Interval data visualisation

Software for visualisation of B&B solutions

$$y \leq \sin(x) + \cos(2 * x) \text{ for } x \in [-5,5], y \in [-5,5]$$

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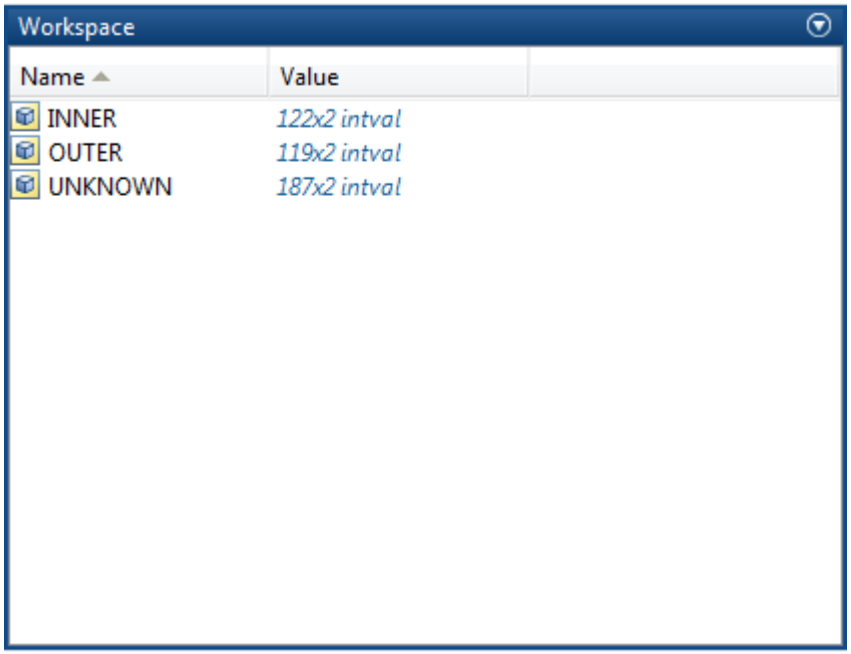

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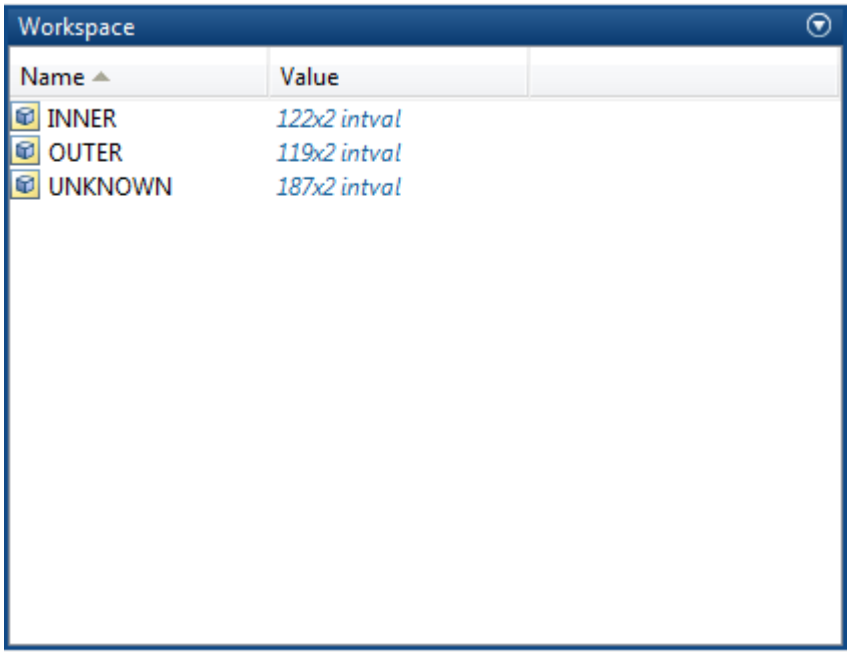

