Partition and Cover FieldTrees

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Loose Quadtree (Octree)/Cover Fieldtree

- Overcomes drawback of MX-CIF quadtree that the width $w$ of the minimum enclosing quadtree block of a rectangle $o$ is not a function of the size of $o$.
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- Instead, it depends on the position of the centroid of $o$ and often considerably larger than $o$
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- Solution: expand size of space spanned by each quadtree block of width $w$ by expansion factor $p$ ($p > 0$) so expanded block is of width $(1 + p)w$.

Diagram showing the quadtree structure and fieldtree representation.
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2. $p = 1.0$
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  1. $p = 0.3$
  2. $p = 1.0$
- Maximum $w$ (i.e., minimum depth of minimum enclosing quadtree block) is a function of $p$ and radius $r$ of $o$ and independent of position of centroid of $o$
  1. Range of possible ratios $w/2r$ : $1/(1 + p) \cdot w/2r < 2/p$
  2. For $p \geq 1$, restricting $w$ and $r$ to powers of 2, $w/2r$ takes on at most 2 values and usually just 1
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- Subdivision rule guarantees that width of minimum enclosing quadtree block for rectangle $o$ is bounded by 8 times the maximum extent $r$ of $o$
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- Summary: cover fieldtree expands the width of the quadtree blocks while the partition fieldtree shifts the positions of their centroids