

File created: 11-Jun-90 14:41:02 {DSK}<usr>local>lde>lispcore>library>CMLFLOATARRAY.;2

changes to: (VARS CMLFLOATARRAYCOMS)

previous date: 9-Apr-87 16:32:45 {DSK}<usr>local>lde>lispcore>library>CMLFLOATARRAY.;1

Read Table: INTERLISP

Package: INTERLISP

Format: XCCS

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(RPAQQ **CMLFLOATARRAYCOMS**

[(DECLARE%: DONTCOPY DOEVAL@COMPILE (FILES (SYSLOAD FROM VALUEOF DIRECTORIES)
UNBOXEDOPS FLOAT-ARRAY-SUPPORT))

:: MAPARRAY fns and macros

(FNS MAP-ARRAY)
(FUNCTIONS MAP-ARRAY-1 MAP-ARRAY-2)
(FUNCTIONS REDUCE-ARRAY EVALUATE-POLYNOMIAL FIND-ARRAY-ELEMENT-INDEX)
(FUNCTIONS FLATTEN-ARG MAX-ABS MIN-ABS)
(FUNCTIONS %%MAP-FLOAT-ARRAY-ABS %%MAP-FLOAT-ARRAY-FLOAT %%MAP-FLOAT-ARRAY-MINUS
%%MAP-FLOAT-ARRAY-NEGATE %%MAP-FLOAT-ARRAY-PLUS %%MAP-FLOAT-ARRAY-QUOTIENT
%%MAP-FLOAT-ARRAY-TIMES %%MAP-FLOAT-ARRAY-TRUNCATE %%REDUCE-FLOAT-ARRAY-MAX
%%REDUCE-FLOAT-ARRAY-MAX-ABS %%REDUCE-FLOAT-ARRAY-MIN %%REDUCE-FLOAT-ARRAY-MIN-ABS
%%REDUCE-FLOAT-ARRAY-PLUS %%REDUCE-FLOAT-ARRAY-TIMES)

:: For convenience

(PROP FILETYPE CMLFLOATARRAY)
(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY (LOCALVARS . T))
(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILERVARS (ADDVARS (NLAMA)
(NLAML)
(LAMA MAP-ARRAY]))

(DECLARE%: DONTCOPY DOEVAL@COMPILE

(FILESLOAD (SYSLOAD FROM VALUEOF DIRECTORIES)
UNBOXEDOPS FLOAT-ARRAY-SUPPORT)
)

:: MAPARRAY fns and macros

(DEFINEQ

(**MAP-ARRAY**

[LAMBDA ARGS

; Edited 9-Apr-87 16:22 by jop

:: First arg, RESULT, may either be an array of the correct type, or a symbol indicating the element-type of the result, or NIL if the map is for effect.
:: Second arg is the mapping functions. Other args are arrays, all of which must have the same number of elements, or non-arrays which will be
:: treated as scalars

(CL:IF (< ARGS 3)
(CL:ERROR "MAPARRAY takes at least three args"))
(LET ((RESULT (ARG ARGS 1))
(MAPFN (ARG ARGS 2))
(ARRAY1 (ARG ARGS 3))
FIRST-ARRAY)

:: Arg checking. First-array is the first array map argument

(CL:IF (NOT (TYPEP MAPFN 'CL:FUNCTION))
(CL:ERROR "Not a function: ~S" MAPFN))
(CL:DO ((I 3 (CL:1+ I))
MAP-ARG)
(> I ARGS)
(SETQ MAP-ARG (ARG ARGS I))
(CL:WHEN (CL:ARRAYP MAP-ARG)
(CL:IF FIRST-ARRAY
(CL:IF (NOT (EQUAL-DIMENSIONS-P MAP-ARG FIRST-ARRAY))
(CL:ERROR "Dimensions mismatch" MAP-ARG))
(SETQ FIRST-ARRAY MAP-ARG))))