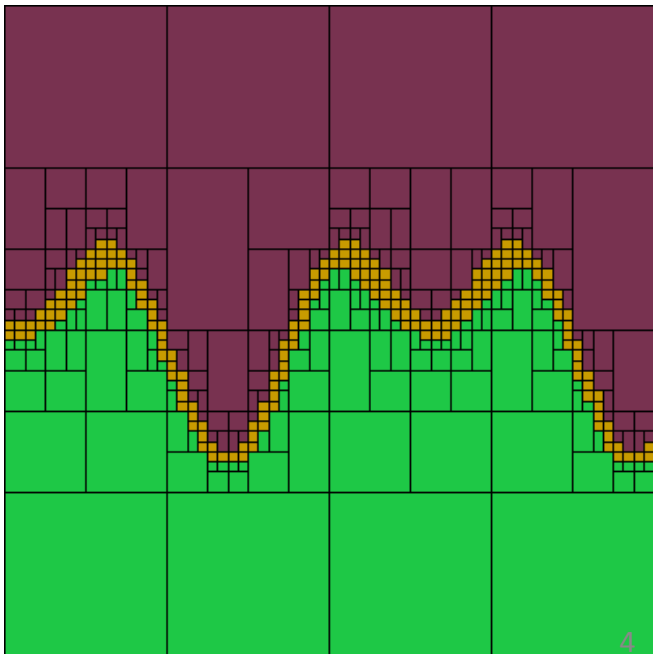

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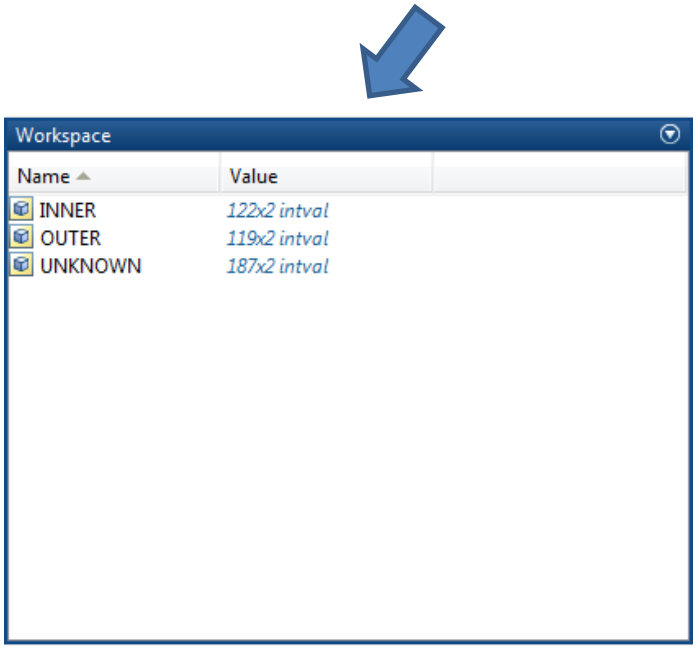
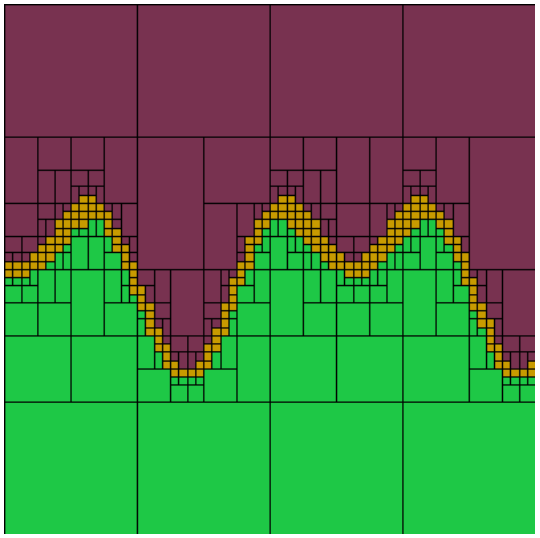
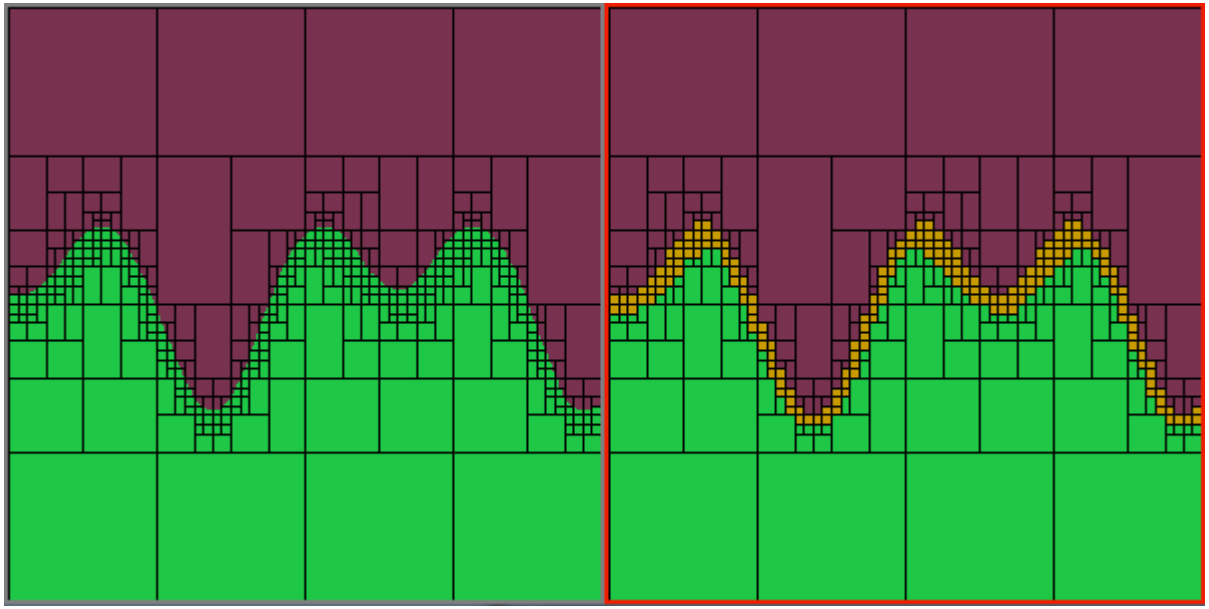




