



## A survey on non specialized off-the-shelf JPEG2000 viewers for digital microscopy use

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### Abstract

**Introduction:** Although standardization for image formats in Pathology is still not completed, much interest has been devoted to JPEG2000 as a format to store digital slides. In order to understand how currently available JPEG2000 viewers deal with digital slides (and JPEG2000 in general), we decided to accomplish a survey of available software, that we tested for use in digital pathology.

**Methods:** Candidate JPEG2000 viewers were identified by searching the Web using the Google search engine. JPEG2000 generic capabilities have been tested by means of conformance files. This involved testing for code-streams Profile 0 and Profile 1, and JPEG2000 files.

Evaluating digital microscopy capabilities were evaluated. For those selected viewers passing the latter test, time needed for opening was recorded, and interface features were examined to understand if and how they could be used for digital microscopy. This included a preliminary analysis of commands related to magnification (i.e., zoom) and image panning. For the latter in particular, the availability of keyboard, wand too, window bars has been recorded.

**Results:** According to the above mentioned methods, twelve JPEG2000 viewers were identified: kdu\_show (KakaduSoftware), JP2View (Mustek), Brava!DesktopIXL (InformativeGraphics), OpenEV (GeoInnovations), XnView (Pierre Gougelet), eFotoXpress Viewer (eFotoExpress), JP2view (OptimiData), ER Viewer (Earth Resource Mapping), IrfanView (Irfan Skiljan), TNTAtas (MicroImages), Vliv (Frederic Delhoume), Stardust Image Viewer (Stardust Software), JVSView (University of Tampere).

SOFTWARE	OPENING TIME (SECONDS)	MAGNIFICATION	FIELD NAVIGATION		
			KEYBOARD	WINDOW BARS	PANNING
Kdu_show	2	yes	yes	yes	yes
OpenEV	9	yes	yes	yes	no
ER Viewer	2	yes	yes	yes	yes
JVSview	2	yes	yes	yes	yes

**Discussion:** About half viewers were unable to open all conformance JPEG2000 files. Considering large JPEG2000 images like those representing digital slides, only 31% of viewers were able to open both of them, i.e., 4 viewers, of which one is specialised in digital microscopy. All those viewers provided for magnification and field navigation through keyboard and window bars; three out of four also a panning tool, which is really useful for microscopy.

**Conclusions:** Digital microscopy, even if based on a standard format as JPEG2000, at present cannot rely on standardised software, but specific digital microscopy viewers are to be developed to deal with the large images produced in this field.