Advances in W3C Web Graphics Standards

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Since 1994 the World Wide Web Consortium has published specifications designed to make a better and easier Web, for end-users, as well as for application developers. While the scope of W3C's work has grown to extend the structure of the Web itself with the Semantic Web and Web Services, an important part of the work is still focused on the browser and the interaction with the user. However both browser and interaction have evolved: the concept of browser is no longer only for desktop computers, while the concept of interaction is no longer restricted to mouse and keyboard input.

W3C Recommendations have not only been designed for easier access to web content but also to allow high-quality presentation, making use of new computer graphics and interaction environments, from bitmap graphics to animated interactive applications: the Portable Network Graphics (PNG) image format was the first W3C Recommendation, in 1996. While other presentation formats (HTML 4, Cascading Style Sheets, MathML) were being developed, new specifications appeared, more oriented towards graphics: SMIL (Synchronized Multimedia Integration Langugage), for concurrent multimedia content, and Scalable Vector Graphics for interactive vector graphics. More recently work has started on a multimodal interaction framework, as well as a timed-text format for captioning Web multimedia content.

Interoperability

Languages such as XHTML, MathML or SVG were designed to work with each other, on a syntactic level, building on XML, as well as on a presentational level, using CSS for styling compound documents. Therefore is was not difficult to make the different formats work together, and many applications that support this integration mechanism are under development.

For instance, the Mozilla browser or W3C's Amaya browser/editor now handle the rendering of XHTML documents including equations encoded in MathML and vector graphics in SVG. While only a subset of SVG is so far supported by both platforms, the point is already proven that web pages containing text, graphics and mathematics are rendered with unprecedented quality, and in a more accessible and user-customisable way (font size, colours through CSS, etc.)

Another example is the X-smiles browser, which implements no less than 10 web standards, among which the presentation-oriented ones are XHTML, XSL (the Extensible Stylesheet Language), CSS and XForms for general pagination, as well as SMIL, SVG and X3D (Extensible 3D Graphics) for graphics and multimedia.

While these projects show that the original design goal of interoperability of those specifications is fulfilled, there are remaining challenges for which current projects are chartered:

Defining profiles While implementations, such as the ones described above, prove the general interoperability of web standards, further investigation needs to be completed to specify finer detail in the description of how to mix the languages. Such questions as where in an XHTML document a synchronised animation can occur are not addressed in either the XHTML or the SMIL specifications, and should therefore be formally answered. The W3C recently started this work of fully characterising the XHTML+MathML+SVG profile by defining additional semantics for the mixing of the respective languages, and by providing validation tools for the compound language.

Overcoming the limitations of plug-ins The next challenge will be to make all Web document formats work together in browsers that handle mixed content through the use of plug-ins. The design of a general plug-in framework is required for specifying how specialised software components, such as an SVG renderer or an X3D engine, must interact with each other in the browser in order to satisfy integration requirements, such as the propagation of CSS properties or the management of user-interface events across the document structure. The W3C chartered a task force of browser vendors to begin work on fully defining this component API.

Targeting new devices

While work is in progress for better Web graphics on the desktop, another area of strong activity from W3C is enabling the web on other devices, such as mobile phones and PDAs.

In order to cater for other devices, or more generally new modes of interaction several W3C working groups, as well as other parties, have developed profiles of existing languages, as in XHTML 1.1, CSS, or XHTML+Voice. These profiles usually specify subset of their original language, in order to meet the requirements of the platform they will be used on (limited display size, slower CPUs, etc.)

For instance, the CSS working group has released two profiles for presenting web content on mobile devices as well as for television set-top boxes, or for Interactive TV. Another example of particular interest here are SMIL and SVG, whose mobile profiles have recently been adopted by the Third Generation Partnership Project (3GPP) for multimedia messaging on mobile phones: while former mobile phone messenging services only allowed text messages, synchronised multimedia content can now also be sent. The embedded SVG or SMIL viewers can also be used in other applications, such as displaying maps.

Additionally, the SVG Print specification is also being designed for directly embedding SVG rendering into high-end printers, removing features such as animation while adding new capabilities such as multiple-page documents.

Other new activities have also started with a view to respond to the need to adapt web content to new interaction modes or new devices: the Device Independence activity is writing guidelines that will ensure web authors write content that is available on any device, and that will provide standard server-accessible means to specify the capabilities of a client device. The Multimodal Interaction Working Group, also recently started, is working on integrating multiple concurrent input and output methods to access web content in various situations, such as voice-controlled browsers in cars, or through pen input and handwriting recognition.

All these new activities are being developed jointly with the Web Accessibility Initiative and Internationalization activities, to ensure that future Web Graphics standards will allow for universal Web access.

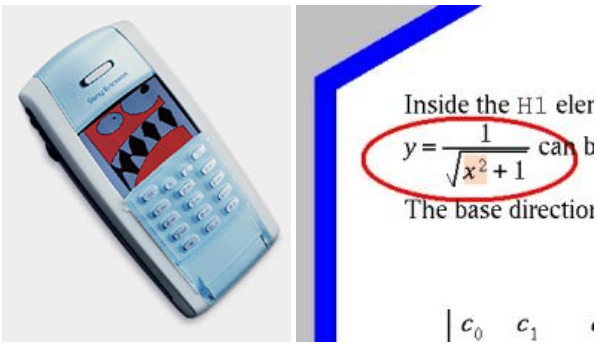

Figure 1: Left: SVG animation on a mobile phone (courtesy of ZoomOn Mobile Solutions). Right: mixed math and graphics inline within HTML document in Amaya

See also:
W3C Web Graphics: http://www.w3.org/Graphics
W3C Amaya: http://www.w3.org/Amaya
X-Smiles: http://www.x-smiles.org