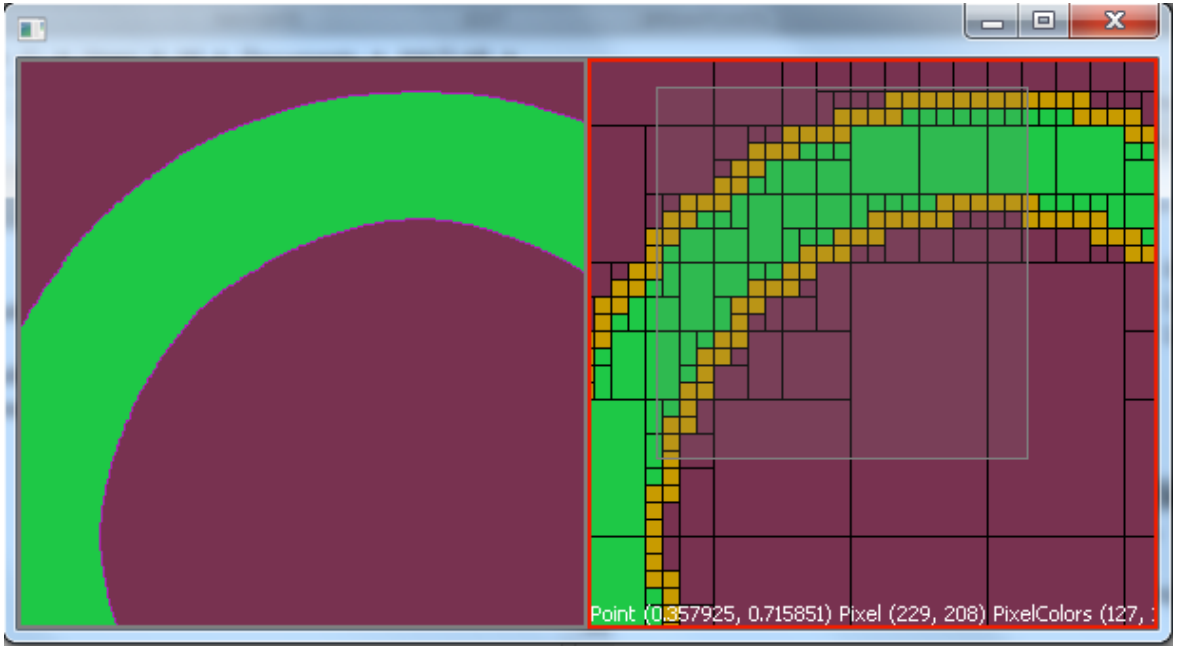


Main goals

- ✓ Written in C++ => usable also outside of Matlab
- ✓ Multi-platform!!! (C++11 threads, minimal use of 3rd party libraries)
- ✓ Fast (CImg library for image processing)
- ✓ Easy to use
- ✓ Easy to add new methods / make big changes with minimal effort

Simple GUI allowing user to:

- perform basic actions
- visualise several B&B solutions at once
- use interpolation and approximation methods to divide the unknown set into satisfying set and non-satisfying set

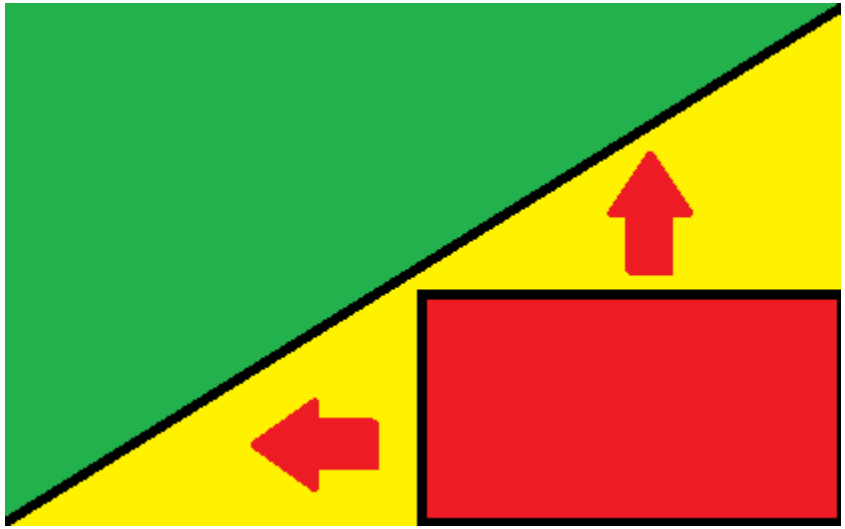


Basic Workflow of the set approximation

1. sample boxes, which will be used for the path
2. create paths of boxes
3. create paths of points
4. gain approximation
   a. simple lines approximation
   b. approximation with borders
   c. approximation with regions
5. using visualisation options

Simple line approximation

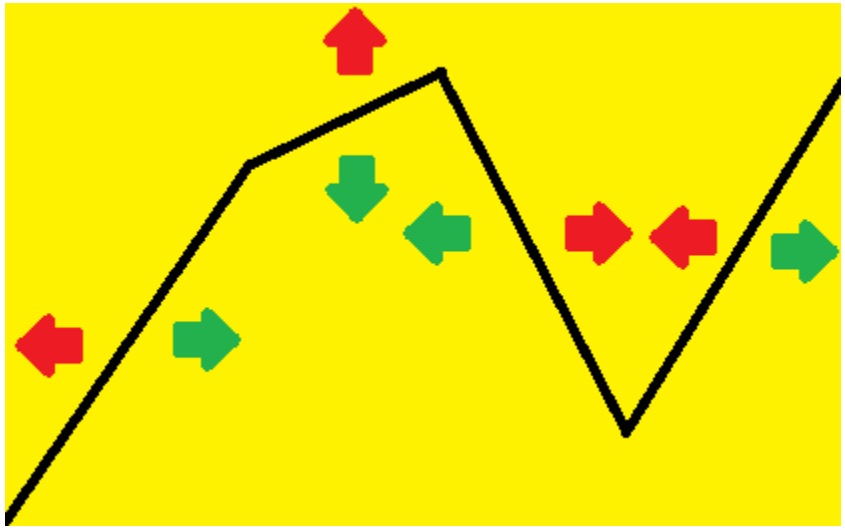
Draw approximating lines, BoxKind of point due to neighbours



