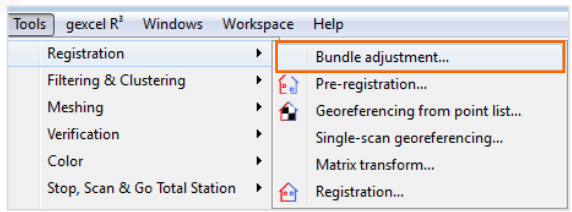
Gexcel

JRC 3D Reconstructor

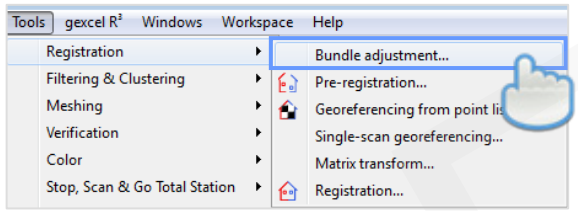
BUNDLE ADJUSTMENT

Registration without targets

1. Pre-Registration
   - with JRC 3D Reconstructor (see the Pre-Registration tutorial)
   - with thirdly party software: data importing already pre-registered
2. Registration
   - ICP algorithm (see the ICP Registration tutorial)
   - **Bundle adjustment**



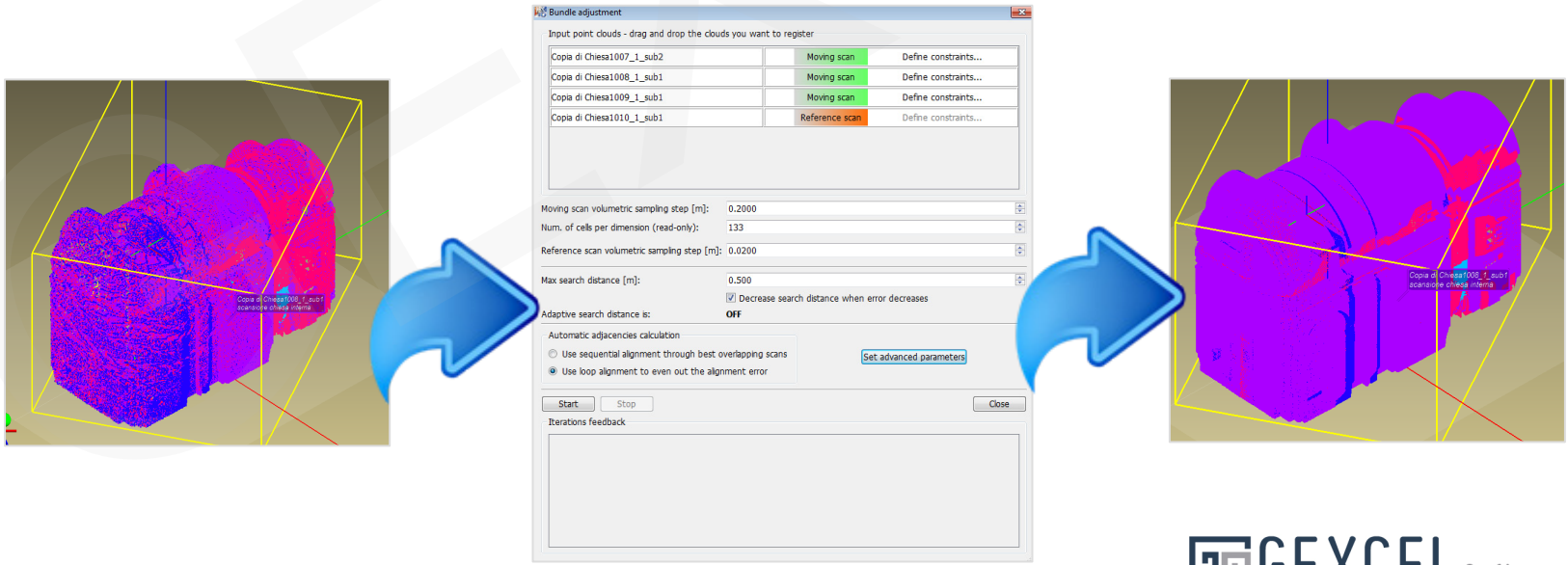
5. Select a group of pre-registered scans



