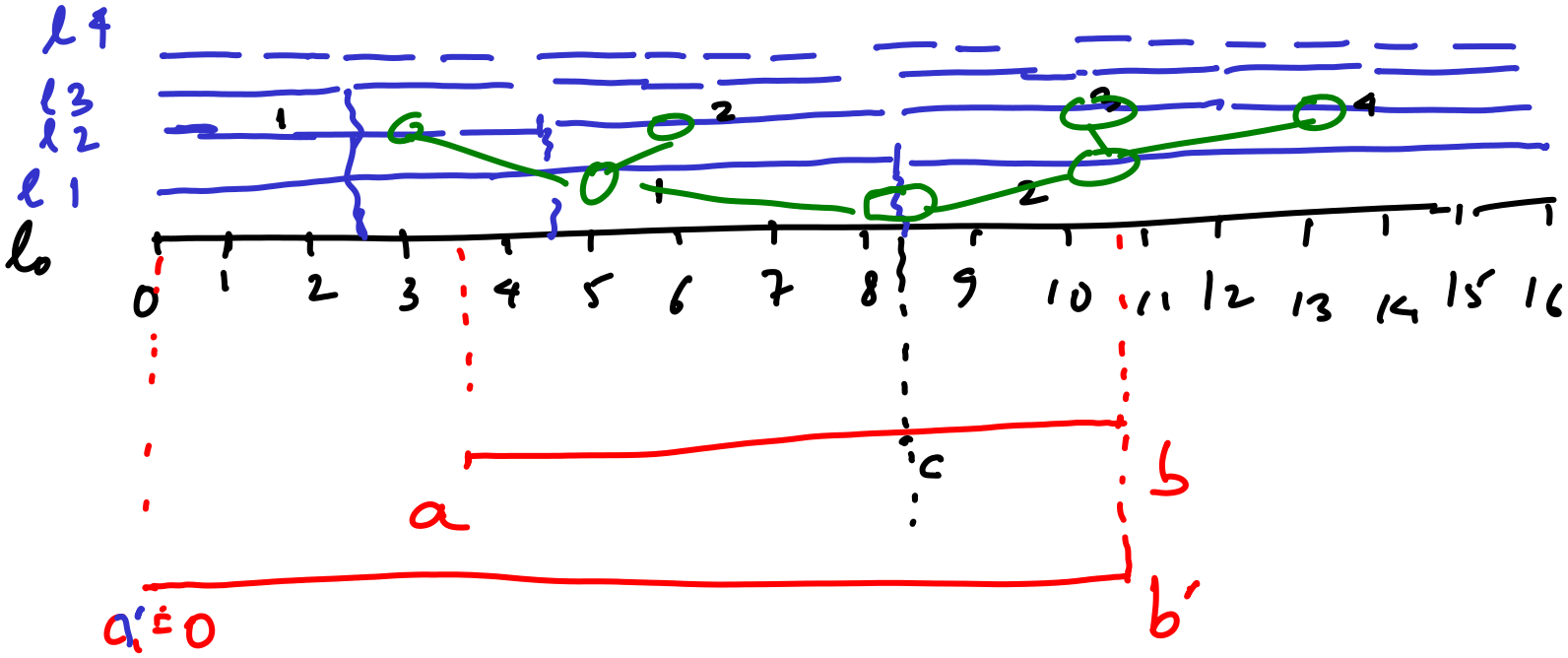
CSL 630 Lecture 23, Oct 30



If "subtraction" is permitted then

$[a,b] : \quad [0,b] - [0,a]$

Various ways of partitioning $[0,b]$ as disjoint union of the blue intervals

Goal : to use as few disjoint intervals

$[0,b'] = \quad l_1' \cup l_3^5$

Obs : We require at most one interval from each level (otherwise we use the larger interval from prev. level)

In general for n points ($n = 2^k$), we need at most $k = O(\log n)$ "canonical" (blue) intervals suffice to express any arbitrary interval $[0, b]$

How many blue intervals $= 2 + 2^2 + \cdots n$

$\leq 2n$

For a general interval $[a, b]$, we can find the "split" point (pivot) - that splits it into two "semi-intervals" and we can use the previous approach

$\Rightarrow$ $2 \log n$ canonical intervals suffice for an arbitrary interval.

The binary tree structure storing the intervals is called a "range tree"