

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%: DONTVAL@LOAD DOEVAL@COMPILE DONTCOPY (LOCALVARS . T))  
  (DECLARE%: DONTVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILEVARS (ADDDVARS (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))] ; Coerce MAPFN to standard form
  (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)))
    (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))
    ])) ; Coerce MAPFN to standard form
  (SETQ MAPFN (CL:TYPECASE MAPFN
    (CL:SYMBOL (CASE MAPFN

```

```

        (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

```

```

    (CL:FUNCALL REDUCTION-FN)))
  (1 (CL:IF INITIAL-VALUE-P
    (CL:FUNCALL 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:FUNCALL REDUCTION-FN ACCUMULATOR (CL:AREF FLATTENED-ARRAY
        INDEX)))))))))

(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)))))))

(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)
    (%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)
      (UFX (\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)
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(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILELVARS

(ADDTOVAR NLAMA )

(ADDTOVAR NLAML )

(ADDTOVAR LAMA MAP-ARRAY)
)

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

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