:: Coerce RESULT into an array or NIL

(CL:TYPECASE RESULT
(CL:ARRAY (CL:IF [NOT (OR (EQUAL-DIMENSIONS-P RESULT FIRST-ARRAY)
(AND (NULL FIRST-ARRAY)
(EQ 0 (CL:ARRAY-RANK RESULT))
(CL:ERROR "Dimensions mismatch: ~S" RESULT))]
(OR CL:SYMBOL CONS) (SETQ RESULT (CL:IF FIRST-ARRAY
(CL:MAKE-ARRAY (CL:ARRAY-DIMENSIONS FIRST-ARRAY)
:ELEMENT-TYPE RESULT)
(CL:MAKE-ARRAY NIL :ELEMENT-TYPE RESULT))))
(T (OR (NULL RESULT)
(CL:ERROR "RESULT must be an array, an element type, or NIL: ~S" RESULT))))
(CL:IF FIRST-ARRAY

```
(CL:IF (AND RESULT (< ARGS 5))
  (CL:ECASE ARGS
    (3
      (MAP-ARRAY-1 RESULT MAPFN ARRAY1))
      ; Note: in this case (EQ ARRAY1 FIRST-ARRAY)
    (4 (MAP-ARRAY-2 RESULT MAPFN ARRAY1 (ARG ARGS 4))))
  [LET* ((FLATTENED-RESULT (FLATTEN-ARG RESULT))
    (SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
    [FLATTENED-ARRAYS (for I from 3 to ARGS collect (FLATTEN-ARG (ARG ARGS I)
      (ELT-SLICE (CL:COPY-LIST FLATTENED-ARRAYS))
      VALUE)
    (CL:DOTIMES (INDEX SIZE RESULT)
      [SETQ VALUE (CL:APPLY MAPFN (CL:DO ((%SUBSLICE ELT-SLICE (CDR %SUBSLICE))
        (%SUBARRAYS FLATTENED-ARRAYS (CDR %SUBARRAYS))
        (NULL %SUBARRAYS)
        ELT-SLICE)
        (AND (CL:ARRAYP (CAR %SUBARRAYS))
          (RPLACA %SUBSLICE (CL:AREF (CAR %SUBARRAYS)
            INDEX))))])
      (CL:IF RESULT
        (CL:SETF (CL:AREF FLATTENED-RESULT INDEX)
          VALUE)))]
    (CL:IF RESULT
      [CL:SETF (CL:AREF RESULT)
        (CL:APPLY MAPFN (for I from 3 to ARGS collect (ARG ARGS I)
          (CL:APPLY MAPFN (for I from 3 to ARGS collect (ARG ARGS I))))))]
    )
  )
```

(CL:DEFUN **MAP-ARRAY-1** (RESULT MAPFN ARRAY)

;; Does something fast for MAPFNS - abs truncate float and EXPONENT. ARRAY is always an array.

```
[LET [(RESULT-FLOAT-P (EQ (CL:ARRAY-ELEMENT-TYPE RESULT)
  'CL:SINGLE-FLOAT))
  (ARRAY-FLOAT-P (EQ (CL:ARRAY-ELEMENT-TYPE ARRAY)
  'CL:SINGLE-FLOAT))
  (SETQ MAPFN (CL:TYPECASE MAPFN
    (CL:SYMBOL (CASE MAPFN
      (MINUS '-)
      (FIX 'CL:TRUNCATE)
      (T MAPFN)))
    (COMPILED-CLOSURE (COND
      ((OR (CL::%EQCODEP MAPFN '-)
        (CL::%EQCODEP MAPFN 'MINUS))
        '-)
      ((CL::%EQCODEP MAPFN 'ABS)
        'ABS)
      ((OR (CL::%EQCODEP MAPFN 'FIX)
        (CL::%EQCODEP MAPFN 'CL:TRUNCATE))
        'CL:TRUNCATE)
      ((CL::%EQCODEP MAPFN 'FLOAT)
        'FLOAT)
      (T MAPFN)))
    (COND
      ((AND (EQ MAPFN '-)
        RESULT-FLOAT-P ARRAY-FLOAT-P)
        (%MAP-FLOAT-ARRAY-NEGATE RESULT ARRAY))
      ((AND (EQ MAPFN 'ABS)
        RESULT-FLOAT-P ARRAY-FLOAT-P)
        (%MAP-FLOAT-ARRAY-ABS RESULT ARRAY))
      ((AND (EQ MAPFN 'CL:TRUNCATE)
        ARRAY-FLOAT-P)
        (%MAP-FLOAT-ARRAY-TRUNCATE RESULT ARRAY))
      ((AND (EQ MAPFN 'FLOAT)
        RESULT-FLOAT-P)
        (%MAP-FLOAT-ARRAY-FLOAT RESULT ARRAY))
      (T (LET ((FLATTENED-RESULT (FLATTEN-ARG RESULT))
        (FLATTENED-ARRAY (FLATTEN-ARG ARRAY)))
        (CL:DOTIMES (INDEX (CL:ARRAY-TOTAL-SIZE RESULT)
          RESULT)
          (CL:SETF (CL:AREF FLATTENED-RESULT INDEX)
            (CL:FUNCALL MAPFN (CL:AREF FLATTENED-ARRAY INDEX)))))]
    )
  )
  )
```

