

FLASH / understand Augmented Reality with FLARToolkit

Pablo Cabana explains how to exploit this new technology

Knowledge Required: Intermediate in ActionScript3
Requires: Adobe Flash CS3
Time: 15 minutes

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You have probably heard or seen over the past months of some "Augmented reality" projects on the web. Augmented Reality is a combination of real world live footage and computer generated data all happening in real time. You can learn more about Augmented reality [here](#). But it's only after that the Japanese coder Saqoosha ported the open source library of ARToolkit to Action Script 3 that Augmented reality came to a whole new level. By creating FLARToolKit, Saqoosha brought Augmented reality to our browser without the need to install any odd plugins or application but by only using good old flash player. In this document I will explain you how to use FLARToolkit to make some cool Augmented Reality.

In this tutorial, I will explain you the basic principles of how to implement FLARToolkit and make further steps, showing you ways to explore your creativity with this new technology and attract more clicks to your website.

The basic logic of this API is to make a bitmap of intersection between the image captured by webcam and a marker detector which can be customized (read the tip "**The best mark detection**"). When FLARToolkit process the image of the webcam, it calculates a matrix that represents the 3D deformation of the mark detection. With this matrix, it generates a 3D environment using a different API, the already established Papervision3D (<http://www.papervision3d.org/>).

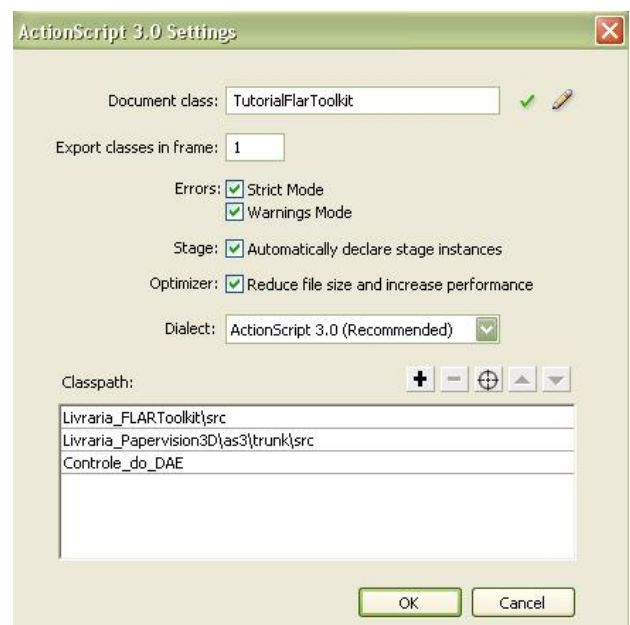
So, first of all, you should install the library of Papervision3D. There are 2 ways to use a library in Action Script, each one with its advantages and disadvantages. The first option is to link it directly in the preferences of your Adobe Flash. This facilitates the tracking updates, but you can have your project ceases to operate if some basic configuration of the code is changed. The second option is to link the library directly and only to your file. FLA. This hampers their access to other projects, but ensure that everything is always running, and allow you to modify the scripts specifically for your application. Because this is a tutorial made to run on any machine, the libraries will be linked directly to the FLA file. By the way, download the zip with all of them in this link:

http://www.cabanacriacao.com/ar2/tutorial_Flartoolkit_english.zip

You'll find:

