**Matrix Datatype Design**

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Note for Qingtian:

>> img: make image! 5x5

== make image! [5x5 #{

FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF...

>> v: make vector! [integer! 16 12]

== make vector! [integer! 16 [0 0 0 0 0 0 0 0 0 0 0 0]]

what will be great

>> m: make matrix! [integer! 16 3x4]

== make matrix! [integer! 16 4 3 [0 0 0 0 0 0 0 0 0 0 0 0]]

In progress…

Matrix (mx)

mx is a special vector where matrix properties are inserted at the head of matrix

mType: matrix type as integer [1: Char, 2: Integer, 3: Float]

bitSize: bit-size as integer [8 | 16 | 32 for integer! and char!, 32 | 64 for float!]

mSize: matrix size as pair with m rows and n columns (e.g 3x4)

mData: matrix values as block transformed into vector for fast computation

mx is composed of header and data

;\_HEADER: [mType bitSize rows cols]

DATA [value..value n\*m]

;Index of Rows and Cols

\_ROWS: 3

\_COLS: 4

\_HLEN: 4

New or updated

To be done

|  |  |  |  |
| --- | --- | --- | --- |
| Function Name | Help | Status | redCV1 routines |
| *Internal Functions* | *Non-documented* |  |  |
| \_getIdx | Real index in vector including header offset | OK |  |
| \_getRowIdx | Real row index | OK |  |
| \_getColIdx | Real column index | OK |  |
| \_getAt | Get value at row x col coordinates | OK |  |
| \_product | Block product | OK |  |
| \_swapDim | Swap mat dimensions | OK |  |
| \_matSizeEQ? | Have matrices equivalent size? | OK |  |
| \_matTypeEQ? | Have matrices equivalent type? | OK |  |
| \_matDepthEQ? | Have matrices equivalent bit-size? | OK |  |
| \_matSimilar? | Are matrices similar? | OK |  |
| \_matOp | Math operators for matrices | OK |  |
| \_matScalarOp | Scalar operators for matrices | OK |  |
| \_matRREF | Reduced Row Eschelon Form | OK |  |
| *Matrix Creation* | *Documented* |  |  |
| rcvCreateMat | Creates rows x columns matrix | OK | rcvCreateMat |
| rcvInitMat | Initializes and creates rows x columns matrix | OK |  |
| rcvCreateMatScalar | Creates a scalar matrix | OK |  |
| rcvCreateMatIdentity | Creates I identity matrix | OK |  |
| rcvCreateMatZero | Creates zero (null) matrix | OK |  |
| rcvGetMatHeader | Return matrix properties (block) | OK |  |
| rcvGetMatData | Return matrix values as a new vector | OK |  |
| rcvGetMatOrder | Return matrix size (pair) | OK | ~rcvLengthMat |
| *Matrix Properties* | *Documented* |  |  |
| rcvGetTrace | Get trace of square matrix | OK |  |
| rcvGetDiagonal | Get matrix main diagonal | OK |  |
| rcvGetDeterminant | Get matrix determinant | OK |  |
| rcvGetEigens2 | Matrix eigen values | OK |  |
| rcvMatSquare? | Square matrix (logic) | OK |  |
| rcvMatZero? | Is null? Any matrix | OK |  |
| rcvMatSingular? | Is singular? Any matrix | OK |  |
| rcvMatDegenerate? | Is degenerate? Any matrix | OK |  |
| rcvMatInvertible? | Is invertible? Any matrix | OK |  |
| rcvMatDiagonal? | Is diagonal? Square matrix | OK |  |
| rcvMatSymmetric? | Is symmetric? Square matrix | OK |  |
|  | do we need nonsingular? nondegenerate? |  |  |
| *Matrix elements access* | *Documented* |  |  |
