Remote Opportunities: A Rethinking and Retooling

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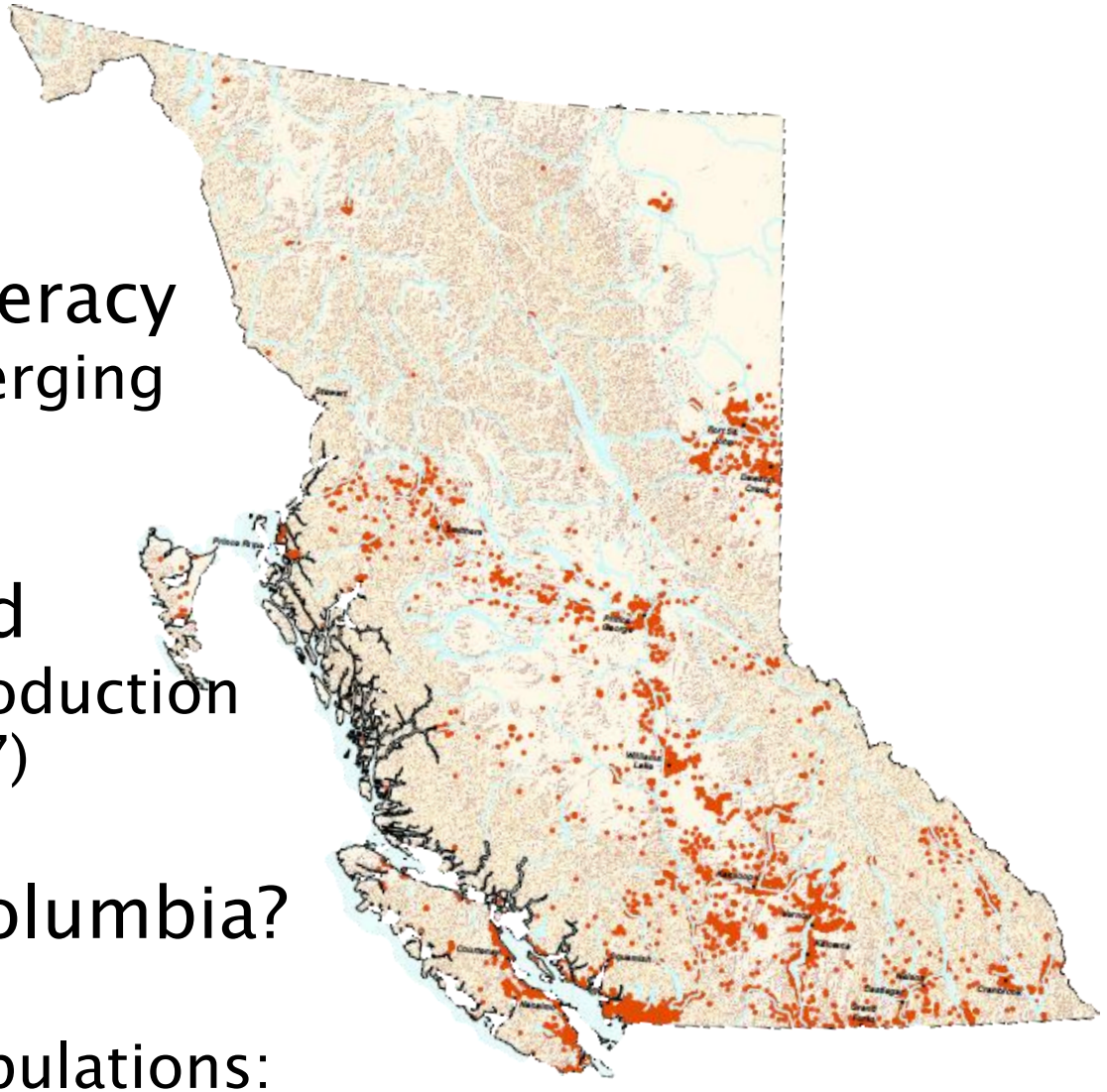
C5 2008

