1 Introduction

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2 Requirements

The product receives EEG/MEG sensor data and constructs a real-time 3D visualization of the brains current activity.

2.1 Mandatory criteria

The following functions have to be implemented correctly and must fulfill given requirements.

2.1.1 Surface constrained distance calculation (geodesic problem on meshes)

The function receives input data, preprocessed by the software environment, structured as a triangulated surface mesh.

C11 Based on that data, the function calculates a matrix that holds values describing the distances between all vertices using double precision.

C12 The function must be able to process up to 200,000 vertices.

C13 The user can limit the calculation to a subset of vertices.

2.1.2 Point to plane mapping

The function receives a set of sensor locations in 3D-Space and maps them onto the underlying surface mesh. Thus every sensor gets assigned to a vertex of the mesh.

C21 The function must be able to handle data from MEG-sensors which have a known orientation.

C22 The function must be able to handle data from EEG-sensors which are non-orientated.

2.1.3 Interpolation algorithm

The algorithm receives a mesh and a subset of vertices

C31 Based on the said subset the algorithm must calculate the values for every vertex of the mesh.

C32 For this, the algorithm creates a matrix storing weights for the later interpolation. The interpolation process can be summarized by the following equation $y_{full} = W \cdot y_{sub}$, where W is the mentioned matrix and y_{sub} is the current dataset for the known sensors, i.e. vertices.

C33 The calculation of the weight matrix must be based on the result of the SCDC.

2.1.4 Integration in Disp3D

In order to ensure usability within the given framework MNE-CPP, the final visualization must be integrated into the preexisting GUI, namely Disp3D.

C41 A new function must be added to the Disp3D tree model. Internally this function must create a new handler.