(CL:DEFUN **MAP-ARRAY-2** (RESULT MAPFN ARRAY-1 ARRAY-2)

;; Does something fast for MAPFNS + - * /. At least one of ARRAY-1 and ARRAY-2 is an array

```
[LET [(ARRAYS-FLOAT-P (AND (EQ (CL:ARRAY-ELEMENT-TYPE RESULT)
  'CL:SINGLE-FLOAT)
  [OR (TYPEP ARRAY-1 ' (CL:ARRAY CL:SINGLE-FLOAT))
  (TYPEP ARRAY-1 ' (OR FLOAT CL:RATIONAL))
  (OR (TYPEP ARRAY-2 ' (CL:ARRAY CL:SINGLE-FLOAT))
  (TYPEP ARRAY-2 ' (OR FLOAT CL:RATIONAL))
  )
  )
  (SETQ MAPFN (CL:TYPECASE MAPFN
    (CL:SYMBOL (CASE MAPFN
      ; Coerce MAPFN to standard form
    )
  )
  )
```

```

        (PLUS '+)
        (MINUS '-')
        (TIMES 'CL:*)
        (QUOTIENT '/')
        (T MAPFN))
    (COMPILED-CLOSURE (COND
        ((OR (CL::%EQCODEP MAPFN '+)
            (CL::%EQCODEP MAPFN 'PLUS))
        '+)
        ((OR (CL::%EQCODEP MAPFN '-')
            (CL::%EQCODEP MAPFN 'MINUS))
        '-)
        ((OR (CL::%EQCODEP MAPFN 'CL:*)
            (CL::%EQCODEP MAPFN 'TIMES))
        'CL:*)
        ((OR (CL::%EQCODEP MAPFN '/')
            (CL::%EQCODEP MAPFN 'QUOTIENT))
        '/')
        (T MAPFN)))
    (T MAPFN))
(COND
  ((AND (EQ MAPFN '+)
    ARRAYS-FLOAT-P)
    (%%MAP-FLOAT-ARRAY-PLUS RESULT ARRAY-1 ARRAY-2))
  ((AND (EQ MAPFN '-')
    ARRAYS-FLOAT-P)
    (%%MAP-FLOAT-ARRAY-MINUS RESULT ARRAY-1 ARRAY-2))
  ((AND (EQ MAPFN 'CL:*)
    ARRAYS-FLOAT-P)
    (%%MAP-FLOAT-ARRAY-TIMES RESULT ARRAY-1 ARRAY-2))
  ((AND (EQ MAPFN '/')
    ARRAYS-FLOAT-P)
    (%%MAP-FLOAT-ARRAY-QUOTIENT RESULT ARRAY-1 ARRAY-2))
  (T (LET ((FLATTENED-RESULT (FLATTEN-ARG RESULT))
    (FLATTENED-ARRAY-1 (FLATTEN-ARG ARRAY-1))
    (FLATTENED-ARRAY-2 (FLATTEN-ARG ARRAY-2)))
    (CL:IF (CL:ARRAYP ARRAY-1)
      (CL:IF (CL:ARRAYP ARRAY-2)
        (CL:DOTIMES (INDEX (CL:ARRAY-TOTAL-SIZE RESULT)
          RESULT)
          (CL:SETF (CL:AREF FLATTENED-RESULT INDEX)
            (CL:FUNCALL MAPFN (CL:AREF FLATTENED-ARRAY-1 INDEX)
              (CL:AREF FLATTENED-ARRAY-2 INDEX))))
        (CL:DOTIMES (INDEX (CL:ARRAY-TOTAL-SIZE RESULT)
          RESULT)
          (CL:SETF (CL:AREF FLATTENED-RESULT INDEX)
            (CL:FUNCALL MAPFN (CL:AREF FLATTENED-ARRAY-1 INDEX)
              FLATTENED-ARRAY-2))))
      (CL:DOTIMES (INDEX (CL:ARRAY-TOTAL-SIZE RESULT)
        RESULT)
        (CL:SETF (CL:AREF FLATTENED-RESULT INDEX)
          (CL:FUNCALL MAPFN FLATTENED-ARRAY-1 (CL:AREF FLATTENED-ARRAY-2 INDEX))))))]))

(CL:DEFUN REDUCE-ARRAY (REDUCTION-FN ARRAY &OPTIONAL (INITIAL-VALUE NIL INITIAL-VALUE-P))
  (SETQ REDUCTION-FN (CL:TYPECASE REDUCTION-FN
    (CL:SYMBOL (CASE REDUCTION-FN
      (PLUS '+)
      (TIMES 'CL:*)
      (T REDUCTION-FN)))
    (COMPILED-CLOSURE (COND
      ((OR (CL::%EQCODEP REDUCTION-FN '+)
        (CL::%EQCODEP REDUCTION-FN 'PLUS))
      '+)
      ((OR (CL::%EQCODEP REDUCTION-FN 'CL:*)
        (CL::%EQCODEP REDUCTION-FN 'TIMES))
      'CL:*)
      ((CL::%EQCODEP REDUCTION-FN 'MIN)
      'MIN)
      ((CL::%EQCODEP REDUCTION-FN 'MAX)
      'MAX)
      ((CL::%EQCODEP REDUCTION-FN 'MIN-ABS)
      'MIN-ABS)
      ((CL::%EQCODEP REDUCTION-FN 'MAX-ABS)
      'MAX-ABS)
      (T REDUCTION-FN)))
      (T REDUCTION-FN)))
  (CL:IF (NOT (CL:ARRAYP ARRAY))
    (CL:IF INITIAL-VALUE-P
      (CL:FUNCALL REDUCTION-FN INITIAL-VALUE ARRAY)
      ARRAY)
  [LET [(SIZE (CL:ARRAY-TOTAL-SIZE ARRAY))
    (ARRAY-FLOAT-P (EQ (CL:ARRAY-ELEMENT-TYPE ARRAY)
      'CL:SINGLE-FLOAT)]