Motivation

- Global Digital Literacy
  - Attention on emerging regions
- Meeting the Need
  - OLPC in mass production (November 2007)
- Even in British Columbia?
  - YES!
  - First Nations' Populations: www.bced.gov.bc.ca/abed/map.htm



Challenges

- Rethinking
  - In context of Computer Science
  - Support natural curiosity and constructivism

- Retooling
  - Tools for remote regions
    - Limited instructional resources
    - Increased interest in collaborative endeavours

Roadmap

- Topics of Focus

- Constructivism
  - Tool Requirements
  - Proposed Solution
- Cognition
  - Visual Representations
- Collaboration
  - Virtual Labs

- Future Work

Topics of Focus

- Constructivism
  - Curiosity drives the questions drives the inquiry
  - The students of today learn in a dynamic, abstracted environment
- Cognition
  - Visual representations are powerful
- Connecting and Collaborating
  - Knowledge is inherently constructed, not imparted
  - Success of Jazz and GoogleDocs

Visual Representations Are Powerful

Roadmap

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Tool Requirements

1. Strong collaboration support.
2. Explore the abstractions of high level languages.
3. Explore the hardware level.
4. Demonstrate the true complexity of topics such as concurrency.
5. Use the resolution of modern displays for awareness information.

A Proposed Solution

Glass Onion

- Visually translates code between languages
- Visually simulates the actions of code at the hardware level
- A tool that connects remote students for joint experimentation and learning.

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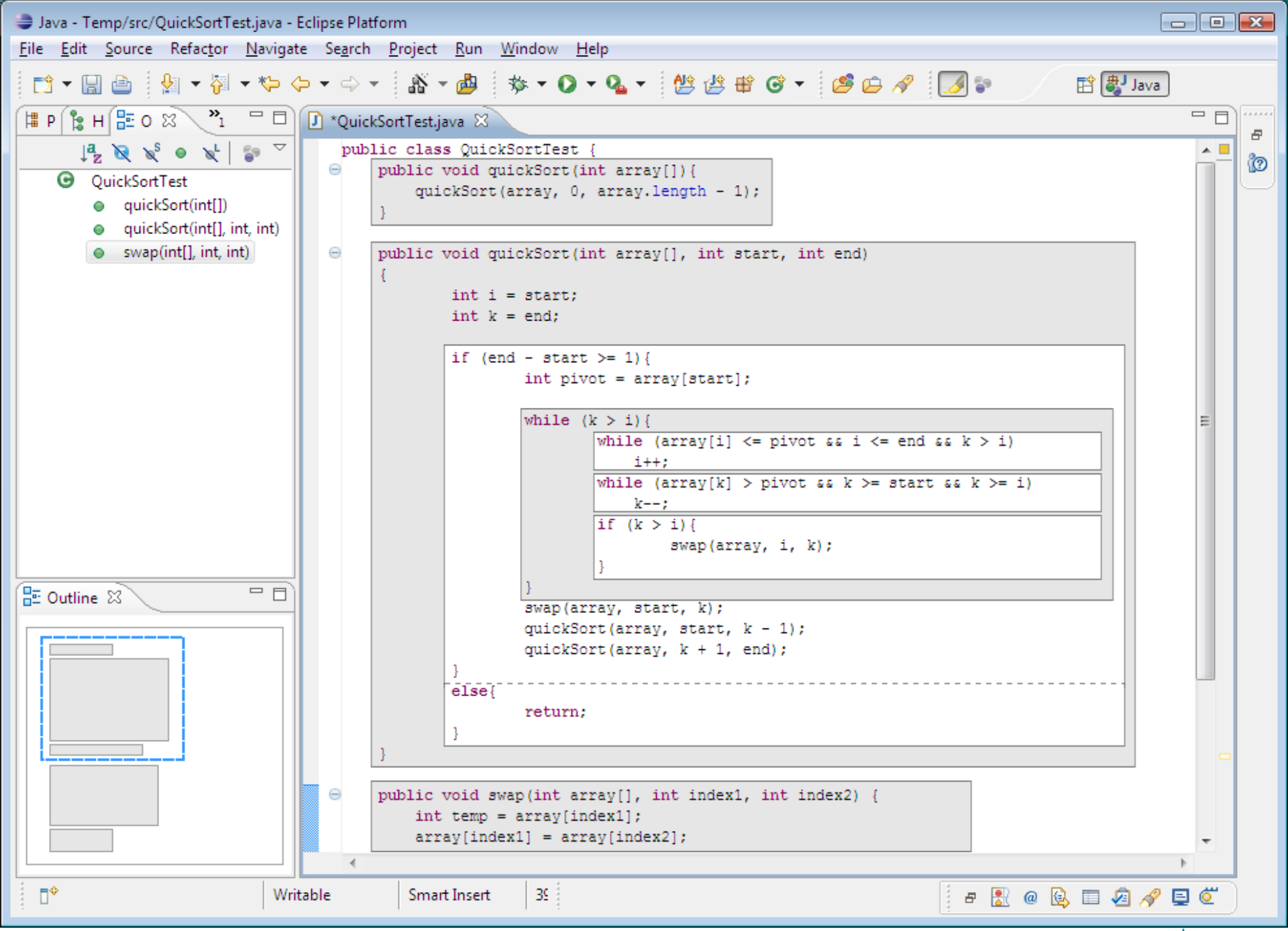
Cognition

