Technology for Speed

- Clever data structures and algorithms:
  - Abstract Data Types

CS 2 "Data Structures" Subject:
  - Using arrays.

They and students must know inners first

C++ professionals use Standard Template Library

Directly useful in application programs
  - Intro. to container classes

Chap. 3 of DSO:

CSI 310: Lecture 3
SION and special cases.

other calculations AVOID DIVI-

With homogeneous coords, many
$m/y = y$ and $m/x = x$ and com-

the coordinates. To be plot-

used as homogeneous or pro-

Triple of hoists $(x',y',z')$

ALTERNATIVE:

Pair of double hoist nums.

double(pos)/double(max)

DIVIDE

Algorithm: To calculate how,

pos and max

Pair of integer variables.

IMPLEMENTATION DATA STRUCTURE

Abstract data type

emiah
structure/algorithm implementation examples.
abstract data types and for clever, efficient data
helpful. CS1310 will concentrate on container classes both as
throttle and point are examples of concrete classes, very
in ch. 3, (4)
store the current position. (also
plus variable current-index
SAME as for base;
Partially filled array

(5)
The invariant p. 103-4)
Study ch. 3 details; especially
used=first empty position.
Array of items; plus variable
Partially filled array

Implementation Data Structure

Abstract Data Type
... 0 1 2 3

How many times does $x$ appear in $M$?

Given an item $x$,

**Multiset $M$** (another name for "bag")

Yes

No

Has a well-defined answer:

"Is $x$ in $S$?"

Given an item $x$,

Set $S$ What is a bag? Mathematicians say "finite multiset"
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Item number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grilled cheese sandwich</td>
<td>99</td>
</tr>
<tr>
<td>3</td>
<td>Pot of hot &amp; sour soup</td>
<td>27</td>
</tr>
<tr>
<td>8</td>
<td>Egg roll</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>Szechuan chicken</td>
<td>72</td>
</tr>
</tbody>
</table>

Example: What a Chinese Restaurant Water serves:
Implementation (They often vary in efficiency.)
The same abstract data type can have very different alternative implementations for various variants.

An alternative implementation for the Linked-list (to be taught) is

Partially filled array,

Of bag

The keyed-bag

{ ... }

\['keyed-bag\]

\{' ... \'}

\['keyed-bag\]

Partially filled array,

Each array element used.

With the receipt stored in with

Partially filled array,

Bag-with-receipts

Implementation Data Structure

Abstract Data Type

More abstract data type/implementation combinations.