Satur Thursday

Some languages place draconian limits on the sizes of sets to make things like intersection, union, membership, etc. can be implemented.

You learned about a lot of possible implementations in 172. It makes them all constant: you can create new strings, but not modify old ones.

Garbage. It's easier to provide these things for strings than for arrays in general. Basically arrays of characters. Strings.

Elements down (array) or delete (which removes an element and moves all underlying parts) are not available for arrays in general.

May also support operations like :

- Arithmetic subtractions:
  - We could compute all that at run time, but we can make do with fewer operations:

  \[
  S_1 = D_2 \times S_2 \\
  D_3 = U_3 \\
  D_2 = U_2 \\
  D_1 = U_1
  \]

- Subtractions:
  - Given A \[L_1..U_1\] of array \[L_2..U_2\]

    \[
    A[a..b] = A[a..b] - C
    \]

    \[
    \]

- Matrix subtractions:
  - Suppose A is a messy local variable.
  - Only on the type of A.

  \[
  \]

Note that deallocating a fully dynamic array on procedure exit requires extra space for the pointers.

The third category can still be put in a procedure's activation record; this divides the frame into fixed and variable parts.

The first two categories are just familiar global and local variables.

Dope vector and a pointer go at a fixed offset from the FP; this avoids multiplication and allows rows to be put anywhere.

The address of a dope vector is a performance issue: the lower bound can be factored out at compile time.

The address of an array on any machine is a performance issue: the lower bound is still there and must be factored out at compile time.

Some languages assume that all array indexing starts at zero.

The address of an array on any machine is a performance issue: the lower bound is still there and must be factored out at compile time.

Let \( g = \text{sp} + \text{offset} \).

- Global lifetime, static shape

  \( g = \text{fp} - (L_1 \times S_1) + (L_2 \times S_2) + (L_3 \times S_3) + \text{constant that depends } \)

  \( \text{on the size of the frame} \).

- Local lifetime, shape bound at elaboration

  \( g = \text{fp} + \text{offset} \).

- Lifetime

  \( g = \text{fp} - (L_1 \times S_1) + (L_2 \times S_2) + (L_3 \times S_3) + \text{constant that depends } \)

  \( \text{on the size of the frame} \).

- Dynamic shape you need dope vectors.

  \( g = \text{fp} - (L_1 \times S_1) + (L_2 \times S_2) + (L_3 \times S_3) + \text{constant that depends } \)

  \( \text{on the size of the frame} \).

- Arbitrary lifetime, dynamic shape.

  \( g = \text{fp} - (L_1 \times S_1) + (L_2 \times S_2) + (L_3 \times S_3) + \text{constant that depends } \)

  \( \text{on the size of the frame} \).

- Arbitrary lifetime, shape bound at elaboration

  \( g = \text{fp} - (L_1 \times S_1) + (L_2 \times S_2) + (L_3 \times S_3) + \text{constant that depends } \)

  \( \text{on the size of the frame} \).

Languages

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