**Boundary Element Method Open Source Software in Matlab**

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| File / Module(s) | [l2lc.m](http://www.boundary-element-method.com/mfiles/l2lc.m)/ l2lc |
| Title | A code for evaluating the discrete Laplace integral operators for two –dimensional problems. |
| Version(Date) and History | **2.** (September 2015). (Version 1 2008). Changes include quadrature rule is now an input to the function (rather than being internally generated). Verification of the input quadrature rule and geometry is included. |
| Description | This subroutine computes the discrete form of the 2-dimensional Laplace integral operators *L, M, Mt*, and *N* over a straight line element. The subroutine is useful in integral equation methods for the solution of 2-dimensional Laplace problems. |
| Interface | function [l,m,mt,n, lFail]= l2lc(p, vecp, qa, qb, lponel, nq, w, x, lvalid, tolGeom, tolQuad, lFail, needl, needm, needmt, needn)  Input parameters  *real* p(2) : *the observation point*  *real* vecp(2) : *the vector corresponding to the point* p *(not always required)*  *real* qa(2), qb(2) : *t he points at either side of the panel, thus defining the panel*  *logical* lponel : *informs l2lc that* p *lies on the panel* qa-qb *(True) or not (False)*  *integer* nq : *the number of quadrature points*  *real* w() : *the quadrature weights*  *real* x(): *the quadrature points*  *logical* lvalid *: informs l2lc that validation of the input to the module is required (True) or not (False)*  *real* tolGeom : *the expected tolerance in the accuracy of the geometrical data input to the module*  *real* tolQuad : *the expected tolerance in the accuracy of the quadrature data input to the module*  Output parameters  *logical* lFail : *If the validation switch* lValid *is True then this returns ‘True’ if the parameters are validated, otherwise it returns ‘False’ if the input parameters are invalid*  *logical* needl, needm, needmt, needn : *informs l2lc which discrete operators L, M, Mt, and/or N need to be returned (set ‘True’)*  *or not (‘False’)*  *real* l0, m0, m0t, n0 : *the values of the discrete operators L, M, Mt, and/or N. If* need\* *is ‘False’ then a zero value is returned for the corresponding discrete operator* |
| Web source of code. | [www.boundary-element-method.com/mfiles/l2lc.m](http://www.boundary-element-method.com/mfiles/l2lc.m) |
| Web source of this guide | <http://www.boundary-element-method.com/mfiles/l2lc_m.pdf> |
| Web source of the algorithm | [Computation of the Discrete Forms of the Laplace Integral Operators](http://www.boundary-element-method.com/tutorials/Computation%20of%20the%20Discrete%20Forms%20of%20the%20Laplace%20Integral%20Operators.pdf) |
| Dependent routines | Utility routines for 2D geometry from the GEOM2D.bas module in [dist.m](http://www.appliedmathematics.info/software/mfiles/dist.m), [norm2.m](http://www.appliedmathematics.info/software/mfiles/norm2.m), [dotproduct.m](http://www.appliedmathematics.info/software/mfiles/dotproduct.m), [size.m](http://www.appliedmathematics.info/software/mfiles/size.m), [ssize.m](http://www.appliedmathematics.info/software/mfiles/ssize.m), [vector.m](http://www.appliedmathematics.info/software/mfiles/vector.m).  Verification module for checking the input geometry; [OkGeometry2lc.m](http://www.boundary-element-method.com/mfiles/OkGeometry2lc.m)  Verification module for checking the input quadrature rule; [OkQuadrature.m](http://www.boundary-element-method.com/mfiles/OkQuadrature.m) |
| Test problems or modules tested | A set of test problems are given on the spreadsheet Sheet *l2lc\_test\_sheet* in l2lc.xlsm |
| 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](mailto:webmaster@boundary-element-method.com) . |
| Codes that this may be used alongside this one | This code was written as a utility routine to for the solution of 2D Laplace problems1. |
| Similar codes that may be of interest | A similar Excel VBA code is available in the following file:  <http://www.boundary-element-method.com/Excel_VBA/l2lc.xlsm>  A similar code in Fortran is available:  <http://www.boundary-element-method.com/fortran/L2LC.FOR> |
| Applications | To be included in the file libem2.m on the [www.boundary-element-method.com](http://www.boundary-element-method.com) website |
| Author | [Stephen Kirkup](https://www.researchgate.net/profile/Stephen_Kirkup) |
| References | 1. [www.boundary-element-method.com](http://www.boundary-element-method.com)  2. [www.freemat.info](http://www.freemat.info)  2. [Computation of the Discrete Forms of the Laplace Integral Operators](http://www.boundary-element-method.com/tutorials/Computation%20of%20the%20Discrete%20Forms%20of%20the%20Laplace%20Integral%20Operators.pdf)  3. [Discretization of the Laplace Integral Operators](http://www.boundary-element-method.com/tutorials/Discretization%20of%20the%20Laplace%20Integral%20Operators.pdf) |