    (CASE SIZE
      (0 (CL:IF INITIAL-VALUE-P
        INITIAL-VALUE

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(CL:FUNCCALL REDUCTION-FN)))
(1 (CL:IF INITIAL-VALUE-P
    (CL:FUNCCALL REDUCTION-FN INITIAL-VALUE (CL:AREF (FLATTEN-ARG ARRAY)
                                                    0))
    (CL:AREF (FLATTEN-ARG ARRAY)
              0)))
(T [COND
  ((AND (EQ REDUCTION-FN '+)
        ARRAY-FLOAT-P)
   (%%REDUCE-FLOAT-ARRAY-PLUS ARRAY INITIAL-VALUE))
  ((AND (EQ REDUCTION-FN 'CL:*)
        ARRAY-FLOAT-P)
   (%%REDUCE-FLOAT-ARRAY-TIMES ARRAY INITIAL-VALUE))
  ((AND (EQ REDUCTION-FN 'MIN)
        ARRAY-FLOAT-P)
   (%%REDUCE-FLOAT-ARRAY-MIN ARRAY INITIAL-VALUE))
  ((AND (EQ REDUCTION-FN 'MAX)
        ARRAY-FLOAT-P)
   (%%REDUCE-FLOAT-ARRAY-MAX ARRAY INITIAL-VALUE))
  ((AND (EQ REDUCTION-FN 'MIN-ABS)
        ARRAY-FLOAT-P)
   (%%REDUCE-FLOAT-ARRAY-MIN-ABS ARRAY INITIAL-VALUE))
  ((AND (EQ REDUCTION-FN 'MAX-ABS)
        ARRAY-FLOAT-P)
   (%%REDUCE-FLOAT-ARRAY-MAX-ABS ARRAY INITIAL-VALUE))
  (T (CL:DO* ((FLATTENED-ARRAY (FLATTEN-ARG ARRAY))
              (ACCUMULATOR (CL:IF INITIAL-VALUE-P
                                   INITIAL-VALUE
                                   (CL:AREF FLATTENED-ARRAY 0)))
              (INDEX (CL:IF INITIAL-VALUE-P
                            0
                            1)
                      (CL:1+ INDEX)))
            ((EQ INDEX SIZE)
             ACCUMULATOR)
            (SETQ ACCUMULATOR (CL:FUNCCALL REDUCTION-FN ACCUMULATOR (CL:AREF FLATTENED-ARRAY
                                                                           INDEX)))))))]))

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(CL:DEFUN EVALUATE-POLYNOMIAL (X COEFFICIENTS)
  (CL:IF (NOT (CL:ARRAYP COEFFICIENTS))
    (CL:ERROR "Not an array: ~S" COEFFICIENTS)
    (CL:IF (EQ (CL:ARRAY-ELEMENT-TYPE COEFFICIENTS)
                'CL:SINGLE-FLOAT)
      (%%POLY-EVAL (FLOAT X)
                   (%%GET-FLOAT-ARRAY-BASE COEFFICIENTS)
                   (CL:1- (CL:ARRAY-TOTAL-SIZE COEFFICIENTS)))
      (CL:DO ((FLATTENED-ARRAY (FLATTEN-ARG COEFFICIENTS))
              (INDEX 1 (CL:1+ INDEX))
              (SIZE (CL:ARRAY-TOTAL-SIZE COEFFICIENTS))
              (PRODUCT (CL:AREF COEFFICIENTS 0)))
            ((EQ INDEX SIZE)
             PRODUCT)
            (SETQ PRODUCT (+ (CL:* X PRODUCT)
                              (CL:AREF COEFFICIENTS INDEX))))))

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(CL:DEFUN FIND-ARRAY-ELEMENT-INDEX (ELEMENT ARRAY)
  (CL:IF (NOT (CL:ARRAYP ARRAY))
    (CL:ERROR "Not an array: ~S" ARRAY)
    (CL:IF (EQ (CL:ARRAY-ELEMENT-TYPE ARRAY)
                'CL:SINGLE-FLOAT)
      (CL:DO ((BASE (%%GET-FLOAT-ARRAY-BASE ARRAY)
                    (\ADDBASE BASE 2))
              (INDEX 0 (CL:1+ INDEX))
              (F-ELEMENT (FLOAT ELEMENT))
              (SIZE (CL:ARRAY-TOTAL-SIZE ARRAY)))
            ((EQ INDEX SIZE)
             NIL)
            (DECLARE (TYPE FLOAT F-ELEMENT))
            (CL:IF (UFEQP F-ELEMENT (\GETBASEFLOATP BASE 0))
                    (RETURN INDEX)))
      (CL:DO ((FLATTENED-ARRAY (FLATTEN-ARG ARRAY))
              (INDEX 0 (CL:1+ INDEX))
              (SIZE (CL:ARRAY-TOTAL-SIZE ARRAY)))
            ((EQ INDEX SIZE)
             NIL)
            (CL:IF (EQL ELEMENT (CL:AREF FLATTENED-ARRAY INDEX))
                    (RETURN INDEX))))))

