BigSTeP toolbox

Updated on Oct. 25, 2024, by Yusuke Takeda

1. Introduction

BigSTeP toolbox is a suite of MATLAB functions to perform STeP and BigSTeP proposed in the following papers.

- Takeda Y., Hiroe N., Yamashita O., Sato M., 2016. Estimating repetitive spatiotemporal patterns from resting-state brain activity data. NeuroImage 133:251-65. https://doi.org/10.1016/j.neuroimage.2016.03.014

- Takeda Y., Itahashi T., Sato M., Yamashita O., 2019. Estimating repetitive spatiotemporal patterns from many subjects' resting-state fMRIs. NeuroImage 203:116182. https://doi.org/10.1016/j.neuroimage.2019.116182

From resting-state brain activity data, such as MEG and fMRI, STeP estimates repetitive spatiotemporal patterns without using their onset and shape information (Fig. 1) (Takeda et al., 2016).

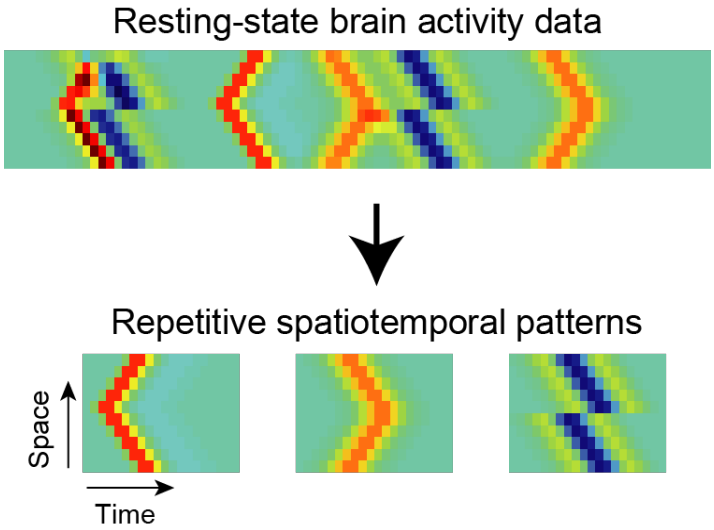

Figure 1: Purpose of STeP.

BigSTeP is an extension of STeP for big data. From many subjects' resting-state brain activity data, BigSTeP estimates spatiotemporal patterns that are common across subjects (common spatiotemporal patterns) as well as the corresponding

spatiotemporal patterns in each subject (subject-specific spatiotemporal patterns) (Fig. 2) (Takeda et al., 2019).

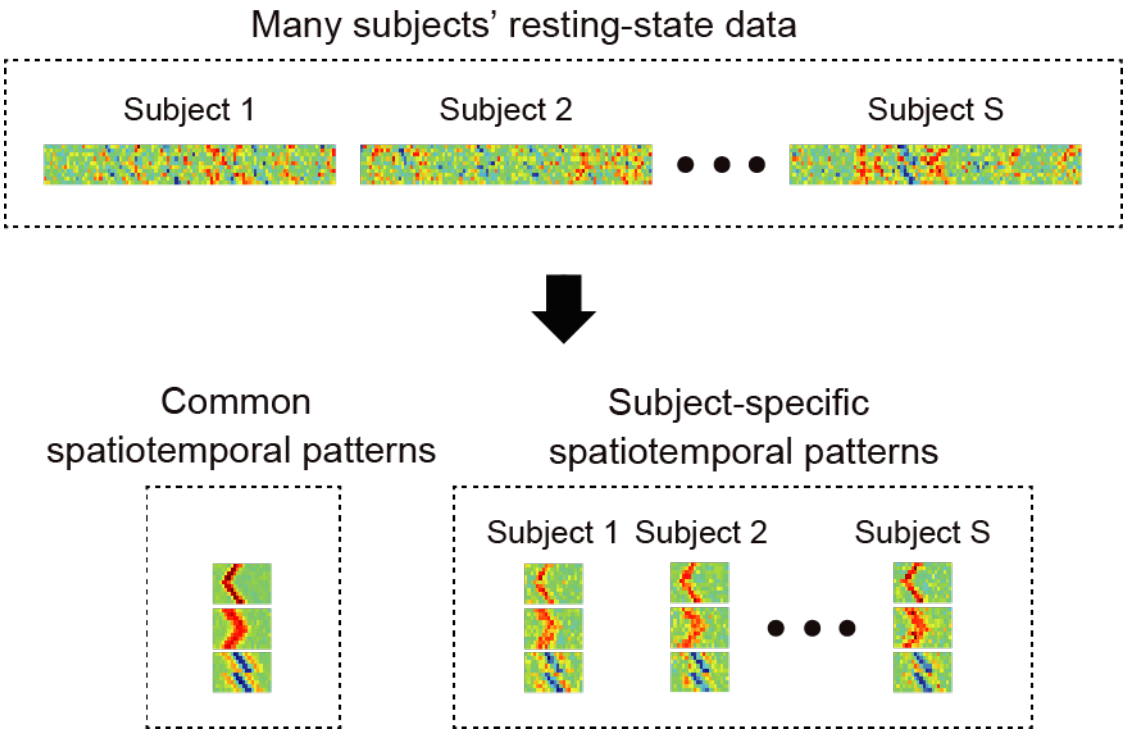

Figure 2: Purpose of BigSTeP.

2. System Requirements

BigSTeP toolbox works on MATLAB (R2010a or later).

3. Demo programs

Please start from the following demo programs to learn how this toolbox works.

bs_demo_STeP_m: Demo program for STeP

bs_demo_BigSTeP.m: Demo program for BigSTeP

4. Main programs

bs_STeP.m : This program performs STeP

bs_BigSTeP.m : This program performs BigSTeP

5. Feedback & Bug report

Any feedback and bug reports are welcome. Please contact me if you have any

questions (takeda@atr.jp).

6. Acknowledgements

This research was supported by contracts with the National Institute of Information and Communications Technology (NICT) entitled "Development of network dynamics modeling methods for human brain data simulation systems" (173) and "Analysis of multi-modal brain measurement data and development of its application for BMI open innovation" (209). This work was also supported by the Japan Agency for Medical Research and Development (AMED) (JP18dm0307008, JP18dm0307026) and JSPS KAKENHI (21K07269).

7. References

STeP paper:

- Takeda Y., Hiroe N., Yamashita O., Sato M., 2016. Estimating repetitive spatiotemporal patterns from resting-state brain activity data. NeuroImage 133:252-65. https://doi.org/10.1016/j.neuroimage.2016.03.014

BigSTeP paper:

- Takeda Y., Itahashi T., Sato M., Yamashita O., 2019. Estimating repetitive spatiotemporal patterns from many subjects' resting-state fMRIs. NeuroImage 203:116182. https://doi.org/10.1016/j.neuroimage.2019.116182

- Takeda Y., Niroe N., Yamashita O., 2021. Whole-brain propagating patterns in human resting-state brain activities. NeuroImage 245:118711. https://doi.org/10.1016/j.neuroimage.2021.118711