- Understanding translations between languages
- The benefits of “view source”
- Understanding objects
- Understanding syntax structures


Java - Temp/src/QuickSortTest.java - Eclipse Platform
File Edit Source Refactor Navigate Search Project Run Window Help
Java
QuickSortTest
quickSort(int[])
quickSort(int[], int, int)
swap(int[], int, int)
Outline
*QuickSortTest.java
public class QuickSortTest {
public void quickSort(int array[]){
quickSort(array, 0, array.length - 1);
}
public void quickSort(int array[], int start, int end)
{
int i = start;
int k = end;
if (end - start >= 1){
int pivot = array[start];
while (k > i){
while (array[i] <= pivot && i <= end && k > i)
i++;
while (array[k] > pivot && k >= start && k >= i)
k--;
if (k > i){
swap(array, i, k);
}
}
swap(array, start, k);
quickSort(array, start, k - 1);
quickSort(array, k + 1, end);
}
else{
return;
}
}
public void swap(int array[], int index1, int index2) {
int temp = array[index1];
array[index1] = array[index2];
Writable
Smart Insert

Cognition

- Correspondence of blocks of code must be clearly displayed.

```
void foo( )
{
        int counter;
        int limit = 10;
        int sum = 0;
        for (counter = 0; counter < limit;
             counter++)
        {
                sum += counter;
        }
}
```

```
foo:
        pushl   %ebp
        movl    %esp, %ebp
        subl    $12, %esp
        movl    $10, -8(%ebp)
        movl    $0, -12(%ebp)
        movl    $0, -4(%ebp)
.L2:
        movl    -4(%ebp), %eax
        cmpl    -8(%ebp), %eax
        jge     .L1
        movl    -4(%ebp), %eax
        leal    -12(%ebp), %edx
        addl    %eax, (%edx)
        leal    -4(%ebp), %eax
        incl    (%eax)
        jmp     .L2
.L1:
        leave
        ret
```

Roadmap

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- Constructivism
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  - Proposed Solution
- Cognition
  - In the small
  - In the large
- Collaboration
  - Virtual Labs