- Pros: fast
- Cons: not working well in zooms

Border approximation

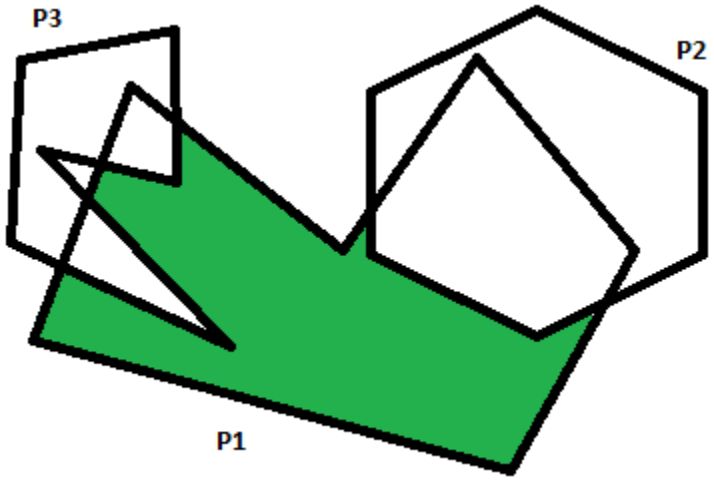
Border = line, BoxKind on the “right side”, BoxKind on the “left side”



- Pros: computation still fast enough, works in zooms
- Cons: slower assignment of BoxKind for pixels, possible conflicts

