Table 4 Equation style summary of line-by-line description of FieldML example XML

| Line number | Object | Name | Equation | Description |
|---|---|---|---|---|
| 13 | Import: Ensemble Type | `trilinearLagrange.points` | $LL3c = \{1,2,\ldots,8\}$ | Set of identifiers, essentially for the 8 corners of the unit cube |
| 12 | Import: Continuous Type | `trilinearLagrange.parameters` | $LL3p = \mathbb{R}^8$ | 8 real numbered nodal DOF values for the 8 corners of the unit cube for tri-linear Lagrange interpolation. |
| | | | $LL3p = (LL3c \to \mathbb{R})$ | Alternate view of the above. |
| 16 | Import: Argument Evaluator | `trilinearLagrange.parameters.argument` | | |
| 19 | Import: Argument Evaluator | `chart.3d.argument` | $\xi \in \mathbb{R}^3$ | Unit cube |
| 18 | Import: External Evaluator | `trilinearLagrange.interpolator` | $LL3: \mathbb{R}^3 \times LL3p \to \mathbb{R}$ | tri-linear Lagrange interpolation basis functions |
| 21 | Import: External Evaluator | `shape.unit.cube` | $pU3: \mathbb{R}^3 \to \mathbb{B}$ | Shape predicate |

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| 25 | Ensemble type | `mesh1.nodes` | $m1n = \{1,2,\ldots,20\}$ | |
| 34 | Argument Evaluator | `mesh1.nodes.argument` | $m1na \in m1n$ | |
| 38 | Argument Evaluator | `mesh1.node.dofs.argument` | $m1dof : m1n \to \mathbb{R}$ | |
| 46 | Mesh type's ensemble | `mesh1.mesh.type.elements` | $m1e = \{1, 2, \ldots, 4\}$ | Four elements in mesh |
| 45 | Mesh Type | `mesh1.mesh.type` | $m1 = m1e \times U3$ | Four unit squares |
| 54 | Predicate | | $U3 = [0,1] \times [0,1] \times [0,1]$ | Unit square |
| 83 | Parameter Evaluator | `mesh1.trilinearLagrange.connectivity` | $m1c : m1e \to LL3c \to m1n$ | Local node to global node mapping. This is a matrix. |
| 94 | Aggregate Evaluator | `mesh1.trilinearLagrange.parameters` | $a1 : m1e \to LL3p$ | Forms parameter vector of the 8 parameters required for tri-linear Lagrange interpolation of a scalar field for each element |
| | | | $a1 : m1e \to (LL3c \to \mathbb{R})$ | Alternative view of the above |
| | | | $a1 : m1e \to LL3c \to \mathbb{R}$ | Alternative view of the above, using currying style. |
| 98, 100 | | | $a1(e, n) = m1dof(m1c(e, n))$ | Behaviour of the above: get global node from local to global node mapping, |

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| | | | | get DOF from nodal parameters for field. |
| 106 | Reference Evaluator | `mesh1.trilinear.interpolator` | $r1 : m1 \to \mathbb{R}$<br>$r1(e, \xi) = LL3(\xi, (n \mapsto a1(e, n)))$ | The definition of $r1$ implies that $\xi \in U3$, $e \in m1e$ and $a1(e) \in \mathbb{R}^8$. |
| 120 | Piecewise Evaluator | `mesh1.template.trilinear` | $m1pw : m1e \to (U3 \times LL3p \to \mathbb{R})$<br>$\forall e \in m1e, m1pw(e) = LL3$ | |
| 222 | Parameter Evaluator | `mesh1.node.pressure` | $pn : m1n \to \mathbb{R}$ | Pressure nodal DOFs |
| 232 | Reference Evaluator | `pressure` | $pr : (m1n \to \mathbb{R}) \to (m1 \to \mathbb{R})$<br>$pr : (m1n \to \mathbb{R}) \to m1 \to \mathbb{R}$ | Pressure field declaration, equivalent forms. |
| | | | $pr(pn, (e, \xi)) = s(\xi, l)$<br>where<br>$s = m1pw(e) = LL3$<br>$l = (n \mapsto pn(m1c(e, n)))$<br>$l \in LL3p$ | Pressure field definition |
| 165 | Parameter Evaluator | `mesh1.node.coordinates` | $cn : m1n \to \{1,2,3\} \to \mathbb{R}$ | 3D geometric coordinates DOFs. This is a matrix. |

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| 179 | Aggregate Evaluator | `coordinates` | $gc: (m1n \to \mathbb{R}) \to (m1 \to \mathbb{R}^3)$<br>$gc: (m1n \to \mathbb{R}) \to m1 \to (\{1,2,3\} \to \mathbb{R})$<br>$gc: (m1n \to \mathbb{R}) \to m1 \to \{1,2,3\} \to \mathbb{R}$ | Coordinates field declaration, equivalent forms. |
| | | | $\forall d \in \{1,2,3\},$<br>$gc(cn, (e, \xi), d) = s(\xi, l)$<br>where<br>$s = m1pw(e) = LL3$<br>$l = (n \mapsto cn(m1c(e, n), d))$<br>$l \in LL3p$ | Coordinate field definition |