Content, applications, functionality and availability in terms for evolution of human brain atlases.

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Editorial

Human brain atlases have evolved significantly, driven by sophisticated imaging techniques, advanced brain mapping methodologies, huge data, analytical tactics, and powerful computers, and spurred recently by brain large projects. In contrast to previous studies that focus just on material, we can break down this progression into four categories: content, applications, functionality, and availability. Early cortical maps print stereotactic atlases, early digital atlases, and advanced brain atlas platforms are differentiated, as are five avenues in electronic atlases covering the previous two generations. New electronic atlases are divided into eight categories based on their scope, parcellation, modality, plurality, scale, ethnicity, abnormality, and a combination of these factors. Tools and features for atlas generation, navigation, individualization, enabling actions, and application-specific functionality are addressed. With three degrees of accessibility, availability is explored across media and platforms, ranging from mobile solutions to cutting-edge supercomputers. Although clinical applications are currently trailing behind atlas content advancement, the primary application shift has been from research to clinical practise, notably in stereotactic and functional neurosurgery. Atlas functionality has also been ignored until recently, despite the fact that managing the surge of brain data necessitates sophisticated tools.

The brain atlas category is the most diverse and dynamic, with multiple divisions such as postmortem *versus in vivo* data, whole brain *versus* specific cerebral regions, structure *versus* function, single data acquisition modality *versus* multi-modal data, single brain specimen and individual features *versus* a population of specimens and/or aspects and in also health *versus* disease, static print *versus* dynamic digital, single atlas *versus* multi-atlases, sluggish versus, rapid dynamic, and mono scale versus multi-scale are only a few examples. The original development of cerebral cortical maps was mostly done in one direction, which included researching cortical parcellation.

The development of computerised electronic brain atlases was a natural step forward in brain atlasing, aiming to overcome the limitations of their print counterparts, such as static content, image plate sparseness, lack of or limited functionality, cumbersome use, lack of interactivity, and difficulty in mapping atlas content into an individual brain scan. The Visible Human Project (VHP), which contains the most complete volumetric data of human anatomy, including cryosection photographs, computed tomography, and magnetic resonance images of American male and female specimens, has greatly benefited Atlas-assisted neuroeducation, training, and simulation. The development of new human electronic brain atlases was aided by significant advances in imaging, brain mapping, and computation. Different criteria, such as parcellation, modality, plurality, quality, ab/normality, longevity, extendibility, ethnicity, geographical and temporal scales, may be used to discover and systemize multiple paths in the content evolution of new atlases. We can categorise 23 directions into eight types of brain atlas content development (seven major and one combination). A brain atlas instant can thus be regarded an element in a seven-dimensional brain atlas space if this classification is taken into consideration. In addition, in the second decade of this century, additional specialised neurosurgical atlases were produced, which are mentioned. The expansion of the brain atlas material from 2D to 3D has been pushed by neuroeducation. Various approaches, ranging from a rudimentary type of Virtual Reality (VR) to QuickTime VR technology, were used to produce the three-dimensional effect.

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