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Product review

***CD-ROM Review: Discussion of the Brain Atlas for Functional Imaging (BAFI)*, W.L. Nowinski, A. Thirunavuukarasuu, D.N. Kennedy; Thieme Verlag, Stuttgart, 2000, ISBN 3-131-26051-3, DM 648, ATS 4730, Euros 331.32**

Positive issues:

1. Installation of the program is easy and intuitive.
2. User Guide contains sufficient details, explains program features well and makes good use of illustrations.
3. *Data format:* TIFF and AVW formats are widely distributed image formats and various data conversion programs exist for conversion of local formats into TIFF or AVW (but see also section: Problematic Issues).
4. Warping is extremely quick.
5. Simultaneous presentation of axial, coronal and sagittal atlas views allows easy 3D orientation and application of the software for didactical purposes.
6. Implementation of Brodmann as well as Anatomical labels simultaneously on both hemispheres is very helpful, just as the possibility to switch between different atlases and hemispheres.
7. Blending facilities are very important and useful for judgment of functional and anatomical relationships.
8. *Loading of loci list:* Loading of Talairach coordinates (loci list) appears to be an excellent function of the BAFI. With this function it is possible to visualize Talairach coordinates published in papers and compare spatial relations to own results.There is just one small disadvantage: to load a new loci list, it is necessary to start the BAFI program again.

Problematic issues:

1. Running of the program is only possible with inserted CD. If this is lost or damaged, use of the program is not possible.
2. After the start of the program on a computer with a monitor resolution of 1600×1200, the program window appeared in the center of the monitor and was not movable. Thus, optimal use of desktop space (e.g. for simultaneous use of text editors or image processing programs) was not possible.
3. *Image format:* We had considerable problems to convert our .gif-images in a suitable .tif format. In this respect our impression was that the amount of information/specifications given in the User Guide is not sufficient. For example, with some .tif conversions images could be loaded and no error occurred during warping, but images were never visible.

   Using grayscale TIFF 6.0 images, the grayscale resolution remained acceptable after loading and warping. Using different kinds of indexed color TIFF 6.0 images (32, 64, 128 and 256 colors), the color resolution (including the anatomical grayscale part) appeared to be downgraded (e.g. 256 to 32 colors) after loading. Therefore, it was difficult to distinguish anatomical details in color images. We missed examples of anatomical high quality indexed color images on the CD to check whether downgrading was a specific problem of our images.

   We recommend completing the tiff-tag-list (User Guide side 34) with at least the Tiff Tag 282 (X Resolution, Typ Rational, Data = 72), Tag 283 (Y Resolution, Typ Rational, Data = 72) and Tag 296 (ResolutionUnit).
4. It would be helpful to allow a broader spectrum of image file formats (e.g. various TIFF formats, GIF format).
5. Is there any advantage of using AVW versus TIFF format? No information is given about this point.
6. *File naming conventions:* We experienced problems when the prefix of our TIFF files contained numbers in addition to the digit slice number (e.g. names like: run12_trial_16_image_01.tif). This should be mentioned in the User Guide.
7. *Example data:* We would have liked to run also non-smoothed and colored functional images as examples.
8. *Warping:* With our data as well as the examples given, warping yields always slices with considerable mismatch (up to the centimeter range) between the Talairach cortex and the individual cortex. This is especially evident with distorted brains due to pathology. For example, with the

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clinical example data provided with the CD, the right parietooccipital cortex would be identified as left after warping, since there is a shift of the posterior interhemispheric fissure to the left due to pathology. The User Guide suggests dragging activation marks onto the nearest point of the Talairach Atlas—a very subjective procedure. Would it not be possible to implement a warping procedure that accounts for local incongruities? Note that interactive warping as currently implemented would not help in this case, since a consideration of additional landmarks (e.g. cortical surface points, interhemispheric fissure points) would be necessary. A further problem with interactive warping currently is that improvements for one slice may result in deteriorated matching for another.

9. *Warping of functional data:* Since functional EPI data may show considerable distortions relative to anatomical images, it would be useful to include an option for separate setting of Talairach landmarks for the functional and anatomical data (and separate warping procedures). This should reduce incongruities between functional and anatomical data sets.
10. *Selection of atlas:* When testing the program with sagittal slices loaded, we have not been able to select the BG or GB atlas for the sagittal slices in the main window.
11. *Overlay of functional on anatomical data:* To ease judgment of the relationship between functional activation and local anatomy, it would be helpful to allow overlay of activated areas on anatomical slices. Activated areas can be defined by using the threshold slide—a possible solution would therefore be to allow overlay of just the thresholded areas (preferably in a colored form) on the anatomical slices, which currently is not possible, as far as we understand. On the other hand, it is important that marks pinpointing activation centers may already be shown on the anatomical slices.
12. *Output of atlas data:* The image export functions are not sufficient, because capturing the screen for each slice is very time consuming. It would be very useful to be able to export simultaneously all slices of a volume including all labels and marks with selected blending settings (e.g. Talairch atlas to anatomical dataset blending: 0, 50, 100%).
13. *Typing error:* During the running of the Preview Program—Step "Thresholding of Functional Data"—the commentary says "…The mark in displayed on the triplanar and in the loci list" instead of "…The mark is…"

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