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Image segmentation in Volunter Computing Framework (BOINC)

Alberto Resco Pérez

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Image segmentation in BOINC

- Image segmentation
  - ISRG algorithm
- BOINC
- Adapt image segmentation to BOINC
- Examples

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Image segmentation

- **Image Segmentation** is the partitioning of an image into multiple regions (sets of pixels) according to a given criterion.
- There are different methods of segmentation:
  - Edge-based techniques.
  - **Region-based techniques.**
  - Deformable models.
  - Global optimization approaches.

ISRG algorithm

- One of the most robust region-based techniques is the **Improved Seeded Region Growing** algorithm (Mehnert and Jackway, 1997).
- It takes an image and a set of seeds (individual points or connected components) as inputs.
- The algorithm grows the seed regions in an iterative process. At each iteration all those pixels that border the growing regions are examined.

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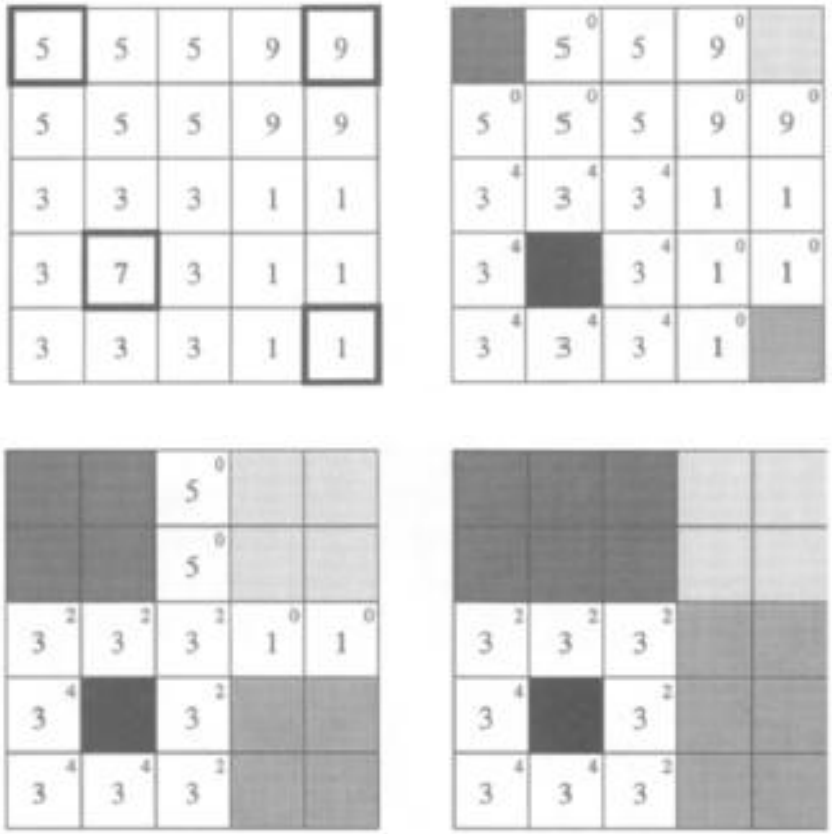
ISRG algorithm



ISRG algorithm

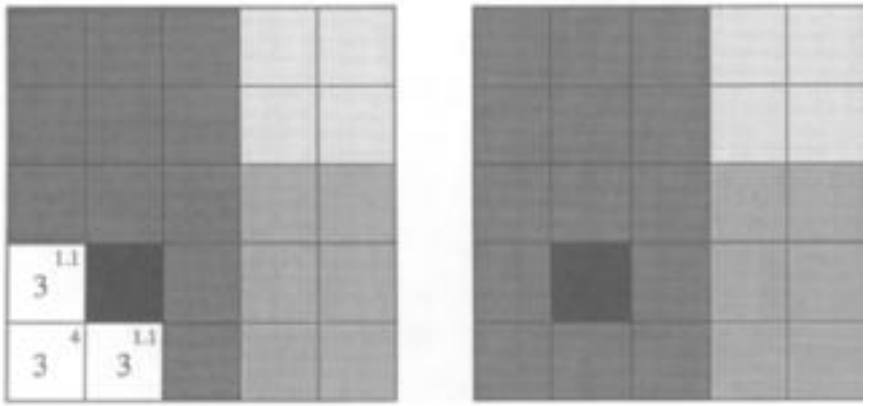
- An efficient implementation of the ISRG algorithm utilizes an ascending priority queue (PQ), and several LIFO queues.
- The PQ is ordered from the smallest to largest. In this case the value is **δ** that is the difference between the intensity of the pixel (measured in grey or RGB values) and the **mean** all of its **neighbours**.

ISRG algorithm

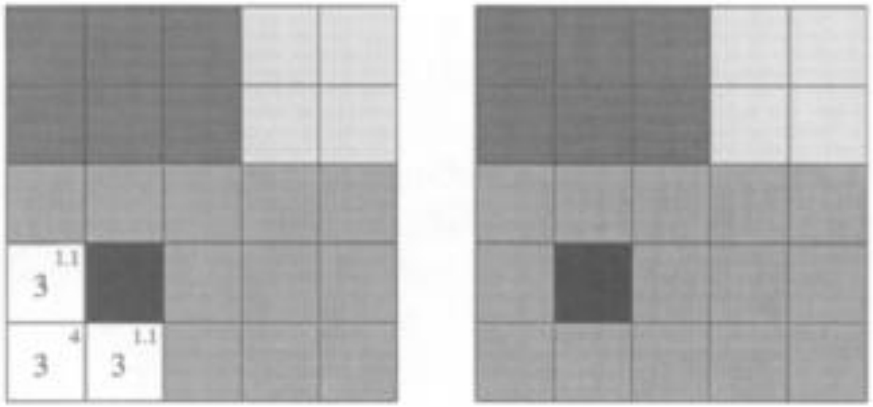
But there is an inconvenience…

ISRG algorithm

A)



B)



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BOINC

- **Volunteer Computing** is… "an arrangement in which so called volunteers, provide computing resources to projects, which use the resources to do distributed computing and/or storage".
- **BOINC** is a Distributed Computing software designed to use volunteer resources.
- But…We do not want Volunteers…We want dedicated Workers!!!