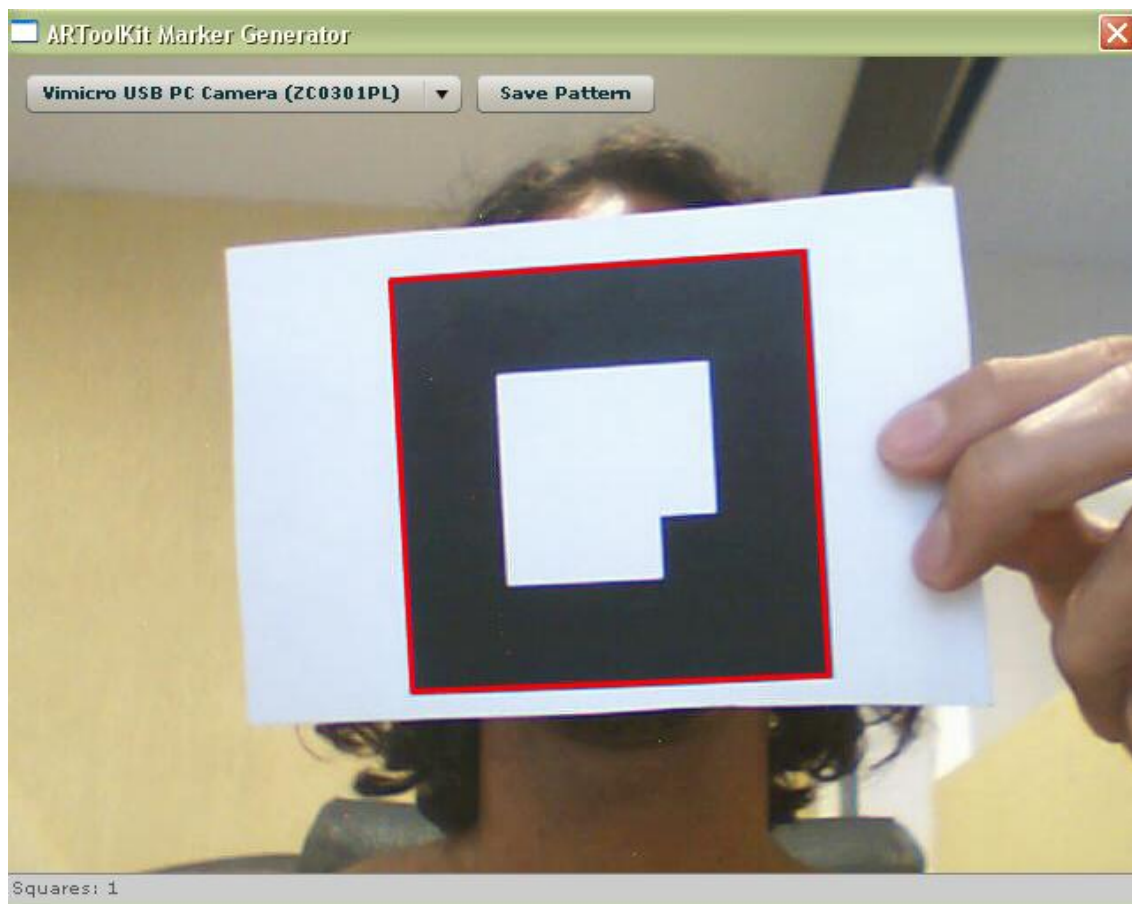
- 1 - The folder "Data", which stores the basic configuration files of the FLARToolkit (I will talk about them below)
- 2 - The DAE folder, which stores the 3D model used in this tutorial. (read the tip "**Create your 3D model**").
- 3 - The folder "Livraria_FLARToolkit" which, as the name says, keeps the scripts of FLARToolkit
- 4 - The folder "Livraria_Papervision3D" where are the scripts of Papervision3D
- 5 - The folder "Controle_do_DAE" where are the scripts written by Pablo Bandin (<http://tracehello.wordpress.com/>). With this class we can control DAE models like we do with MovieClips
- 6 - O. FLA "Tutorial_Cabanudo_FLARToolkit fla", its .SWF published and the class used in this tutorial: "TutorialFlarToolkit.as. Besides it, a index.html to view the .SWF.
- 7 - The folder "music", with the class "trilha.as", used to control the sound and the music file "billi2.mp3" which is the song Billie Jean of Michael Jackson.

Open the .FLA in Flash CS3. Click anywhere outside of the stage and see the at tab "Properties" the item "Document Class". You'll see that it points to the class "TutorialFlarToolkit". Note that it is not necessary to put the ".as". Now, in the same tab, click "Settings ...", go tab "Flash" and click "Settings ..." again. Here I have put the paths to the folders of scripts needed to compile the .SWF. This means that this .FLA ignores the standard way to get the imported classes (if you set some in "Preferences") and pull only the folders listed. Note then that we have installed the libraries of Papervision3D, FLARTollkit and the Pablo Bandini class to control the DAE.



Open now the folder "Data". The file "camera_para.dat" is the core of FLARToolkit and you'll probably never need to change it. The file "cabanudo_marker.pat" is the mark detection in the format that should be loaded by FLARToolkit. This is the same design that you find in the file "markercabanudo.pdf", made to be printed. If you want to change the mark, download the application MarkerGenerator at this link:

<http://sagoosha.net/lab/FLARToolKit/MarkerGenerator/MarkerGenerator.air> . (you must have installed the Adobe Air: <http://www.adobe.com/products/air/>). Start it, point the webcam to your mark and click "Save Pattern" and save the file in the folder "Data".



Already printed the mark? Already have a webcam? Already turn the sound on? Then access the file "index.html" and have some fun with Augmented Reality. Do you like it? Open the file "TutorialFlarToolkit.as" and see how everything works.

The script is full of comments where I explain step by step what is being done. I organize things for you to read it as a text and understand each step.

Initially, all the necessary classes are imported. Besides the classes of FLARToolkit, Papervision3D and Flash, I also call a class called "trilha", used to control the sound.

After that, the variables are defined. See the comments to know them.

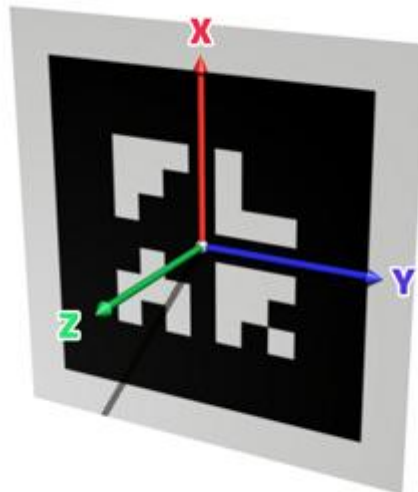
In line 117, the application reads the "camera_para.dat". Note that this file should be read in "BINARY" format. When the download is complete, (Event.COMPLETE, _onLoadParam), the

application get the mark of detection, which is the file "cabanudo_marker.pat". If you created a mark with another name, change this path to point to yours. This file should be read in "TEXT" format. When the download is complete, it starts to configure the FLARToolkit (lines 136 and 137) and began to view the 3D model.

