CS10
The Beauty and Joy of Computing

Lecture #25: Tree Recursion

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MS KINECT = BODY I/O

The newly released (and much-hyped) Microsoft Kinect system for the XBOX 360 used controller-free body motions to control games, music, and movies.

xbox.com/kinect/
Review: What’s in a Strong Solution

- For every position
  - (for player whose turn it is)
    - Winning ($\exists$ losing child)
    - Losing (All children winning)
    - Tieing ($\not\exists$ losing child, but $\exists$ tieing child)
    - Drawing (can’t force a win or be forced to lose)
  - Remoteness
    - How long before game ends?
Review: Example: 1, 2, ..., 10

- Rules (on your turn):
  - Running total = 0

- Rules (on your turn):
  - Add 1 or 2 to running total

- Goal
  - Be the FIRST to get to 10

- Example
  - Ana: “2 to make it 2”
  - Bob: “1 to make it 3”
  - Ana: “2 to make it 5”
  - Bob: “2 to make it 7” \(\rightarrow\) photo
  - Ana: “1 to make it 8”
  - Bob: “2 to make it 10” I WIN!

7 ducks (out of 10)
Let’s write code to determine value!

- 0 = Win
- 1 = Lose
- 2 = Win
- 3 = Win
- 4 = Lose
- 5 = Win
- 6 = Win
- 7 = Lose
- 8 = Win
- 9 = Win
- 10 = Lose

- P = Position
- M = Move

- We only need 3 blocks to define a game
  - Do Move M on Position P
    - a new Position
  - Generate Moves from Position P
    - list of Moves
  - Primitive Value of Position P
    - {win, lose, tie, undecided}
Answer

```
if not Primitive Value P = CONSTANT Undecided

  report Primitive Value P

else

  script variables children child values

  set children to # map Do Move on Position P over
  Generate Moves from Position P

  set child values to # map Value over children

  if child values contains CONSTANT Lose

    report CONSTANT Lose

  else

    CONSTANT Win

  else

    if child values contains CONSTANT Tie

      report CONSTANT Tie

    else

      CONSTANT Tie

    else

      report CONSTANT Lose
```

Garcia, Fall 2010