```

```

(CL:DEFUN FLATTEN-ARG (ARG)
  (CL:IF (OR (NOT (CL:ARRAYP ARG))
            (EQ 1 (CL:ARRAY-RANK ARG)))
    ARG
    (CL:MAKE-ARRAY (CL:ARRAY-TOTAL-SIZE ARG)
                   :ELEMENT-TYPE

```

(CL:ARRAY-ELEMENT-TYPE ARG)
:DISPLACED-TO ARG))

(CL:DEFUN MAX-ABS (X Y)
(CL:IF (> (ABS X)
(ABS Y))
X
Y))

(CL:DEFUN MIN-ABS (X Y)
(CL:IF (< (ABS X)
(ABS Y))
X
Y))

(CL:DEFUN %%MAP-FLOAT-ARRAY-ABS (RESULT ARRAY)
(CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
(RESULT-BASE (%%GET-FLOAT-ARRAY-BASE RESULT)
(\ADDBASE RESULT-BASE 2))
(ARRAY-BASE (%%GET-FLOAT-ARRAY-BASE ARRAY)
(\ADDBASE ARRAY-BASE 2))
(INDEX 0 (CL:1+ INDEX)))
(EQ INDEX SIZE)
RESULT)
(\PUTBASEFLOATP RESULT-BASE 0 (UFABS (\GETBASEFLOATP ARRAY-BASE 0))))))

