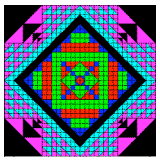
Divide, Conquer, and Glue in PictureWorld

Tuesday, September 25, 2007

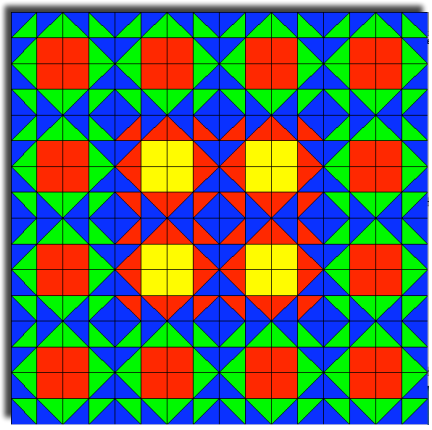


CS111 Computer Programming

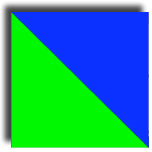
Department of Computer Science
Wellesley College

A Quilt Problem

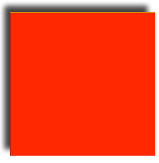
How do we build this complex quilt …



… from simple primitive parts?



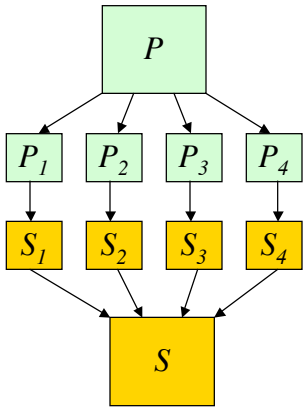
triangles(Color.green, Color.blue)



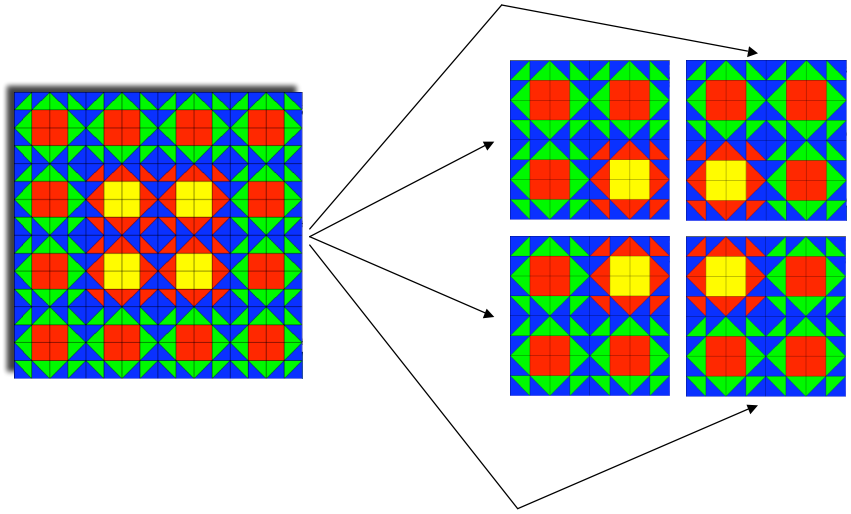
patch(Color.red)

Recall big idea #3: Divide, conquer & glue

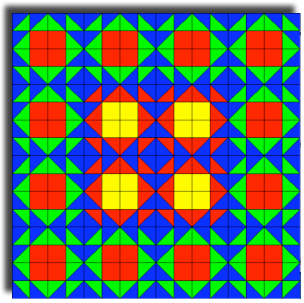
Divide
problem P into subproblems.
Conquer
each of the subproblems, &
Glue (combine)
the solutions to the subproblems into a solution S for P.

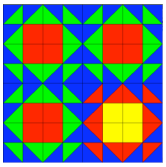


Divide the Quilt in Subproblems

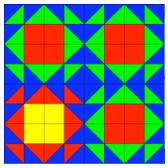


Conquer the Subproblems via "Wishful Thinking"

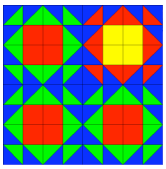




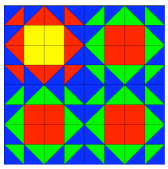
clockwise270(quadrant())



quadrant()

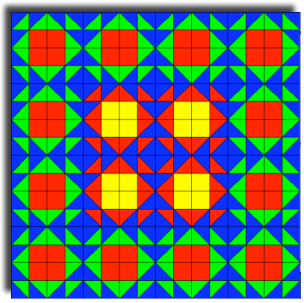


clockwise180(quadrant())



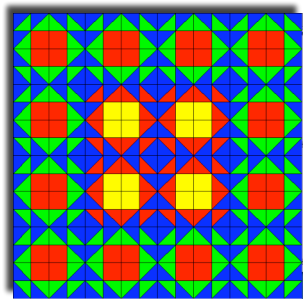
clockwise90(quadrant())

Glue the Solutions to Solve the Problem



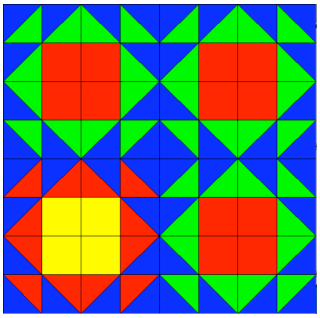
```
public Picture quilt () {
  return fourPics(clockwise270(quadrant()),
                  quadrant(),
                  clockwise180(quadrant()),
                  clockwise90(quadrant())
                  );
}
```

Abstracting Over the Glue



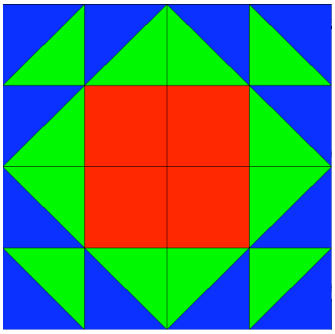
```
public Picture quilt() {
  return rotations (quadrant());
}

public Picture rotations (Picture p) {
  return fourPics(clockwise270(p), p,
                  clockwise180(p), clockwise90(p));
}
```


Now Flesh out quadrant()



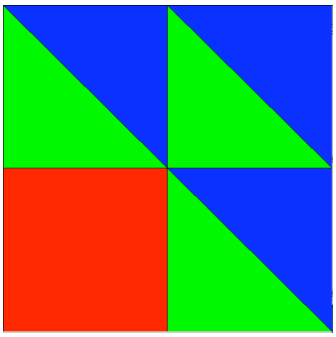
quadrant()

Continue the Descent …



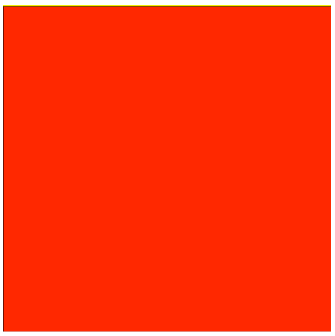
star(Color.red, Color.green, Color.blue)

And Descend Some More …

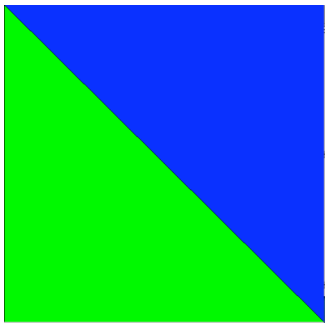


starQuadrant(Color.red, Color.green, Color.blue)

Until we Reach Primitives



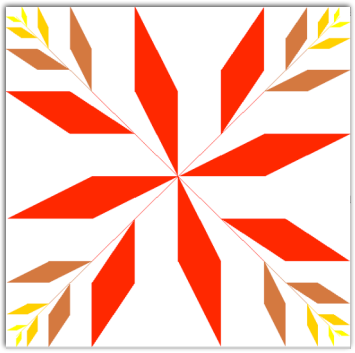
patch(Color.red)



triangles(Color.green, Color.blue)

A New Problem

How do we build this picture …



autumnLeaves()

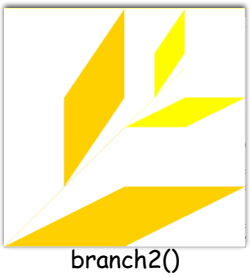
… from this primitive?

twoLeaves(Color.orange)

Branching Out

branch4()

branch3()



branch2()

So a panda walks into a bar . . .