#### Introduction to FLARToolKit

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**Twitter tag: #adobemax284** 

#### Saqoosha

- Real name is Tomohiko Koyama (小山 智彦).
- Flash Developer and CTO of Katamari Inc.
- 10 years of Flash experience.
- My recent works at Katamari are listed at <u>http://katamari.co.jp/</u>



# kamai

Twitter: <u>@Saqoosha</u> Blog: <u>saqoosha.net</u>

## HAPPY NEW YEAR'

AID-DCC Inc. & KATAMARI Inc. PRESENTS NEW YEAR SPECIAL SITE [ZERO-NINE].



## **FLARToolKit**

- MAS
- The world's first Flash based augmented reality library ported from <u>NyARToolkit</u> (Java ported version of <u>ARToolKit</u>).
- First version was released in May 2008.
- Porting was completed in about 1 week.
- FLAR is a part of Spark project.
  - http://www.libspark.org/wiki/saqoosha/FLARToolKit/en

#### Smart Gr Augmented Reali See a digital hologram art Grid technology cor to life in your hand

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Get plugged i hare with a frien Tips and tricks Dpen the door to and turning you computer's micr

#### tting Started

 Augmented Reality requires a printed
Solar Panel Marker to work. If you don't already have one, print one here.>

Turn on your computer's sound and webcam. And turn off any pop-up blockers.

Select the "Wind Turbine" or "Solar Energy" experience by clicking the buttons below.

Hold your printed marker so it faces your computer's webcam.

Open the door to the Smart Grid by twisting and turning your marker. For wind, blow into your computer's microphone to see what happens.

unch Wind Turbine

unch Solar Energ

imagination at work

Navigate the Smart Grid

ecomagination



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#### **Basic usage**

- FLARToolKit doesn't render the 3D objects.
- Calculates only the orientation of the marker.
- Use other 3D engines to render 3D objects.
  - Papervision3D
  - Away3D (both 2.x and 3.x)
  - Sandy
  - Alternativa3D
- Start-up guide for FLARToolKit.
  - http://saqoosha.net/en/flartoolkit/start-up-guide/

#### FLARToolKit does the following steps to create final AR image.

- **1. Capture the image from webcam.**
- 2. Binarize input image.
- 3. Labeling.
- 4. Find squares.
- 5. Matching with patterns.
- 6. Calculate transform matrix.
- 7. Render the 3D objects.

- Capture the image from webcam. (Step 1 of 7)
  - Simply use Camera and Video classes.
  - then draw video instance onto the BitmapData.







Binarize input image. (Step 2 of 7)







#### Binarize input image. (Step 2 of 7)







Binarize input image. (Step 2 of 7)







Labeling. (Step 3 of 7)





Find squares. (Step 4 of 7)





#### Marker pattern specification.

- Needs to be square.
- Only 50% of center area is used in matching process.
- Marker pattern is 16 x 16 dots bitmap by default.
  - Size of the pattern can be lager, but it requires more recognition time.





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- Matching with patterns. (Step 5 of 7)
  - Extract the images from detected rectangles using homography transform.





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- Extract the images from detected rectangles using homography transform.
- Each extracted image is compared with registered patterns.



0.38	0.29	-0.15	-0.11
0.86	0.20	-0.01	-0.14
0.27	-0.03	0.03	-0.14
0.13	0.16	-0.08	-0.01



#### Calculate transform matrix. (Step 6 of 7)

- It's calculated by square's vertices of the detected marker.
- Internal algorithm is written in the paper. <u>http://www.hitl.washington.edu/artoolkit/publications/</u>







#### Render the 3D objects. (Step 7 of 7)

- Use transform matrix calculated in previous step with other 3D engines.
- FLARToolKit includes support classes which converts FLAR's transform matrix to each 3D engine internal matrix classes.





- Binarize step is most important part in marker recognition.
- Current implementation of binarize in FLAR is fixed threshold value specified by user.
  - FLARSingleMarkerDetector#detectMarkerLite method.





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threshold = 128

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threshold = 50



threshold = 200

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- Binarize step is most important part in marker recognition.
- Current implementation of binarize in FLAR is fixed threshold value specified by user.
  - FLARSingleMarkerDetector#detectMarkerLite method.
- Require to adapt the threshold value to current illumination circumstances.
  - Adaptive thresholding algorithm.
- FLARManager has another binarize algorithm which automatically adopt to illumination changes.
  - http://words.transmote.com/wp/flarmanager/
- FLARManager has many functions to use FLARToolKit more easier.

#### **Future of FLARToolKit**





#### **Future of FLARToolKit**



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## **Alchemy version of FLARToolKit**

- Done by Ryo lizuka (aka nyatla)
- 2 times faster than AS3 version.
  - You can use more polygons to create 3D models.
  - It runs more slower PCs.
- Committed at alchemy branch.
  - http://www.libspark.org/svn/as3/FLARToolKit/branches/alchemy/
- Saqoosha is not necessary anymore. ;-)

#### AlchemyMaster

- Toolkit for porting C++ class library to AS3 with Alchemy.
- Includes C++ template and proxy AS3 class.
- Easy to write Alchemy bridge codes.
- Developed for FLARToolKit for Alchemy.
- Committed to FLARToolKit's nyatla branch at Spark project repository.
  - <u>http://www.libspark.org/svn/as3/FLARToolKit/branches/nyatla/extlib/</u> <u>NyARToolkitCPP/forAlchemy/AlchemyMaster/</u>

## Community



- Google group: FLARToolKit-userz.
  - http://groups.google.com/group/flartoolkit-userz
- Want to make FLARToolKit better?
  - Become a Spark project's committer!
  - http://www.libspark.org/wiki/WikiStart/en



# Thank you!

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