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

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| File / Module(s) | [gls.m](http://www.boundary-element-method.com/mfiles/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 | This is a Matlab /Octave/Freemat/Scilab source file for solving a general linear system of equations

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|  | $$A\overline{x}=B\overline{y}+\overline{c},$$ | (1a) |

where *A* and *B* are known $n×n $matricesand$\overline{c} $is a known $n$-vector with

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|  | $$α\_{i} x\_{i}+ β\_{i }y\_{i}= f\_{i} for i=1…n$$ | (1b) |
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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 $\overline{x}$ and $\overline{y}$ is the solution of the process.  |
| Interface | function [x, y, xory, L, U, B\_gls, perm, lfail ] = gls(A, B, c, n, alpha, beta, f)*Input Parameters*integer n *The dimension of the matrices and vectors*a(n,n) *The matrix A*b(n,n) *The matrix B*c(n) *The vector c*alpha(n) *The αi* $for i=1…n$beta(n) *The βi* $for i=1…n$f(n) *The fi* $for i=1…n$*Output Parameters*x(n) *The solution vector x*y(n) *The solution vector y**The following parameters are 'output', but only needed if new ‘boundary conditions’ are to be applied to the system**The matrix A is overwritten by the LU factorisation and B is altered by row swaps with A* xory(n) *The record of column exchanges.*L(n,n) *The lower triangular matrix*U(n,n) *The upper triangular matrix*B\_gls(n,n). *An altered matrix B*perm (n,n) *The permutation matrix (resulting from the LU factorisation*)lfail |
| Web source of code. | [www.boundary-element-method.com/mfiles/gls.m](http://www.boundary-element-method.com/mfiles/gls.m) |
| Web source of this guide | [www.boundary-element-method.com/mfiles /gls\_m.pdf](http://www.boundary-element-method.com/mfiles%20/gls_m.pdf) |
| Web source of the algorithm | [www.boundary-element-method.com/tutorials/Numerical Solution of a General Linear System of Equations.pdf](http://www.boundary-element-method.com/tutorials/Numerical%20Solution%20of%20a%20General%20Linear%20System%20of%20Equations.pdf) |
| Dependent routines | lufbsub.m from the file : [www.numerical-methods.com/mfiles/LUfbsub.m](http://www.numerical-methods.com/mfiles/LUfbsub.m) |
| Test problems or modules tested | [www.boundary-element-method.com/mfiles/gls\_t.m](http://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](http://www.gnu.org/licenses/lgpl.txt) 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](http://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](https://www.researchgate.net/profile/Stephen_Kirkup) |
| References | 1. [Numerical Solution of General Linear Systems of Equations](http://www.boundary-element-method.com/guides/Numerical%20Solution%20of%20a%20General%20Linear%20System%20of%20Equations.pdf)2. [The Boundary Element Method in Acoustics](https://www.researchgate.net/publication/261760562_The_Boundary_Element_Method_in_Acoustics)3. [www.boundary-element-method.com](http://www.boundary-element-method.com)4. www.freemat.info |