Quad Tree

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Rectangle

use diagonal vertex coordinate to represent a `Rect`
Why We Need Quad Tree?

The following shape is a combination of Rect, but we can’t just represent with vertex coordinate.
How Quad Tree Thinks

• select a center
• Divide the whole space into 4 sub-space
• recursively repeating, until the rects formed by each center cover whole shape
ADT of Quad Tree

QuadTree := Empty \hspace{1cm} ;; empty area \hspace{1cm} ①
| Covered \hspace{1cm} ;; covered area \hspace{1cm} ②
| Quad (x y) QuadTree QuadTree QuadTree QuadTree \hspace{1cm} ;; quad tree has 4 children, \hspace{1cm} ③
| ;; (x y) is center

\begin{itemize}
  \item \hspace{1cm} ①
  \item \hspace{1cm} ②
  \item \hspace{1cm} ③
\end{itemize}
Quad Tree Diagram
Add Element Into Quad Tree

empty tree

add (rect 0 0 1 1)
Add Element Into Quad Tree

(rect 0 0 1 1)

add (rect -1 0 1 2)
Function needed in code:

• rect : normalize a rectangle
• rect-area : calculate the area of a rectangle
• quad-tree? : predicate for quad tree
• quad-add : add a rect into a quad tree
• build-quad : build a quad tree from a list of rect
• quad-area : calculate all covered area in a quad tree
Thanks