# Using NAG Library routines in LabVIEW - examples

## 1 Introduction

This archive contains example virtual instruments (VIs) which illustrate some aspects of utilizing NAG numerical routines and methods within the LabVIEW programming environment. Some background information on how to incorporate NAG routines into LabVIEW is available at

- http://blog.nag.com/2011/07/using-nag-net-methods-in-labview.html
- http://blog.nag.com/2011/10/calling-routines-from-nag-fortran-and-c.html

These examples use the NAG Fortran Library, the NAG C Library and the NAG Library for .NET, and have been built under Windows 7 using LabVIEW Version 11.0. Before running any of these examples, the user must have (a) the appropriate version of LabVIEW and (b) the relevant NAG Library (or Libraries) installed on their machine.

Most of the examples have been built in the 32 bit environment (see following section); we also present a 64 bit example in §3.

## 2 32 bit examples

These examples have been built under LabVIEW Version 11.0 (32 bit); each uses one of the following NAG Libraries:

- NAG Library for .NET [Release 1] for Windows XP/Vista/7, x86-32, x86-64 (***DTW3A01DAL***)[1]
- NAG C Library [Mark 23] for Windows XP/Vista/7, Intel C/C++ or Microsoft C/C++ (***CLW3223DAL***)[2]
- NAG Fortran Library [Mark 23] for Win32 Applications, Windows XP/Vista/7 DLL, Intel Visual Fortran (***FLDLL234M***)[3]

### 2.1 NAG Library for .NET examples

These examples all use ***DTW3A01DAL***. Note that the 32 bit assembly (`NagLibrary32.dll`) is used rather than the 64 bit one (which is also part of the NAG Library for .NET installation).

`c09cc.vi` – computes the one-dimensional multi-level discrete wavelet transform.

`e01ba.vi` – determines a cubic spline interpolant to a given set of data.

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[1] http://www.nag.co.uk/downloads/dtdownloads.asp

[2] http://www.nag.co.uk/downloads/cl/clw3223dal

[3] http://www.nag.co.uk/downloads/fl/fldll234ml.asp

`e04uf.vi` – minimizes an arbitrary smooth function subject to constraints (including bounds on the variables, linear constraints and smooth nonlinear constraints) using a sequential programming method.

`f06bn.vi` – computes the square root of $a^2 + b^2$, where $a$ and $b$ are its arguments.

`g01aa.vi` – calculates the mean, standard deviation, coefficients of skewness and kurtosis, and the maximum and minimum values for a set of ungrouped data. Weighting may be used.

## 2.2 NAG C Library examples

These examples all use ***CLW3223DAL***.

`c06ekc.vi` – calculates[4] the circular convolution or correlation of two real vectors.

`c09cac.vi` – computes[5] the one-dimensional discrete wavelet transform at a single level.

`e04nfc.vi` – solves[6] general quadratic programming problems.

`f01ecc.vi` – computes[7] the matrix exponential of a real square matrix.

`f07adc.vi` – computes[8] the *LU* factorization of a real matrix.

`f07aec.vi` – solves[9] a real system of linear equations with multiple right-hand sides, where the matrix of coefficients has been factorized by `f07adc`.

`f07agc.vi` – estimates[10] the condition of a real matrix *A*, where *A* has been factorized by `f07adc`.

`g01aac.vi` – calculates[11] the mean, standard deviation, coefficients of skewness and kurtosis, and the maximum and minimum values for a set of ungrouped data. Weighting may be used.

## 2.3 NAG Fortran Library examples

These examples all use***FLDLL234M***.

`f01blf.vi` – calculates[12] the rank and pseudo-inverse of a real matrix.

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[4] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/C06/c06ekc.pdf

[5] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/C09/c09cac.pdf

[6] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/E04/e04nfc.pdf

[7] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/F01/f01ecc.pdf

[8] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/F07/f07adc.pdf

[9] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/F07/f07aec.pdf

[10] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/F07/f07agc.pdf

[11] http://www.nag.co.uk/numeric/CL/nagdoc_cl23/pdf/G01/g01aac.pdf

`f03aaf.vi` – calculates[13] the determinant of a real matrix.

`f06eaf.vi` – calculates[14] the dot product of two real vectors.

`f06raf.vi` – calculates[15] one of various norms, or the maximum absolute value of the elements of a real matrix.

`g01aaf.vi` – calculates[16] the mean, standard deviation, coefficients of skewness and kurtosis, and the maximum and minimum values for a set of ungrouped data. Weighting may be used.

## 3 64 bit example

This example uses LabVIEW 2011 SP1, version 11.0.1f1 (64 bit), and (all of) the following NAG Libraries:

- NAG Library for .NET [Release 1] for Windows XP/Vista/7, x86-32, x86-64 (***DTW3A01DAL***)[17]. Note that this example uses the 64 bit assembly (`NagLibrary64.dll`) rather than the 32 bit one (which is also part of the NAG Library for .NET installation).

- NAG C Library [Mark 9] for Microsoft Windows XP/Vista/7, Intel C/C++ 64 or Microsoft 64-bit C/C++ (***CLW6I09DAL***)[18]

- NAG Fortran Library [Mark 23] for x86-64 systems, Windows XP/Vista/7 DLL, Intel Fortran for 64-bit applications (***FLW6I23DCL***)[19]

This example calls the same routine three times – once from each library – and displays the results (which should all be identical). This duplication is only intended to illustrate that all of the libraries work in the 64 bit environment, and is clearly not necessary in a working application, which would only utilise one of the libraries.

`s01ba.vi` – calculates[20] the value of the shifted logarithm of its argument.

## 4 Support and feedback

It should be noted that, although this collection of examples has been built and run on the platforms mentioned above, it is not a NAG product. However, we are keen to

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[12] http://www.nag.co.uk/numeric/fl/nagdoc_fl23/pdf/F01/f01blf.pdf

[13] http://www.nag.co.uk/numeric/fl/nagdoc_fl23/pdf/F03/f03aaf.pdf

[14] http://www.nag.co.uk/numeric/fl/nagdoc_fl23/pdf/F06/f06eaf.pdf

[15] http://www.nag.co.uk/numeric/fl/nagdoc_fl23/pdf/F06/f06raf.pdf

[16] http://www.nag.co.uk/numeric/fl/nagdoc_fl23/pdf/G01/g01aaf.pdf

[17] See footnote 1, above.

[18] http://www.nag.co.uk/downloads/cl/clw6i09dal.asp

[19] http://www.nag.co.uk/downloads/fl/flw6i23dcl.asp

[20] http://www.nag.co.uk/numeric/CL/nagdoc_cl09/pdf/S/s01bac.pdf; http://www.nag.co.uk/numeric/fl/nagdoc_fl23/pdf/S/s01baf.pdf

receive user feedback, and will respond to technical queries and problem reports via support@nag.co.uk with the aim of further refining this collection and making it still more useful to the LabVIEW community.

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