(CL:DEFUN %%MAP-FLOAT-ARRAY-FLOAT (RESULT ARRAY)
(LET ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
(CL:IF (EQUAL (CL:ARRAY-ELEMENT-TYPE ARRAY)
'(CL:UNSIGNED-BYTE 16))
(%%BLKSMALLP2FLOAT (%%GET-FLOAT-ARRAY-BASE ARRAY)
(%%GET-FLOAT-ARRAY-BASE RESULT)
SIZE)
(CL:DO ((RESULT-BASE (%%GET-FLOAT-ARRAY-BASE RESULT)
(\ADDBASE RESULT-BASE 2))
(INDEX 0 (CL:1+ INDEX)))
(EQ INDEX SIZE)
(\PUTBASEFLOATP RESULT-BASE 0 (FLOAT (CL:AREF ARRAY INDEX))))))
RESULT))

(CL:DEFUN %%MAP-FLOAT-ARRAY-MINUS (RESULT ARRAY-1 ARRAY-2)
(CL:IF (CL:ARRAYP ARRAY-1)
(CL:IF (CL:ARRAYP ARRAY-2)
(%%BLKFDIFF (%%GET-FLOAT-ARRAY-BASE ARRAY-1)
(%%GET-FLOAT-ARRAY-BASE ARRAY-2)
(%%GET-FLOAT-ARRAY-BASE RESULT)
(CL:ARRAY-TOTAL-SIZE RESULT))
(CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
(RESULT-BASE (%%GET-FLOAT-ARRAY-BASE RESULT)
(\ADDBASE RESULT-BASE 2))
(ARRAY-1-BASE (%%GET-FLOAT-ARRAY-BASE ARRAY-1)
(\ADDBASE ARRAY-1-BASE 2))
(ARRAY-2-BASE (%%GET-FLOAT-ARRAY-BASE ARRAY-2)
(\ADDBASE ARRAY-2-BASE 2))
(SCALAR (FLOAT ARRAY-2))
(INDEX 0 (CL:1+ INDEX)))
(EQ INDEX SIZE)
(DECLARE (TYPE FLOATP SCALAR))
(\PUTBASEFLOATP RESULT-BASE 0 (FDIFFERENCE (\GETBASEFLOATP ARRAY-1-BASE 0)
SCALAR))))
(CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
(RESULT-BASE (%%GET-FLOAT-ARRAY-BASE RESULT)
(\ADDBASE RESULT-BASE 2))
(SCALAR (FLOAT ARRAY-1))
(ARRAY-2-BASE (%%GET-FLOAT-ARRAY-BASE ARRAY-2)
(\ADDBASE ARRAY-2-BASE 2))
(INDEX 0 (CL:1+ INDEX)))
(EQ INDEX SIZE)
(DECLARE (TYPE FLOATP SCALAR))
(\PUTBASEFLOATP RESULT-BASE 0 (FDIFFERENCE SCALAR (\GETBASEFLOATP ARRAY-2-BASE 0))))))
RESULT)

(CL:DEFUN %%MAP-FLOAT-ARRAY-NEGATE (RESULT ARRAY)
(CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
(RESULT-BASE (%%GET-FLOAT-ARRAY-BASE RESULT)
(\ADDBASE RESULT-BASE 2))
(ARRAY-BASE (%%GET-FLOAT-ARRAY-BASE ARRAY)
(\ADDBASE ARRAY-BASE 2))
(INDEX 0 (CL:1+ INDEX)))
(EQ INDEX SIZE)
RESULT)
(\PUTBASEFLOATP RESULT-BASE 0 (UFMINUS (\GETBASEFLOATP ARRAY-BASE 0))))))

```

(CL:DEFUN %%MAP-FLOAT-ARRAY-PLUS (RESULT ARRAY-1 ARRAY-2)
  (CL:IF (NOT (CL:ARRAYP ARRAY-1))
    (CL:ROTATEF ARRAY-1 ARRAY-2)) ; addition is commutative
  (CL:IF (CL:ARRAYP ARRAY-2)
    (%BLKFPLUS (%GET-FLOAT-ARRAY-BASE ARRAY-1)
      (%GET-FLOAT-ARRAY-BASE ARRAY-2)
      (%GET-FLOAT-ARRAY-BASE RESULT)
      (CL:ARRAY-TOTAL-SIZE RESULT))
    (CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
      (RESULT-BASE (%GET-FLOAT-ARRAY-BASE RESULT)
        (\ADDBASE RESULT-BASE 2))
      (ARRAY-1-BASE (%GET-FLOAT-ARRAY-BASE ARRAY-1)
        (\ADDBASE ARRAY-1-BASE 2))
      (SCALAR (FLOAT ARRAY-2))
      (INDEX 0 (CL:1+ INDEX)))
      (EQ INDEX SIZE))
      (DECLARE (TYPE FLOATP SCALAR))
      (\PUTBASEFLOATP RESULT-BASE 0 (FPLUS (\GETBASEFLOATP ARRAY-1-BASE 0)
        SCALAR))))
  RESULT)