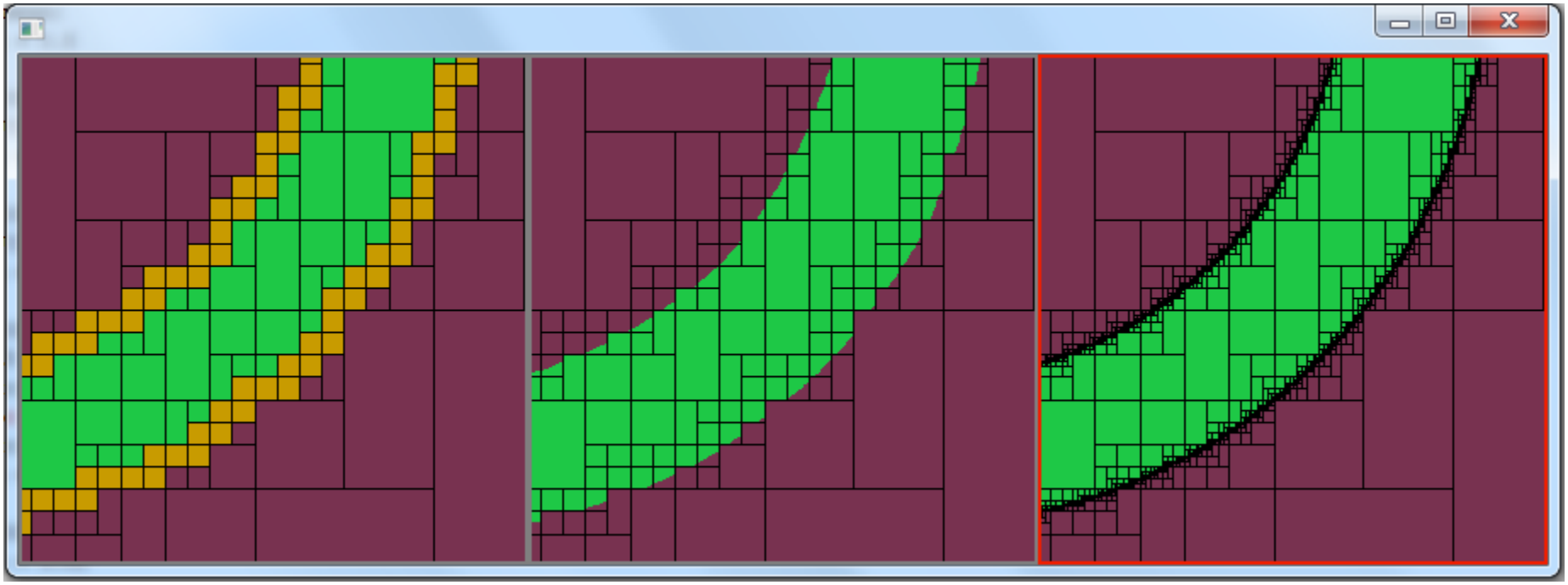
Region approximation

Region = vector of polygons, vector of informations IN/OUT for each polygon



- Pros: approximated solution split on regions
- Cons: slow, possible conflicts

Examples



Solution 1

224 satisfying boxes

360 unknown boxes

236 non-satisfying boxes

Approx. of Solution 1

Region approximation

Loose samplation

