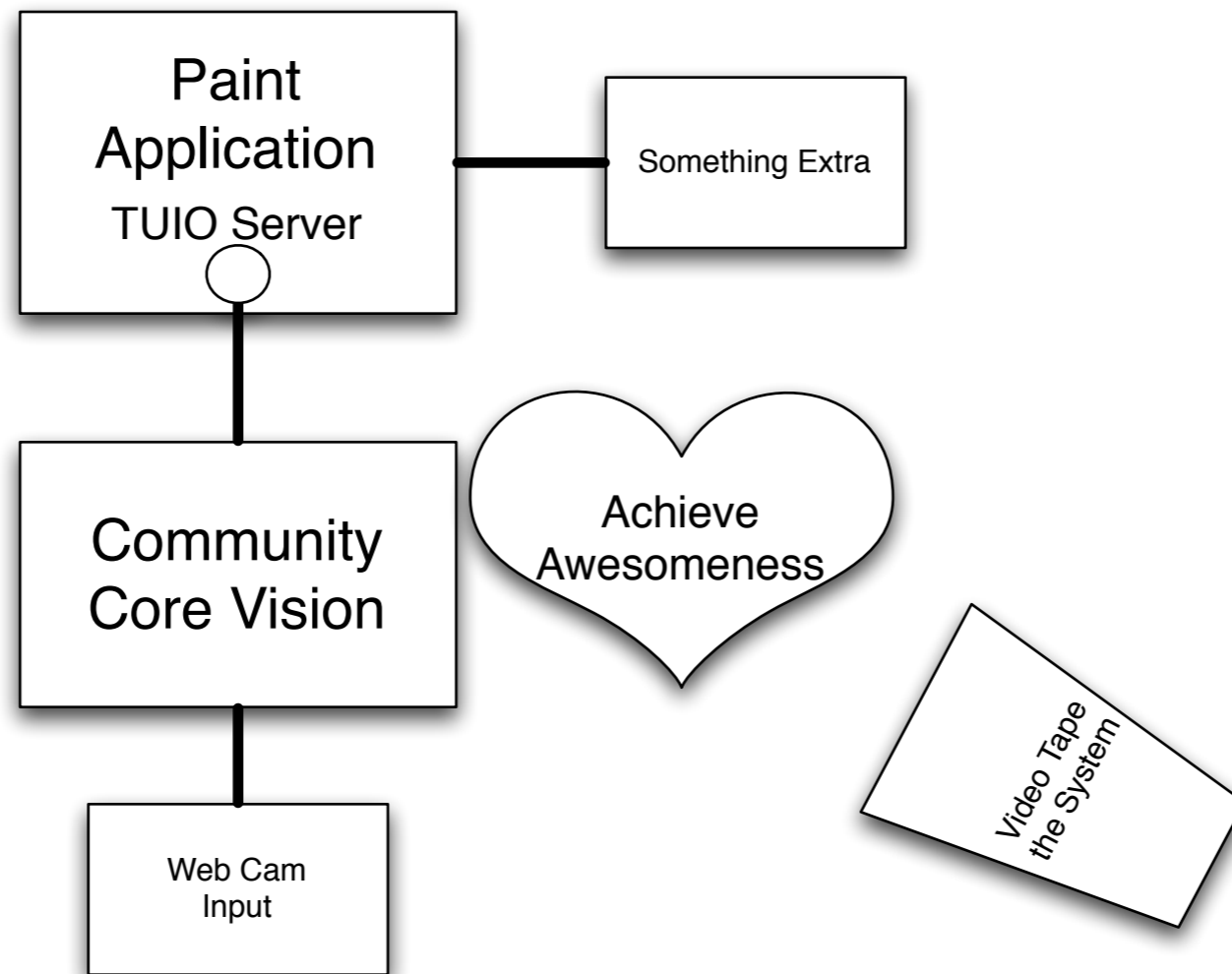
How to go about doing Task #21

- Get an end-to-end demo running with off the shelf stuff
- Then slowly replace the pieces with your implementations



How to go about doing Task #21

- Get an end-to-end demo running with off the shelf stuff
- Then slowly replace the pieces with your implementations

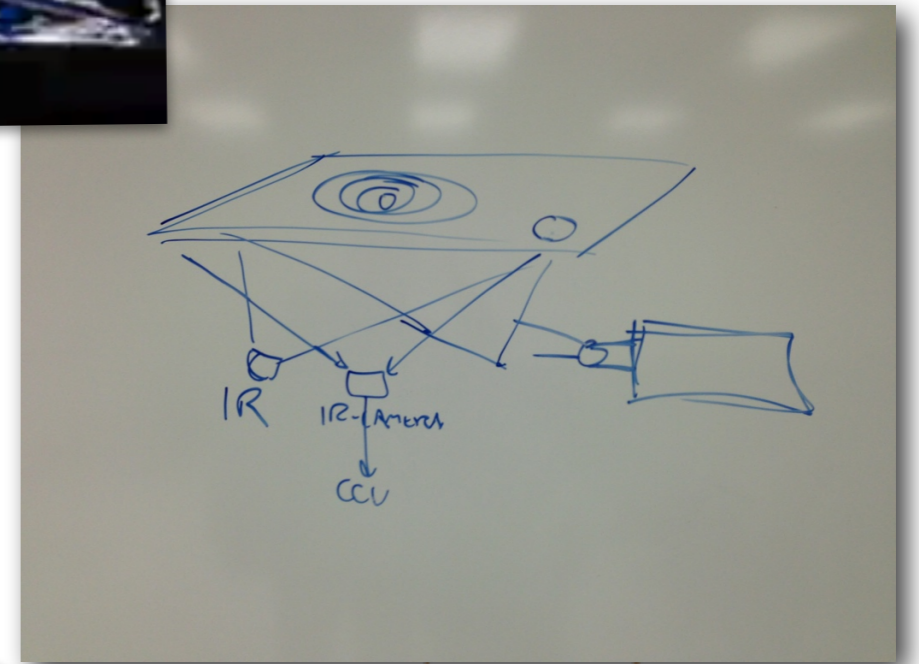


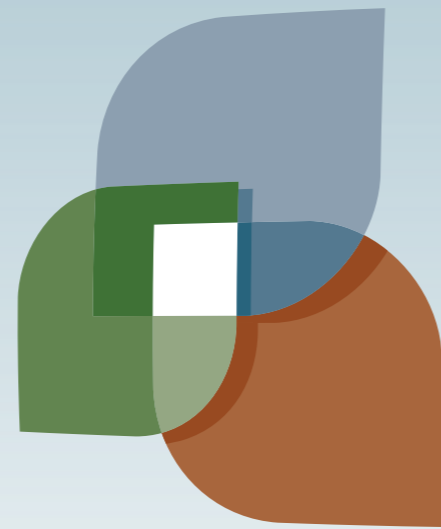
How to go about doing Task #21

- Options for increased awesomeness
 - Do a different application than a paint program
 - Make sure it needs multi-touch (talk to prof.)
 - Do a different input than a webcam
 - Make sure it is more than just a download (talk to prof.)
- Remember this can be a portfolio piece!



How to go about doing Task #21





L U C I

