



Quantum Documentation

Release 3.4

/ELSA/MU-XXXX/V3.4

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CONTENTS

Quantum is a mesh deformation module based on inverse distance weighting interpolation. To preserve the orthogonality of the mesh in the boundary layers when large displacements occur, the surfaces displacements are splitted in a rotation and a translation terms. These terms are then interpolated in the volume mesh. The Inverse distance weighting interpolation is speed up by a Fast Multipole like Algorithm.

CGNS PARSER

Data used in mesh deformation module can either be set in the CGNS File or using set up class methods. The figure below show the data structure that mesh deformation module can handle. All mesh deformation parameters are located in the **BC_t** nodes. The mesh deformation boundary condition is set inside the **.Solver#BC** Nodes using **Data_t** node type named **mesh_def_type**.

Possible values for this field are :

- **“imposed”** or **“prescribed”**: displacements are imposed on this boundary conditions meaning that Quantum will search a **.BCDisplacement#i** node containing mesh displacement fields : **DisplacementX**, **DisplacementY**, **DisplacementZ**.
- **“free”** : displacements are free on this boundary.
- **“null”** or **“zero”** : displacements are null on this boundary.

<p>Warning: be aware that this data structure is not fixed. it might change in the next Quantum version</p>
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CGNSTree	CGNSTree_t				MT
navier	CGNSBase_t			(2,)	I4 [3, 3]
├─ FSStructBlock_00001	Zone_t			(3, 3)	I4 [[11, 10, 0], [6, 5, 0], [5, 4, 0]]
├─ FSStructBlock_00002	Zone_t			(3, 3)	I4 [[11, 10, 0], [7, 6, 0], [5, 4, 0]]
├─ FSStructBlock_00003	Zone_t			(3, 3)	I4 [[11, 10, 0], [7, 6, 0], [5, 4, 0]]
├─ FSStructBlock_00004	Zone_t			(3, 3)	I4 [[11, 10, 0], [6, 5, 0], [5, 4, 0]]
├─ FSStructBlock_00005	Zone_t			(3, 3)	I4 [[37, 36, 0], [11, 10, 0], [6, 5, 0]]
├─ ZoneType	ZoneType_t			(10,)	C1 Structured
├─ GridCoordinates	GridCoordinates_t				MT
├─ ZoneBC	ZoneBC_t				MT
├─ 5_symmetry plane y=...	BC_t			(10,)	C1 BCFarfield
├─ FamilyName	FamilyName_t			(20,)	C1 symmetry plane y=cz
├─ .solver#BC	UserDefinedData_t				MT
├─ mesh_def_type	Data_t			(1,)	C1 0
├─ InwardNormalIndex	"int[IndexDimension]"			(3,)	I4 [0, 1, 0]
├─ PointRange	IndexRange_t			(3, 2)	I4 [[1, 37], [1, 1], [1, 6]]
├─ 5_upper wing#1	BC_t			(6,)	C1 BCWall
├─ FamilyName	FamilyName_t			(10,)	C1 upper wing
├─ .AdditionalData#0	UserDefinedData_t			(34,)	C1 DAMAS.Calculation.BENDING_ACCURATE
├─ .BCDisplacement#0	UserDefinedData_t				MT
├─ DisplacementX	DataArray_t			(11, 6)	R8 [[0.0, 0.0, 0.0, 0.0, 0.0, 0.0], [0.0, 0.0, 0.0, 0.0, 0.0, 0.0]]
├─ DisplacementY	DataArray_t			(11, 6)	R8 [[0.0, 0.0, 0.0, 0.0, 0.0, 0.0], [0.0, 0.0, 0.0, 0.0, 0.0, 0.0]]
├─ DisplacementZ	DataArray_t			(11, 6)	R8 [[0.0, 0.0, 0.0, 0.0, 0.0, 0.0], [0.0, 0.0, 0.0, 0.0, 0.0, 0.0]]
├─ InwardNormalIndex	"int[IndexDimension]"			(3,)	I4 [1, 0, 0]
├─ PointRange	IndexRange_t			(3, 2)	I4 [[1, 1], [1, 11], [1, 6]]
├─ .solver#BC	UserDefinedData_t				MT
├─ ZoneGridConnectivity	ZoneGridConnectivity_t				MT
├─ FSStructBlock_00006	Zone_t			(3, 3)	I4 [[37, 36, 0], [11, 10, 0], [6, 5, 0]]
├─ FSStructBlock_00007	Zone_t			(3, 3)	I4 [[37, 36, 0], [11, 10, 0], [6, 5, 0]]
├─ FSStructBlock_00008	Zone_t			(3, 3)	I4 [[11, 10, 0], [7, 6, 0], [6, 5, 0]]
├─ FSStructBlock_00009	Zone_t			(3, 3)	I4 [[11, 10, 0], [7, 6, 0], [6, 5, 0]]
├─ FSStructBlock_00010	Zone_t			(3, 3)	I4 [[37, 36, 0], [11, 10, 0], [6, 5, 0]]
├─ FSStructBlock_00011	Zone_t			(3, 3)	I4 [[37, 36, 0], [6, 5, 0], [6, 5, 0]]
├─ FSStructBlock_00012	Zone_t			(3, 3)	I4 [[37, 36, 0], [6, 5, 0], [6, 5, 0]]
├─ FSStructBlock_00013	Zone_t			(3, 3)	I4 [[11, 10, 0], [7, 6, 0], [6, 5, 0]]