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What I need to adapt?

- The program to execute in the volunteers will not have a lot of changes. Only the management of the files and 2 calls to the BOINC API (start, finish, and if we want, a checkpoint every X iterations).
- A **work generator** that sends the images to segment.
- An **assimilator** that gets the segmentation and can:
  - Takes the best segmentation of each image.
  - Applies a merge algorithm.
  - Deletes everything…

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What I need to adapt?

- The ISRG algorimth needs the input of the initial seeds to start the algorithm.
  - A waste of data transmission.
  - So, send only the number of the max regions we want and generate them randomly.

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Examples of segmentation

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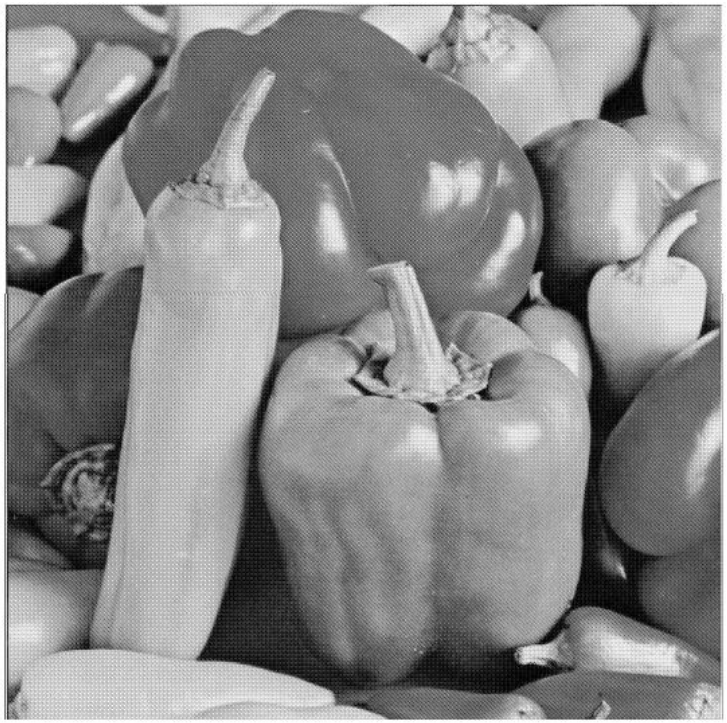
Examples of segmentation



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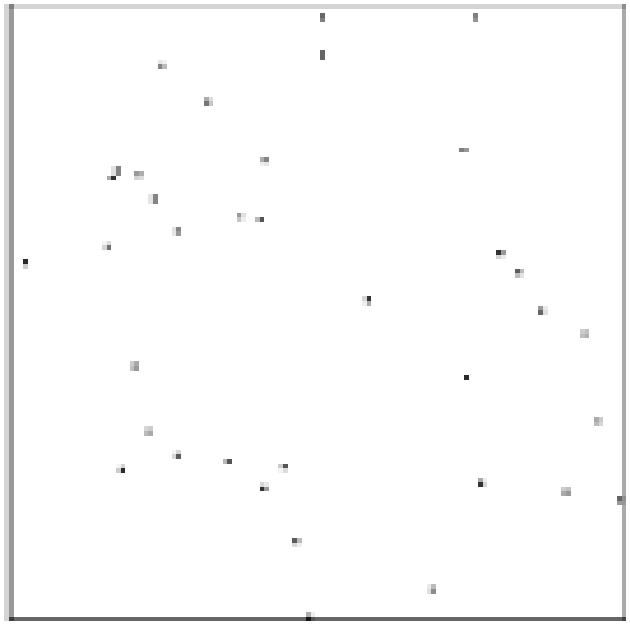
Examples of segmentation



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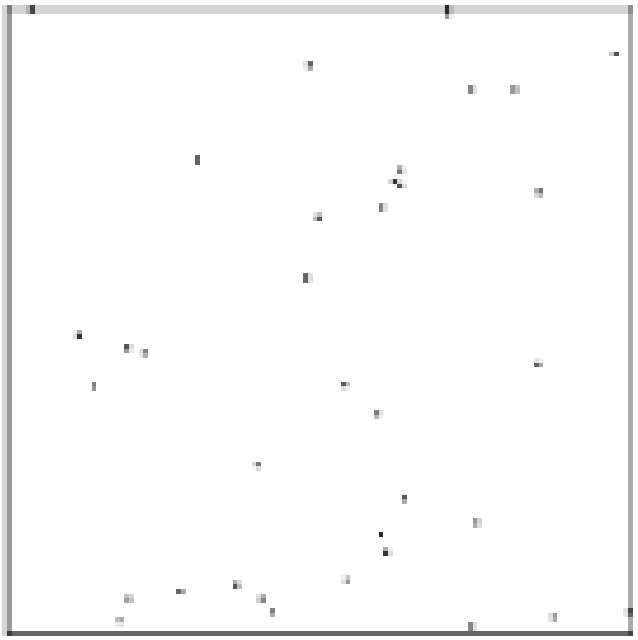
Examples of segmentation



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More info

- BOINC official site: http://boinc.berkeley.edu
- BOINC unofficial wiki: http://www.boinc-wiki.info/
- Linux packages: boinc-manager & boinc-client

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