



GDD-9000 Floating Point Extended C Callable BLAS (Basic Linear Algebra Subroutines) Library for TMS320C6000.

The library is a set of about 90 functions and macros that implement the Basic Linear Algebra Subroutines standard for Level 1 BLAS vector-vector ($O(n)$ complexity) operations, Level 2 BLAS matrix-vector ($O(n^2)$ complexity) operations and Level 2 BLAS matrix-matrix ($O(n^3)$ complexity) operations. Library's functions perform these operations on the IEEE-754 single and double precision floating point format numbers. The library uses native floating point arithmetic support of the TMS320C67xx DSP and software simulates floating point arithmetic for the fixed point DSP members of the C6000 family of DSPs. The library process both REAL and COMPLEX data vectors and matrices. Many vector and matrix operations involve scaling by a real or complex scalar values. By using special memory allocation routines the amount of RAM storage is minimized for structured types of matrices, like symmetric, band and triangular classes of matrices

The library is supported for use in any development environment using TI Code Generation Tools for the TMS320C6000 DSP and for both big endian and little endian memory formats. All the functions are C callable and comply with TI's C environment calling conventions.

Library's functions have been optimised algorithmically at the assembly level to fully utilize advantages of TMS320C6000 parallel architecture, floating point arithmetic and pipeline. Level 1 functions are hand-coded in assembly to obtain maximum possible performance of the TMS320C6000 DSPs.

The library can be used in various application areas of linear algebra problems providing with a set of basic standard operations. The user's manual gives the details on using library functions.

FUNCTION LIST

ECC BLAS LEVEL 1

REAL VECTOR OPERATIONS

- Index of the maximum absolute value of vector elements
- Index of the maximum value of vector elements
- Index of the minimum absolute value of vector elements
- Index of the minimum value of vector elements
- Fill a vector with a constant
- Copy a vector to a vector
- Interchange elements of two vectors
- Sum of the absolute values of vector elements
- Add a constant to a vector
- Add a vector to a vector
- Multiply a vector by a constant
- Multiply a vector by a constant, add a vector
- Multiply a vector by a vector
- Dot product
- Euclidean norm of a vector
- Construct givens plane rotation
- Apply givens plane rotation
- Machine constants

COMPLEX VECTOR OPERATIONS

- Index of the maximum absolute value of vector elements
- Index of the minimum absolute value of vector elements
- Fill a vector with a constant
- Copy a vector to a vector
- Interchange elements of two vectors
- Sum of the absolute values of vector elements
- Add a constant to a vector
- Add a vector to a vector
- Multiply a vector by a real constant
- Multiply a vector by a constant
- Multiply a vector by a constant, add a vector
- Multiply a vector conjugate by a constant, add a vector
- Multiply a vector by a vector
- Dot product
- Dot product with conjugation
- Unitary norm of a vector
- Construct givens plane rotation
- Apply givens plane rotation
- Machine constants

ECC BLAS LEVEL 2

REAL MATRIX-VECTOR OPERATIONS

- Multiply a matrix by a vector, add a vector
- Multiply a band matrix by a vector, add a vector
- Multiply a symmetric matrix by a vector, add a vector
- Multiply a band symmetric matrix by a vector, add a vector
- Multiply a triangular matrix by a vector
- Multiply a band triangular matrix by a vector
- Rank 1 update, general matrix
- Rank 1 update, symmetric matrix
- Rank 2 update, symmetric matrix
- Solve a linear system with a triangular matrix
- Solve a linear system with a band triangular matrix

COMPLEX MATRIX-VECTOR OPERATIONS

- Multiply a matrix by a vector, add a vector
- Multiply a band matrix by a vector, add a vector
- Multiply a hermitian matrix by a vector, add a vector
- Multiply a band hermitian matrix by a vector, add a vector
- Multiply a triangular matrix by a vector
- Multiply a band triangular matrix by a vector
- Rank 1 update, general matrix
- Rank 1 update, hermitian matrix
- Rank 2 update, hermitian matrix
- Solve a linear system with a triangular matrix
- Solve a linear system with a band triangular matrix

ECC BLAS LEVEL 3

REAL MATRIX-MATRIX OPERATIONS

- Multiply a matrix by a matrix, add a matrix
- Multiply a symmetric matrix by a matrix, add a matrix
- Multiply a triangular matrix by a matrix
- Rank k update, symmetric matrix
- Rank 2k update, symmetric matrix
- Solve simultaneous linear systems with a triangular matrix

COMPLEX MATRIX-MATRIX OPERATIONS

- Multiply a matrix by a matrix, add a matrix
- Multiply a symmetric matrix by a matrix, add a matrix
- Multiply a hermitian matrix by a matrix, add a matrix
- Multiply a triangular matrix by a matrix
- Rank k update, symmetric matrix
- Rank 2k update, symmetric matrix
- Rank k update, hermitian matrix
- Rank 2k update, hermitian matrix
- Solve simultaneous linear systems with a triangular matrix

MATRIX NORMS

REAL MATRICES

- L1, Euclidean (L2), Infinity; GENERAL matrix
- L1, Euclidean (L2), Infinity; BAND matrix
- L1, Euclidean (L2), Infinity; SYMMETRIC matrix
- L1, Euclidean (L2), Infinity; SYMMETRIC BAND matrix
- L1, Euclidean (L2), Infinity; TRIDIAGONAL matrix
- L1, Euclidean (L2), Infinity; SYMMETRIC TRIDIAGONAL matrix
- L1, Euclidean (L2), Infinity; TRIANGULAR matrix
- L1, Euclidean (L2), Infinity; BAND TRIANGULAR matrix

COMPLEX MATRICES

- L1, Euclidean (L2), Infinity; GENERAL matrix
- L1, Euclidean (L2), Infinity; BAND matrix
- L1, Euclidean (L2), Infinity; SYMMETRIC/HERMITIAN matrix
- L1, Euclidean (L2), Infinity; SYMMETRIC/HERMITIAN BAND matrix
- L1, Euclidean (L2), Infinity; TRIDIAGONAL matrix
- L1, Euclidean (L2), Infinity; SYMMETRIC/HERMITIAN TRIDIAGONAL
- L1, Euclidean (L2), Infinity; TRIANGULAR matrix
- L1, Euclidean (L2), Infinity; BAND TRIANGULAR matrix

MEMORY ALLOCATION FOR VECTOR AND MATRIX OBJECTS

REAL MATRICES AND VECTORS

- Vector memory allocation
- General matrix memory allocation
- Symmetric and triangular matrix memory allocation
- Band matrix memory allocation
- Band symmetric and band triangular matrix memory allocation

COMPLEX MATRICES AND VECTORS

- Vector memory allocation
- General matrix memory allocation
- Hermitian and triangular matrix memory allocation
- Band matrix memory allocation
- Band Hermitian and band triangular matrix memory allocation