| rcvGetAt | Get value at mxn coordinate | OK | rcvGetIntValue  rcvGetFloatValue  rcvGetFloat32Value  rcvGetInt2D  rcvGetReal2D  rcvGetReal322D |
| rcvSetAt | Set value at mxn coordinate | OK | rcvSetIntValue  rcvSetFloatValue  rcvSetInt2D  rcvSetReal2D |
| *Matrix rows & columns* | *Documented* |  |  |
| rcvGetCol | Return a new matrix column n (vector) | OK |  |
| rcvGetRow | Return a new matrix row n (vector) | OK |  |
| rcvRemoveRow | Remove row in matrix | OK |  |
| rcvRemoveCol | Remove column in matrix | OK |  |
| rcvInsertRow | Insert row in matrix | OK |  |
| rcvAppendRow | Append row in matrix | OK |  |
| rcvInsertCol | Insert column in matrix | OK |  |
| rcvAppendCol | Append column to matrix | OK |  |
| rcvAugmentMat | Augment matrix with another matrix (same number of rows) | OK |  |
| rcvMatSplit | Split matrix | OK |  |
| rcvSwitchRows | Switch two rows in matrix | OK |  |
| rcvMatRowAdd | Add data to row | OK |  |
| rcvMatRowProduct | Scalar multiplication of a matrix row | OK |  |
| *Matrix Transform* | *Documented* |  |  |
| rcvMatTranspose | Transpose matrix | OK | Similar in fft |
| rcvMatNegate | Negate integer of float matrices | OK |  |
| rcvMatRotate | Rotate matrix | OK | Similar in fft |
| rcvMatRotateRow | Row rotation | OK | Similar in fft |
| rcvMatRotateCol | Column(s) rotation | OK | Similar in fft |
| rcvMatInvert | Matrice inversion | OK |  |
| *Matrix Compute* | *Documented* |  |  |
| rcvMatProduct | Matrix product as float value | OK | rcvProdMat |
| rcvMatSum | Matrix sum as float value | OK | rcvSumMat |
| rcvMatMean | Matrix mean as float value | OK | rcvMeanMat |
| rcvMatMin | Min value of the matrix as number | OK | rcvMinMat |
| rcvMatMax | Max value of the matrix as number | OK | rcvMaxMat |
| rcvMatRowAdd | Add row to a matrix row | OK |  |
| rcvMatRowProduct | Scalar multiplication of a matrix row | OK |  |
| rcvMatAddition | Addition of two matrices | OK |  |
| rcvMatSubstraction | Substraction of two matrices | OK |  |
| rcvMatStandardProduct | Standard product of compatible matrices | OK |  |
| rcvMatHadamardProduct | Hadamard product of compatible matrices | OK |  |
| rcvMatKroneckerProduct | Kronecker product of two matrices | OK |  |
| rcvMatDivide | Division of two matrices | TBD |  |
| rcvMatScalarAddition | Matrix + value | OK |  |
| rcvMatScalarSubtraction | Matrix - value | OK |  |
| rcvMatScalarProduct | Product of scalar multiplication of the matrix | OK |  |
| rcvMatScalarDivision | Matrix / value | OK |  |
| rcvMatScalarRemainder | Matrix % value | OK |  |
| rcvMatScalarAnd | Matrix AND value | OK |  |
| rcvMatScalarOr | Matrix OR value | OK |  |
| rrcvMatScalarXor | Matrix XOR value | OK |  |
| rcvMatScalarRightShift | Matrix right shift (>>) | OK |  |
| rcvMatScalarRightShiftUnsigned | Matrix right shift (unsigned >>>) | OK |  |
| rcvMatScalarLeftShift | Matrix left shiht | OK |  |
| *Matrix Decomposition* | *Documented* |  |  |
| rcvGetIdentity | Get (left or right) identity matrix for given matrix | OK |  |
| *Matrix Form* | *Documented* |  |  |
| rcvMatShow | Form matrix | OK |  |
| *Misc* |  |  |  |
| rcvMatApply |  |  |  |