```

```

(CL:DEFUN %%MAP-FLOAT-ARRAY-QUOTIENT (RESULT ARRAY-1 ARRAY-2)
  (CL:IF (CL:ARRAYP ARRAY-1)
    (CL:IF (CL:ARRAYP ARRAY-2)
      (CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
        (RESULT-BASE (%GET-FLOAT-ARRAY-BASE RESULT)
          (\ADDBASE RESULT-BASE 2))
        (ARRAY-1-BASE (%GET-FLOAT-ARRAY-BASE ARRAY-1)
          (\ADDBASE ARRAY-1-BASE 2))
        (ARRAY-2-BASE (%GET-FLOAT-ARRAY-BASE ARRAY-2)
          (\ADDBASE ARRAY-1-BASE 2))
        (INDEX 0 (CL:1+ INDEX)))
        (EQ INDEX SIZE))
        (\PUTBASEFLOATP RESULT-BASE 0 (FQUOTIENT (\GETBASEFLOATP ARRAY-1-BASE 0)
          (\GETBASEFLOATP ARRAY-2-BASE 0))))
      (CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
        (RESULT-BASE (%GET-FLOAT-ARRAY-BASE RESULT)
          (\ADDBASE RESULT-BASE 2))
        (ARRAY-1-BASE (%GET-FLOAT-ARRAY-BASE ARRAY-1)
          (\ADDBASE ARRAY-1-BASE 2))
        (SCALAR (FLOAT ARRAY-2))
        (INDEX 0 (CL:1+ INDEX)))
        (EQ INDEX SIZE))
        (DECLARE (TYPE FLOATP SCALAR))
        (\PUTBASEFLOATP RESULT-BASE 0 (FQUOTIENT (\GETBASEFLOATP ARRAY-1-BASE 0)
          SCALAR))))
      (CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
        (RESULT-BASE (%GET-FLOAT-ARRAY-BASE RESULT)
          (\ADDBASE RESULT-BASE 2))
        (SCALAR (FLOAT ARRAY-1))
        (ARRAY-2-BASE (%GET-FLOAT-ARRAY-BASE ARRAY-2)
          (\ADDBASE ARRAY-2-BASE 2))
        (INDEX 0 (CL:1+ INDEX)))
        (EQ INDEX SIZE))
        (DECLARE (TYPE FLOATP SCALAR))
        (\PUTBASEFLOATP RESULT-BASE 0 (FQUOTIENT SCALAR (\GETBASEFLOATP ARRAY-2-BASE 0))))))
  RESULT)

```

```

(CL:DEFUN %%MAP-FLOAT-ARRAY-TIMES (RESULT ARRAY-1 ARRAY-2)
  (CL:IF (NOT (CL:ARRAYP ARRAY-1))
    (CL:ROTATEF ARRAY-1 ARRAY-2)) ; Multiplication is commutative
  (CL:IF (CL:ARRAYP ARRAY-2)
    (%BLKFTIMES (%GET-FLOAT-ARRAY-BASE ARRAY-1)
      (%GET-FLOAT-ARRAY-BASE ARRAY-2)
      (%GET-FLOAT-ARRAY-BASE RESULT)
      (CL:ARRAY-TOTAL-SIZE RESULT))
    (CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
      (RESULT-BASE (%GET-FLOAT-ARRAY-BASE RESULT)
        (\ADDBASE RESULT-BASE 2))
      (ARRAY-1-BASE (%GET-FLOAT-ARRAY-BASE ARRAY-1)
        (\ADDBASE ARRAY-1-BASE 2))
      (SCALAR (FLOAT ARRAY-2))
      (INDEX 0 (CL:1+ INDEX)))
      (EQ INDEX SIZE))
      (DECLARE (TYPE FLOATP SCALAR))
      (\PUTBASEFLOATP RESULT-BASE 0 (FTIMES (\GETBASEFLOATP ARRAY-1-BASE 0)
        SCALAR))))
  RESULT)

