CS 442/542

- Compiling Arrays
int num1;
int num2;
int i;
int num3[11];
num1 = 10 + 2;
num2 = 20 * 3 + num1;
i = 7;
um3[i] = 500;
num1 = num2 + num3[i] * 10;
print num1;
print num2;
print num3[i];
Compiling Arrays

• Keep an attribute in the symbol table that indicates the size of the array.
• Use this information to generate a directive to allocate space for the array.
• This works for global arrays

num3: .space 44
Compiling Arrays

Example Assembler Code for Array Assignment

Example Assignment statement: num3[i] = 500;

```
li  $t2, 500
lw  $t1, i
la  $t3, num3
sll $t1, $t1, 2
add $t3, $t3, $t1
sw  $t2, ($t3)
```
Compiling Arrays

Example Assembler Code using an array element in an expression

Example statement: num1 = num2+num3[i] * 10;

```
lw       $t4, num2
lw       $t5, i
la       $t6, num3
sll      $t5, $t5, 2
add $t6, $t6, $t5
lw       $t6, ($t6)
li       $t7, 10
mul $t8, $t6, $t7
add $t6, $t4, $t8
sw       $t6, num1
```
i = 0;
while (i < 10) {
    j = 0;
    while (j < 10-i) {
        if (num3[j] > num3[j+1]) {
            temp = num3[j];
            num3[j] = num3[j+1];
            num3[j+1] = temp;
        }
        j = j+1;
    }
    i = i+1;
}
Compiling Arrays: Bubble Sort

L3:
li $t0, 0
sw $t0, i

L9:
lw $t0, i
li $t1, 10
bge $t0, $t1, L5
li $t0, 0
sw $t0, j

L8:
lw $t0, j
li $t1, 10
lw $t2, i
sub $t3, $t1, $t2
bge $t0, $t3, L6
Compiling Arrays: Bubble Sort

lw        $t0,  j
la        $t1,  num3
sll       $t0,  $t0,  2
add       $t1,  $t1,  $t0
lw        $t1,  ($t1)
lw        $t0,  j
li        $t2,  1
add       $t3,  $t0,  $t2
la        $t0,  num3
sll       $t3,  $t3,  2
add       $t0,  $t0,  $t3
lw        $t0,  ($t0)
ble        $t1,  $t0,  L7
Compiling Arrays: Bubble Sort

lw  $t0, j
la  $t1, num3
sll $t0, $t0, 2
add $t1, $t1, $t0
lw  $t1, ($t1)
sw  $t1, temp
lw  $t0, j
lw  $t1, j
li  $t2, 1
add $t3, $t1, $t2
la  $t1, num3
sll $t3, $t3, 2
add $t1, $t1, $t3
lw  $t1, ($t1)
la  $t2, num3
sll $t0, $t0, 2
add $t2, $t2, $t0
sw  $t1, ($t2)
Compiling Arrays: Bubble Sort

lw $t0, j
li $t1, 1
add $t2, $t0, $t1
lw $t0, temp
la $t1, num3
sll $t2, $t2, 2
add $t1, $t1, $t2
sw $t0, ($t1)

L7:
  lw $t0, j
  li $t1, 1
  add $t2, $t0, $t1
  sw $t2, j
  b L8

L6:
  lw $t0, i
  li $t1, 1
  add $t2, $t0, $t1
  sw $t2, i
  b L9

L5: