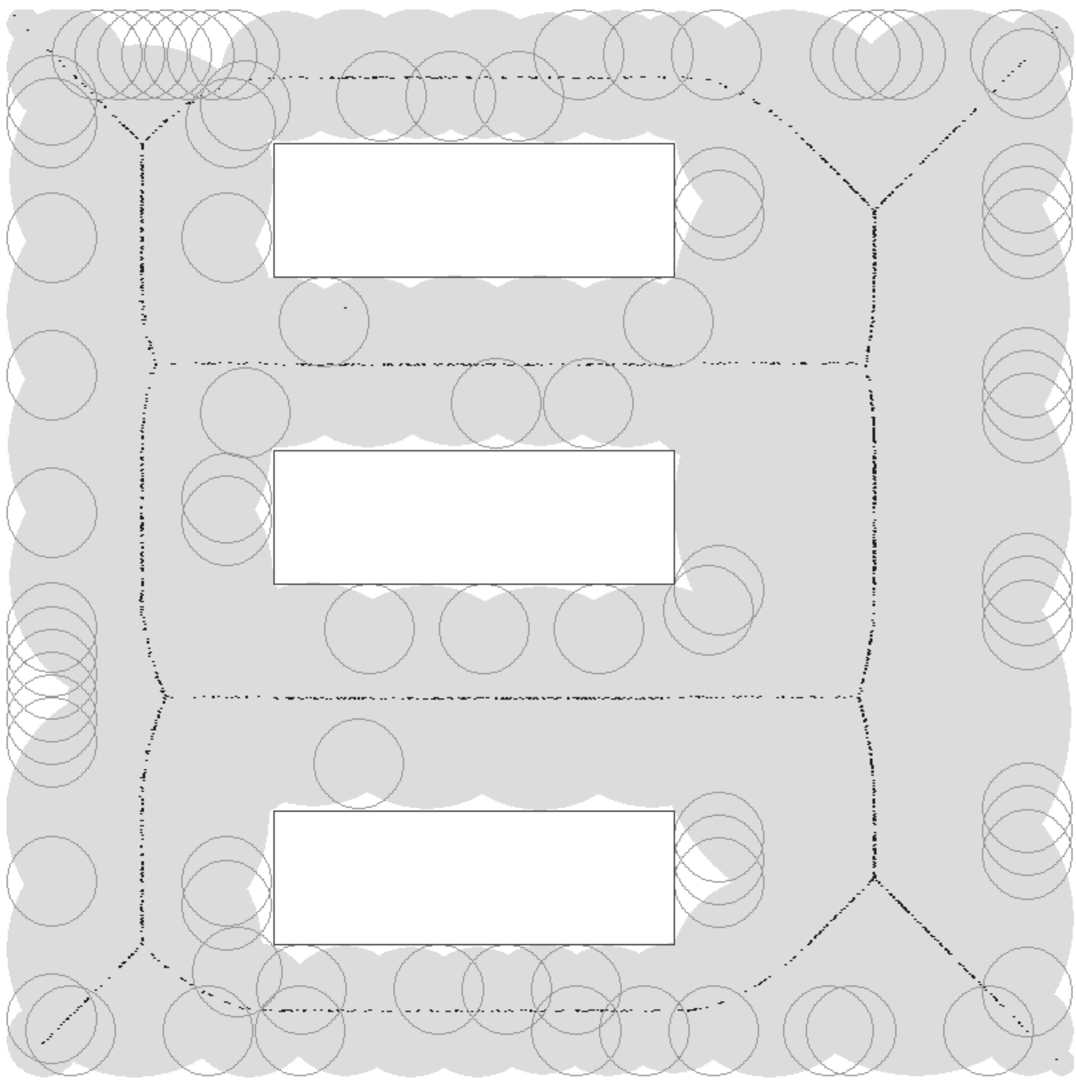
Reducing Small Discs

1 Demo

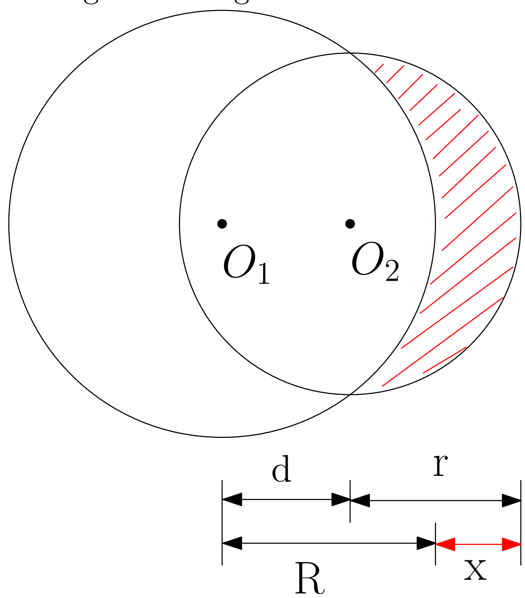
Graph below shows covering left areas by sampling iso-cost discs.



2 Algorithm

2.1 Measuring newly discovered area

Say we have a disc $ball(O_1, R)$ already, and a new disc $ball(O_2, r)$. The newly discovered area, read shaded in the graph, can be expressed as a function of x, denoted as $f(x)$. Obviously, $f(x)$ is monotonically increasing when $x \in [0, 2 \cdot r]$. We can measure if a new disc discovers enough new area by measuring if x is larger than a threashold. ($x = d + r - R \geq threashold$)



Although this $f(x)$ function determines the relation between one new disc and another existing disc instead of a set of existing discs. The result seems pretty good. (No idea why, yet.)

Measuring if a disc is useful:

$maSamples \leftarrow$ medial axis samples.
$isoSamp \leftarrow$ one iso-cost sample.
for $samp \in maSamples$ **do**
  $centerdist \leftarrow |samp.center - isoSamp|$ ▷ Distance between centers
  if $centerdist + isoSamp.radius - samp.radius \leq threashold$ **then**
    return False
  end if
end for
return True;

2.2 Generating small discs to cover left areas

1. Generate Medial Axis Samples.
2. Generate iso-cost small discs. Every disc is some distance away from

existing ones.

3. Test every iso-cost disc to see if it is useful. Keep only useful ones.

3 Questions

1. Why the method to measure new discovered area works.
2. How densely should we sample iso-cost discs?
3. Which size disc should we sample?