
Lecture 19

CPSC 110

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Lecture 19

Clicker questions

- **Functions operating on arbitrary sized data** consume arbitrary sized data, have a 2 case cond, and have a natural recursive call
- **A backtrack search** has several defining properties:
 - Produce **false** if the key was not found (base case)
 - (**if** (**not** (**false** in else
 - If found the entry, return that entry (for now, we have to traverse down the tree again to retrieve its value)
 - Calls itself

Two One-Of

- Cross product tables tell us the **minimum** number of **check-expects** to write
- Cross product causes us to create a new template
 - **template** tag is just (**@template** 2-one-of)
- **cond** template questions are based on the cross product axes
- **On problem sets**, you must show your cross product table in a comment box
- When designing cross tables, ask
 - What data do I have access to?
 - What data do I need?
 - What data do I need to produce?

Problem 1

lon1 (right) lon2 (down)	empty	(cons Number ListOfNumber)
empty	true	false
(cons Number ListOfString)	true	either true or false

- First case: Combine the first column for **true**
- Second case: Top right **false** case
- Third case: Bottom right, either **true** or **false**

Template

```

1 (@template 2-one-of)
2 (define (contains? lon1 lon2)
3   (cond [(empty? lon1) (...)]
4         [(empty? lon2) (...)]
5         [else
6          (... (first lon1)
7              (rest lon1)
8              (contains? (first lon2)
9                        (rest lon2))))]))

```

Creating the `cond`

- For the third case, we have access to the first and rest of `lon1` and `lon2`
- Don't forget to wrap references in their appropriate functions and to create a natural recursive call, if applicable
- If the first in `lon1` equals the first in `lon2`, then call the natural recursion on the rest of each list
- Otherwise, if the first of `lon2` does not match, keep the first in `lon1` and compare it to the rest of `lon2`
 - We must find a match in `lon2` before discarding `(first lon1)`!

Problem 2

bt (right) p (down) false (make-node Natural String BinaryTree BinaryTree)

empty false true

(cons "L"Path) false either false or true

(cons "R"Path) false either false or true

- First case: all **false** cells
- Second case: the one **true** cell
- Third case: recursion on left node
 - Information: first p, rest p, key val, l, r, result of recursion on l, result of recursion on r
 - Information we care about: first p, rest p, l, result of recursion on l
- Fourth case: recursion on right node