The function `lerDae ()` gets the 3D model "cabanudoDancer.dae" from the DAE folder and adds some listeners that monitor the progress of its download, its end and the end of the parsing of its animations. If you want to change the model, simply change the string "DAEpath", line 156, to point the DAE model.

When the download is finished, the application sets up Webcam (line 195), the FLARToolkit (line 198), the Papervision3D (line 201), and start the rendering of the 3D environment (line 204).

At the function `configuraPapervision3D()`, we can see the line "`dae.y = - 40`". Note that I am using this to bring down the model. An important fact is that the coordinates of FLARToolkit are the opposite of Papervision3D. See the image below made by Saqoosha.



Also note that I add "`botao.addEventListener (MouseEvent.CLICK, invertCamera)`". This is important, since many developers using the webcam in Flash forget about. Most webcams are set to display the image without inversion, which makes all less intuitive. The function "invertCamera" reflects the webcam and makes the user's life easier.

We come then to the function "onRenderTick" which is a basic function of Papervision3D to render the 3D environment at each frame.

In this function are the improved methods of detection "Threshold" written by Seb Lee (<http://www.sebleedelisle.com/>).

The important part here is "if (imageFound)", which shows whether the mark has been detected or not. The game is then as follows: If the mark is detected, the animations are all processed and before that the model was stopped, cabanudo should dance and music should play. Otherwise, the music and the dancing stop.

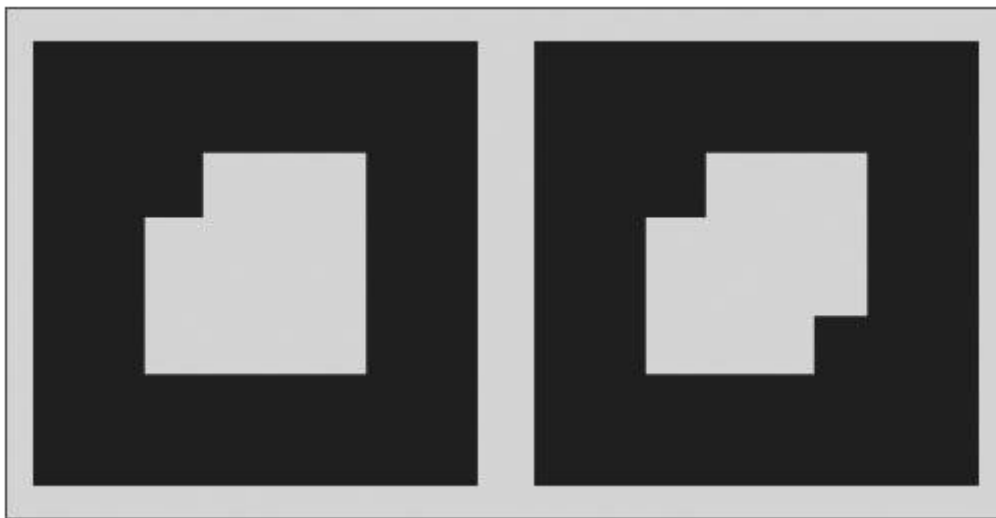
There you go. Now just use your imagination and explore all that the Augmented Reality can

offer.

Tip: The mark detection

Each FLARToolkit application can have its own mark of detection, but you must remember that the intersection of bitmaps should be facilitated. The mark needs to present itself very different to each rotation of 90°, so the FLARToolkit knows the correct way to render the Papervision3D. In the picture below, the right mark would cause confusion to the application. While the second, besides fit perfectly in the parameters, is simple and can even be drawn with a thick pen. Watch the amazing video made by Saqoosha:

<http://www.cabanacriacao.com/blog/archives/a-mensagem-de-ano-novo-mais-bacana-com-flartoolkit-augmented-reality-papervision3d/>



Tip: Create your 3D model

The dancing Cabanudo used in this tutorial was created by Felipe Acioli (www.felipeacioli.com), a designer partner of Cabana, which, among other projects, was responsible for modeling the rabbits used for W/Brazil (a BIG brazilian advertising agency) in the last season of Easter Zona Sual Supermarkets (a BIG brazilian supermarket). He used the Maya software (the source file "cabanudoDancer.ma" is in the "DAE"), but it was necessary to export it to the DAE format to use it in Papervision3D. The Export process is not simple, and deserve another tutorial. But if you follow the video tutorial of Pablo Bandini, everything is easier: tinyurl.com/pmc8re. Other important tips: tinyurl.com/2okfg2

Tip: Links to go further

Multiple marks of detection: <http://www.squidder.com/2009/03/06/clar-how-to-multiple-instances-of-multiple-markers/>

FLARManager class to facilitate control: <http://words.transmote.com/wp/flarmanager/>

The magic of "Saqoosha's Hole": <http://saqoosha.net/en/2009/01/08/1676/>