Rainbow: Bringing video and audio recording to the web

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Abstract

The use of video on the web has seen phenomenal growth in recent years and this trend is only bound to continue. While there has been significant progress on media playback with the introduction of the `<video>` and `<audio>` HTML tags, media authoring in a web browser without reliance on plugins is largely an unexplored area. Rainbow is a Mozilla Labs experiment directed at exploring related ideas. It is currently distributed as a Firefox add-on and provides access to the webcam and microphone to web pages via JavaScript.

1 Overview

As multimedia continues to become a ubiquitous part of the web, browsers have also had to evolve to support new capabilities. We observe that in the case of video playback, a feature that was not long ago only possible with the use of a browser plugin such as Flash, is now supported (to varying degrees) by several modern browsers [1]. As we think about adding more features that enable not just media consumption but also creation in the context of a web browser, programmatic access to a computer's (or mobile device's) camera and microphone from a web page comes to mind.

Webcam and microphone access are already supported by Flash, but it is important to consider why the availability of a feature as a native browser capability is significantly more important and powerful than the same feature provided by a cross-browser plugin. While we won't delve into the details here, a few advantages of the former approach are:

- No dependence on a single 3rd party entity, which reduces the chances of a performance or security bug hampering all of your users at once.
- The ability to expose more *semantic* data related to a video or audio clip opens up the avenue for more types of remixing and mashups than would otherwise be possible [2].
- Easier and tighter integration with other components of a web page.

The Rainbow add-on for Firefox provides access to a client's webcam and microphone to web pages via JavaScript. We think this is the first step to bringing multimedia authoring tools to the web. There are several standards efforts in the areas of bringing access to more types of devices to web pages [3] [4] as well as video streaming [5], and Rainbow can prove to be a great testing ground to help evolve such standards.

2 Features

Rainbow currently supports:

- Previewing video from a camera by projecting images onto a HTML `<canvas>` [6] element which can be read and/or manipulated by JavaScript.
- Recording video and/or audio from a camera and microphone into a single multiplexed Theora/Vorbis in an Ogg container. The resulting file is accessed in JavaScript via the DOMFile API [7].
- Record video with a HTML `<canvas>` object as source rather than a camera, optionally multiplexed with audio from a microphone.

The add-on works on the Windows and Mac OS X platforms. Features that we plan to work on for the future are:

- Support for all major desktop platforms, and possibly mobile devices.
- Support for streaming video to enable real time communication on the web.
- Support for multiple output formats and codecs in addition to the currently implemented Ogg/Theora/Vorbis functionality.

3 Applications

Rainbow is in a highly experimental stage, but we think we can enable a wide variety of use-cases. Image processing algorithms in JavaScript are sophisticated enough [8] to perform edge detection, filtering and other such operations that have traditionally been limited to desktop software. Some of the interesting applications of Rainbow that we hope to see are:

- Capturing and uploading an image (profile picture on Facebook) or record and upload a video (personal channel on Youtube) without relying on anything outside the browser window or plugins.
- Utilizing a face recognition algorithm in JavaScript [9] to login to a website.
- Allowing users to scan QR-codes, and extending that to objects. This can be similar in functionality to the Goggles application offered by Google on the Android and iOS platforms [10].
- Creating screen-casts of web pages by utilizing the 'record from canvas' feature of Rainbow combined with calls to `drawWindow`. [11]
- Real-time video/audio chat in a cross-browser context, with the possibility of multi-party conferencing.

As with many multimedia frameworks, many use-cases (both intended and otherwise) will crop up after developers get their hands on the functionality, the above is only a snapshot of what we could come up with.

A Building

In order to run Rainbow, you need Firefox 4 or later. The add-on may be installed directly from the Mozilla Add-ons directory [12], however, if you wish to build it from source the following pre-requisites are necessary:

- **Mac OS X**: Xcode Developer Tools, Gecko SDK
- **Windows**: Visual Studio 2005 (or later), Gecko SDK, Mozilla Build

The latest Gecko SDK can be obtained from:
`https://developer.mozilla.org/en/gecko_sdk#Get_the_SDK` (you need the 32-bit version).

Mozilla-Build (required only for Windows) can be obtained from:
`https://developer.mozilla.org/en/Windows_Build_Prerequisites#MozillaBuild`

You can obtain the latest version of the source code via Git, or simply download a zip from:
`http://github.com/mozilla/rainbow/zipball/master`

Once you have all the prerequisites in place, set the `MOZSDKDIR` environment variable to point to your Gecko SDK and then execute `make`. A XPI (which is the file format for Firefox add-ons) can be created by executing `make xpi`. To summarize, on Mac OS X, you would execute:

```
$ wget http://bit.ly/elkd3L
$ wget https://github.com/mozilla/rainbow/zipball/master -O rainbow.zip
$ tar xvzf xulrunner-2.0.en-US.mac-i386.sdk.tar.bz2
$ export MOZSDKDIR=$PWD/xulrunner-sdk
$ unzip rainbow.zip
$ cd mozilla-rainbow-*
$ make
$ make xpi
```

B Running

Please note that Rainbow only works on 32-bit version of Mac and Windows. On the Mac, Firefox runs in 64-bit by default, so in order for the bundled examples to work you must execute Firefox from the command-line like so:

```
$ arch -i386 /Applications/Firefox.app/Contents/MacOS/firefox-bin
```

You can install the Rainbow add-on directly from addons.mozilla.org or by opening the XPI file generated by the build step in Firefox. Once Rainbow has been installed, You can run a few examples directly from the example page at: `http://mozilla.github.com/rainbow/`

There are also a few web applications that use Rainbow and are illustrative of its functionality:
`https://photobooth.mozillalabs.com/` and
`https://theband.mozillalabs.com/` are of particular interest.

References

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