- Future Work

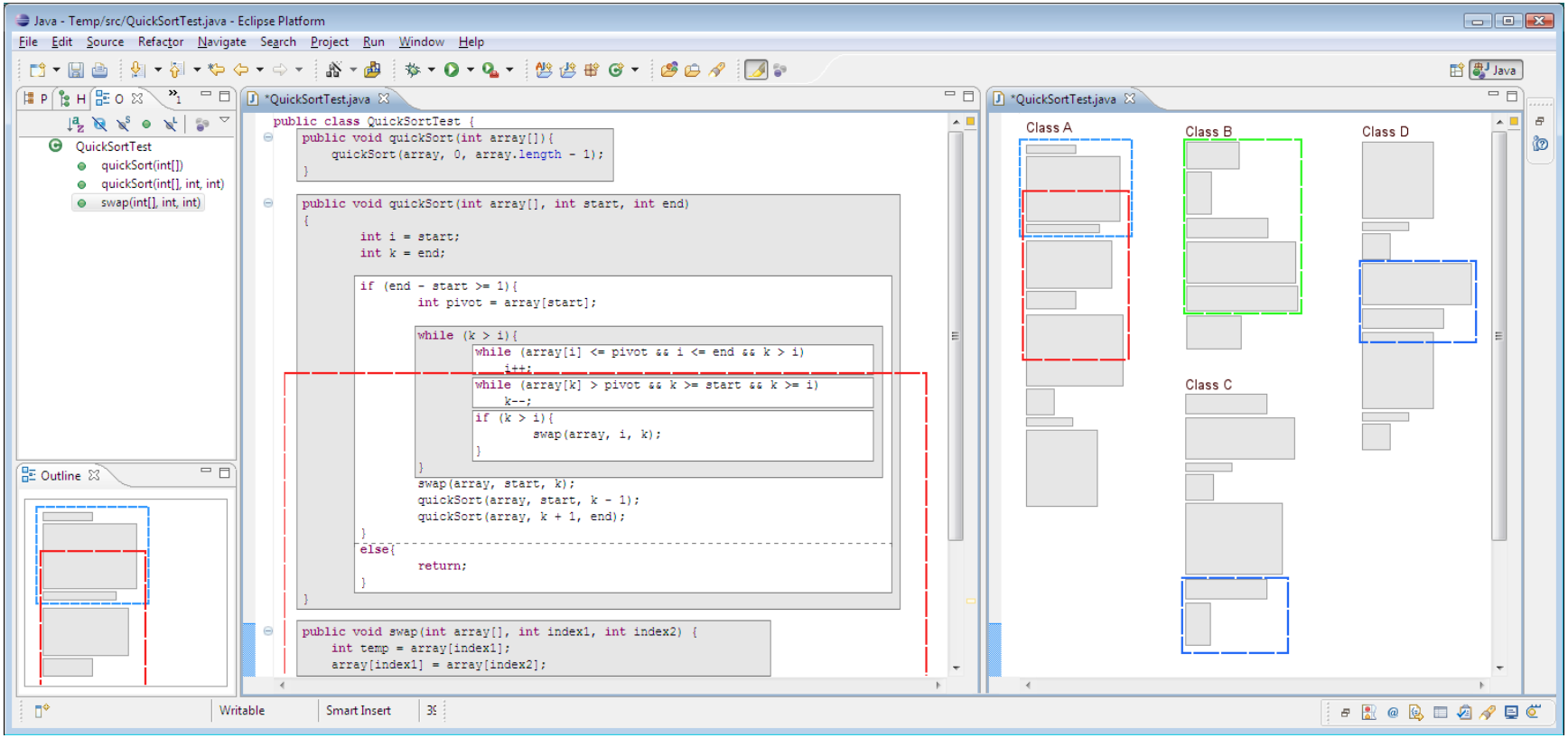
Collaboration

- Absolutely essential for constructivist learning.
- Build on ideas from projects such as Squeak's Nebraska.
- Increasing the number of participants
  - Include distant students.

Collaboration: Virtual Lab

- Simulate the collaborative learning of a computer lab setting.
  - VOIP discussions
  - Team awareness
  - Code highlighting and pointing.

Collaboration: Virtual Lab



Future Work

- Development of Glass Onion
  - Initial prototype development is underway.

- Experiments with the foundation of BRICS
  - Mock-ups and eye tracking experiments to start.
  - Prototype development to follow.

Conclusion

- New software tools are needed to take advantage of the current available technology.
- Promoting rich visualization combined with deep knowledge is critical.
- A great deal of collaboration could happen within the C5 community.

- All constructive feedback is appreciated!

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