Point closering to depth 5

Subdivision (Chaik. coef. = 0.33)

Denied changes of SB/N-SB

Maximalism

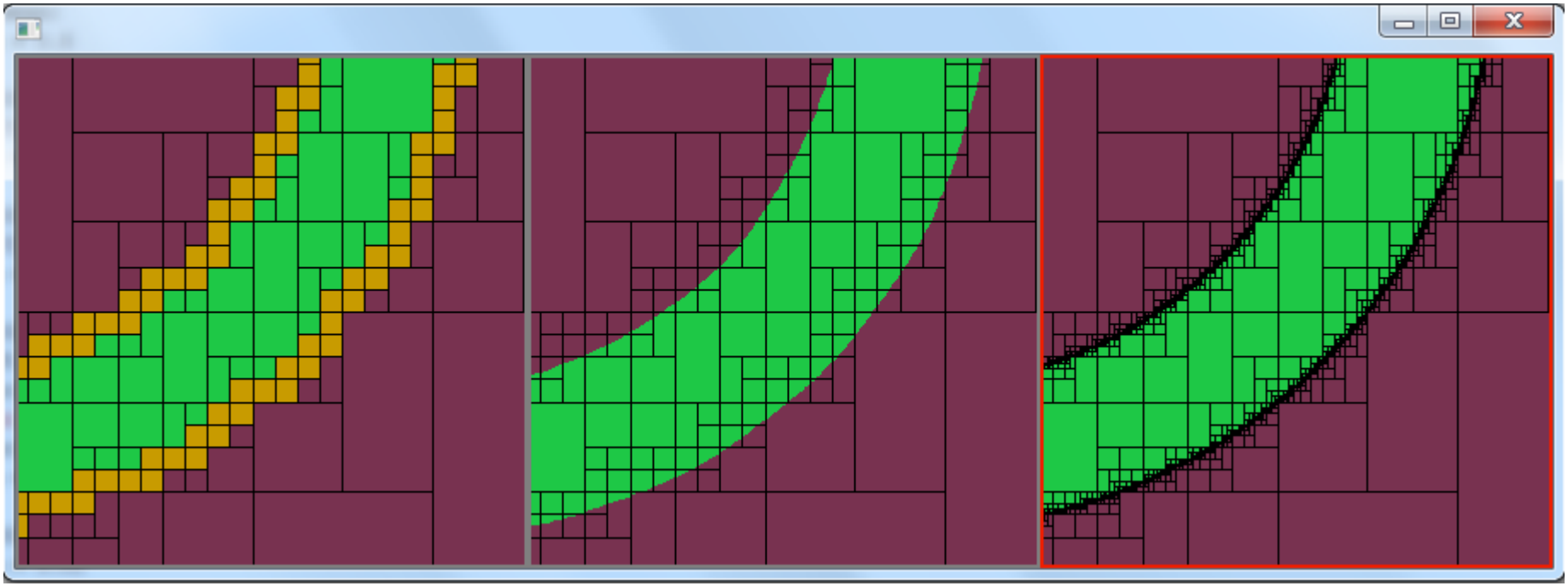
Solution 2

4268 satisfying boxes

5236 unknown boxes

4256 non-satisfying boxes

Examples



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Allowed changes of SB/N-SB

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Thank you for your attention