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Information technology - Brain-computer interfaces - Multi-modal data format

信息技术 脑机接口 多模态数据格式

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Table of Contents

Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed and is under the jurisdiction of the National Information Technology Standardization Technical Committee (SAC/TC28). This document was drafted by: Zhejiang University, China Electronics Technology Standardization Institute, Nanhu Brain-Computer Interdisciplinary Research Institute, and Hangzhou Dianzi University. University of Science and Technology of China, South China Normal University, Tianjin University, University of Science and Technology of China, Beijing University of Posts and Telecommunications, Beijing Mechanical Equipment Research Institute, Artificial Intelligence and Digital Technology Guangdong Provincial Laboratory of Economics (Guangzhou), Hangzhou Qingshi Yongjun Medical Equipment Co., Ltd., Hangzhou Nuoxinjia Electronic Technology Co., Ltd., Electronic Technology Universities, Shanghai University, China Academy of Information and Communications Technology, China Mobile (Hangzhou) Information

Technology Co., Ltd., Beijing Chipwise Neurotechnology Co., Ltd. Zhejiang Qiangnao Technology Co., Ltd., Institute of Biomedical Engineering, Chinese Academy of Medical Sciences, Zhijiang Laboratory, and Boruikang Technology (Shanghai) Co., Ltd. Limited Company, Shanghai Jiao Tong University, Zhejiang Nurotron Neuroelectronics Technology Co., Ltd., Hangzhou Rongnao Technology Co., Ltd., Harbin Engineering University University. The main drafters of this document are. Pan Gang, Li Nan, Liu Xiangang, Fan Kefeng, Dong Jian, Yu Yuntao, Wang Yueming, Zhang Shaomin, Kong Wanzeng, and Pan Jiahui. Ming Dong, Chen Xun, Yang Chen, Zhang Lijian, Li Yuanqing, Li Xiang, Sun Yu, Yao Lin, Sun Wenjing, Cui Bing, Zhang Jianhai, Yang Yuxiao, Hao Yaoyao, Chang Yuan, Xiao Jun Zhao Sha, Qi Yu, Zheng Nenggan, Xiao Xiaolin, Liu Aiping, Zhu Jiang, Qin Yun, Yang Banghua, Liang Liyan, Wang Liuqing, Xie Jue, Adis, Pu Jiangbo, Huang Dandan Xu Honglai, Wu Ruijia, Huang Sui, Dong Shurong, Xu Li.

Brain-computer interfaces (BCIs) are a rapidly developing cutting-edge interdisciplinary technology that has gained traction in recent years, particularly in areas such as neurorehabilitation and human-machine interaction. It shows broad application prospects in multiple fields such as interaction and intelligent control. Various brain signal acquisition technologies, such as electroencephalography (EEG) and magnetoencephalography (MEG), are also being utilized. (MEG), functional near-infrared spectroscopy (fNIRS), functional magnetic resonance imaging (fMRI), intracranial electroencephalography (iEEG), and microelectrode electrophysiology (uEphys) provides crucial support for a deeper understanding of brain activity and forms an important foundation for brain-computer interface systems. However, current brain signal acquisition technologies lack unified standards in data structure, metadata description, and file organization, leading to data... Due to structural heterogeneity, poor interoperability, and high reuse costs, brain-computer interface technology is not conducive to cross-system and cross-institutional data sharing and collaboration, and also limits its development. The large-scale development of technology. This document aims to establish a unified and scalable data format specification applicable to brain-computer interfaces from different brain signal acquisition modalities. This data format represents, stores, and manages data and its related metadata. It supports the recording of unimodal data as well as multimodal synchronous acquisition. Scenario. By defining a consistent file structure, naming conventions, and metadata fields, this file will help improve data quality and enhance compatibility. It also promotes collaboration among research institutions, system developers, and data users. Furthermore, the data format specified in this document adopts a modular and scalable framework design, supporting future data acquisition from emerging brain-computer interface technologies. The expansion and supplementation of techniques and data types can continuously adapt to the development needs of the brain-computer interface field through supplementary documentation or content revisions. Information technology brain-computer interface multimodal data format

1 Scope

GB/T 47127-2026 is the Chinese national standard covering the file format for brain-computer interface recordings - EEG, near-infrared, eye tracking, stimulus events and behavioural responses in one time-aligned structure, with the metadata describing the montage, the paradigm and the subject. Without a common format the recordings of one laboratory are unusable by another, which is the constraint on a field that needs large datasets. First edition. It was issued on 28 January 2026 and has been in force since 1 August 2026, as a first edition. The document is under the responsibility of the Standardization Administration of China. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document establishes the overall structure of the brain-computer interface multimodal data format, and specifies the directory hierarchy and different types of data files. Content and naming conventions. This document applies to the storage of brain-computer interface data acquired simultaneously in a single or multimodal manner, covering modalities including electroencephalography (EEG) and functional neurological markers. Near-infrared spectroscopy, magnetoencephalography, functional magnetic resonance imaging, intracranial electroencephalography, and microelectrode electrophysiology.

2 Normative references

This document has no normative references.

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 A system for establishing a direct communication connection between the central nervous system of humans or other animals and external hardware and software systems.

Note. Brain-computer interfaces enable one-way or two-way communication with external devices and can be used to achieve control and/or feedback.

3.2 Data format A standardized description of the logical structure and physical representation of data.

3.3 modality Different forms or channels used to acquire, express, or perceive information.

Note. In the field of brain-computer interfaces, modality usually refers to the source or measurement method of the signal.

3.4 A graphical record of the voltage change over time obtained using scalp electrodes placed at designated locations. [Source: IEC 60050-891.1998[1], 891-04-23]

3.5 Magnetic resonance imaging (MRI) is a technique used to record blood flow to functional areas of the brain.

Note. This technology relies on cerebral blood flow and neuronal activation coupling.

3.6 Optical brain monitoring technology that uses near-infrared light for functional neuroimaging.

Note. Functional near-infrared spectroscopy uses near-infrared light to measure brain activity to estimate cortical hemodynamic activity, which is a measure of neural activity. response.