

Boundary Element Method Open Source Software in Matlab/ Octave/Freemat/Scilab

File / Module(s)	gls.m / gls.m
Title	Carries out the solution of a general linear system of equations that arise in the direct boundary element method.
Version(Date) and History	1. (July 2015).
Description	<p>This is a Matlab /Octave/Freemat/Scilab source file for solving a general linear system of equations</p> $A\underline{x} = B\underline{y} + \underline{c}, \quad (1a)$ <p>where A and B are known $n \times n$ matrices and \underline{c} is a known n-vector with</p> $\alpha_i x_i + \beta_i y_i = f_i \text{ for } i = 1 \dots n \quad (1b)$ <p>where the α_i, β_i and f_i are constants with α_i and β_i are never both zero for each i. The evaluation of vectors \underline{x} and \underline{y} is the solution of the process.</p>
Interface	<p>function [x, y, xory, L, U, B_gls, perm, lfail] = gls(A, B, c, n, alpha, beta, f)</p> <p><u>Input Parameters</u> integer n <i>The dimension of the matrices and vectors</i> a(n,n) <i>The matrix A</i> b(n,n) <i>The matrix B</i> c(n) <i>The vector c</i> alpha(n) <i>The α_i for $i = 1 \dots n$</i> beta(n) <i>The β_i for $i = 1 \dots n$</i> f(n) <i>The f_i for $i = 1 \dots n$</i></p> <p><u>Output Parameters</u> x(n) <i>The solution vector \underline{x}</i> y(n) <i>The solution vector \underline{y}</i> <i>The following parameters are 'output', but only needed if new 'boundary conditions' are to be applied to the system</i> <i>The matrix A is overwritten by the LU factorisation and B is altered by row swaps with A</i> xory(n) <i>The record of column exchanges.</i> L(n,n) <i>The lower triangular matrix</i> U(n,n) <i>The upper triangular matrix</i></p>

	B_gls(n,n). <i>An altered matrix B</i> perm (n,n) <i>The permutation matrix (resulting from the LU factorisation)</i> lfail
Web source of code.	www.boundary-element-method.com/mfiles/gls.m
Web source of this guide	www.boundary-element-method.com/mfiles/gls_m.pdf
Web source of the algorithm	www.boundary-element-method.com/tutorials/Numerical Solution of a General Linear System of Equations.pdf
Dependent routines	lufbsub.m from the Excel file : www.numerical-methods.com/mfiles/LUfbsub.m
Test problems or modules tested	www.boundary-element-method.com/mfiles/gls_t.m
Licence	This is 'open source'; the software may be used and applied within other systems as long as its provenance is appropriately acknowledged. See the GNU Licence for more information or contact webmaster@boundary-element-method.com .
Codes that this may be used alongside this one	regls.m reuses the results of gls.m so that solutions of problems with different 'boundary conditions' can be found more quickly : http://www.boundary-element-method.com/mfiles/regls.m
Similar codes that may be of interest	A similar m-file code is available in Excel-VBA on www.boundary-element-method.com/Excel_VBA/GLS.xlsm and a similar code is available in Fortran on http://www.boundary-element-method.com/fortran/REGLS.FOR
Applications	
Author	Stephen Kirkup
References	<ol style="list-style-type: none"> 1. Numerical Solution of General Linear Systems of Equations 2. The Boundary Element Method in Acoustics 3. www.boundary-element-method.com 4. www.freemat.info