Subdivide an image initially into a set of arbitrary, disjoint regions and then merge and/or split regions.

**Quadtrees**

**Given:** Image $R$, predicate $Q$

**Approach:** Subdivide $R$ successively into smaller and smaller quadrant regions such that for any region $R_i$, $Q(R_i) = \text{TRUE}$.

Start with entire region.

1. If $Q(R) = \text{FALSE}$ divide into quadrants
2. Recurse on the quadrants.

Has convenient representation: quadtree

Each node has 4 descendants.

**Figure 10.52**

Observation: can result in adjacent regions with identical properties.

→ Allow merging

Merg adjacent regions $R_j$ and $R_k$ if $Q(R_j \cup R_k) = \text{TRUE}$.

**Algorithm:**

1. Split into 4 disjoint regions any region $R_i$ for which $Q(R_i) = \text{FALSE}$
2. When no further splitting is possible, merge any adjacent regions $R_i$ and $R_k$ for which $Q(R_i \cup R_k) = \text{TRUE}$.
3. Stop when no further merging is possible.

**Fig. 10.53**

Predicate $Q = \begin{cases} \text{TRUE} & \text{if overlap AND operators} \\ \text{FALSE} & \text{otherwise} \end{cases}$