```

```

(CL:DEFUN %%MAP-FLOAT-ARRAY-TRUNCATE (RESULT ARRAY)
  (CL:DO ((SIZE (CL:ARRAY-TOTAL-SIZE RESULT))
    (ARRAY-BASE (%GET-FLOAT-ARRAY-BASE ARRAY)
      (\ADDBASE ARRAY-BASE 2))

```

```

      (INDEX 0 (CL:1+ INDEX)))
      (EQ INDEX SIZE)
      RESULT)
  (CL:SETF (CL:AREF RESULT INDEX)
    (UFIX (\GETBASEFLOATP ARRAY-BASE 0))))

```

```

(CL:DEFUN %%REDUCE-FLOAT-ARRAY-MAX (ARRAY INITIAL-VALUE)
  (LET [(RESULT (CL:AREF ARRAY (%%BLKFMAX (%%GET-FLOAT-ARRAY-BASE ARRAY)
    0
    (CL:ARRAY-TOTAL-SIZE ARRAY)
    (CL:IF INITIAL-VALUE
      (MAX INITIAL-VALUE RESULT)
      RESULT)))]

```

```

(CL:DEFUN %%REDUCE-FLOAT-ARRAY-MAX-ABS (ARRAY INITIAL-VALUE)
  (LET [(RESULT (CL:AREF ARRAY (%%BLKFABSMAX (%%GET-FLOAT-ARRAY-BASE ARRAY)
    0
    (CL:ARRAY-TOTAL-SIZE ARRAY)
    (CL:IF INITIAL-VALUE
      (MAX-ABS INITIAL-VALUE RESULT)
      RESULT)))]

```

```

(CL:DEFUN %%REDUCE-FLOAT-ARRAY-MIN (ARRAY INITIAL-VALUE)
  (LET [(RESULT (CL:AREF ARRAY (%%BLKFMIN (%%GET-FLOAT-ARRAY-BASE ARRAY)
    0
    (CL:ARRAY-TOTAL-SIZE ARRAY)
    (CL:IF INITIAL-VALUE
      (MIN INITIAL-VALUE RESULT)
      RESULT)))]

```

```

(CL:DEFUN %%REDUCE-FLOAT-ARRAY-MIN-ABS (ARRAY INITIAL-VALUE)
  (LET [(RESULT (CL:AREF ARRAY (%%BLKFABSMIN (%%GET-FLOAT-ARRAY-BASE ARRAY)
    0
    (CL:ARRAY-TOTAL-SIZE ARRAY)
    (CL:IF INITIAL-VALUE
      (MIN-ABS INITIAL-VALUE RESULT)
      RESULT)))]

```

```

(CL:DEFUN %%REDUCE-FLOAT-ARRAY-PLUS (ARRAY INITIAL-VALUE)
  (LET [(RESULT (%%POLY-EVAL 1.0 (%%GET-FLOAT-ARRAY-BASE ARRAY)
    (CL:1- (CL:ARRAY-TOTAL-SIZE ARRAY)
    (CL:IF INITIAL-VALUE
      (+ INITIAL-VALUE RESULT)
      RESULT)))]

```

```

(CL:DEFUN %%REDUCE-FLOAT-ARRAY-TIMES (ARRAY INITIAL-VALUE)
  (LET ((TOTAL 1.0)
    (DECLARE (TYPE FLOAT TOTAL))
    (CL:DO ((I 0 (CL:1+ I))
      (BASE (%%GET-FLOAT-ARRAY-BASE ARRAY)
        (\ADDBASE BASE 2))
      (SIZE (CL:ARRAY-TOTAL-SIZE ARRAY)))
      ((EQ I SIZE)
        TOTAL)
      (SETQ TOTAL (CL:* TOTAL (\GETBASEFLOATP BASE 0))))
    (CL:IF INITIAL-VALUE
      (CL:* INITIAL-VALUE TOTAL)
      TOTAL)))

```

:: For convenience

```
(PUTPROPS CMLFLOATARRAY FILETYPE CL:COMPILE-FILE)
```

```
(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY
```

```
(DECLARE%: DOEVAL@COMPILE DONTCOPY
```

```
(LOCALVARS . T)
)
)
```

```
(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILERVARS
```

```
(ADDTOVAR NLAMA )
```

```
(ADDTOVAR NLAML )
```

```
(ADDTOVAR LAMA MAP-ARRAY)
)
```

```
(PUTPROPS CMLFLOATARRAY COPYRIGHT ("Venue & Xerox Corporation" 1985 1986 1987 1990))
```

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