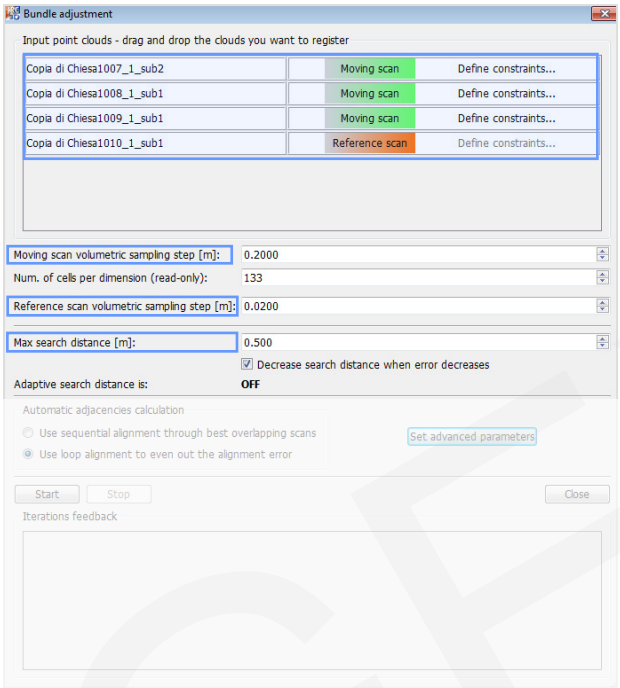
This algorithm allows to register together many point clouds, distributing evenly the registration error.

6. Specifies which point clouds are **reference clouds** (they are locked during the registration) and which are **moving** (the moving clouds will move and align on the reference clouds and between them during alignment).

While the **ICP Registration** (slide 14) works only for one pair of clouds at a time, this algorithm registers together N clouds at the same time, minimizing the registration error also in loop cases. The input clouds do not need to be structured or to have normals.



Bundle adjustment parameters

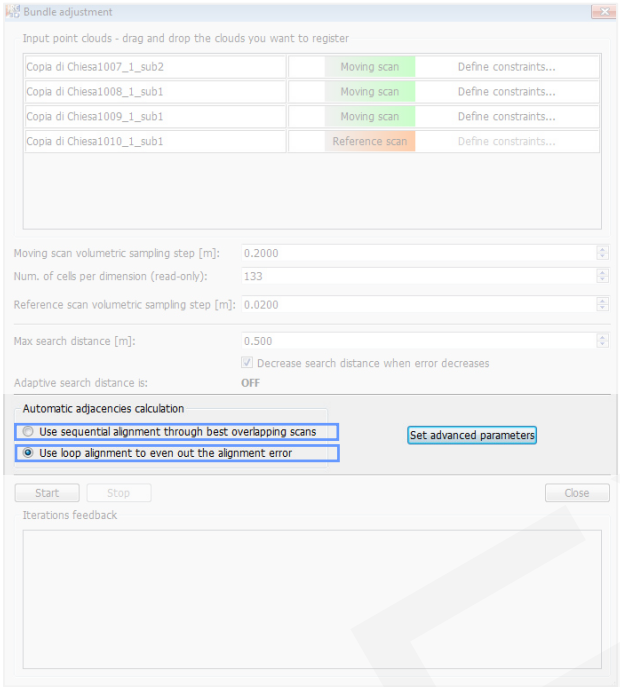


List of the point clouds to be aligned
Click on the red/green labels reference scan or moving scan to toggle each scan's role.

- Moving scan volumetric sampling step
- Reference scan volumetric sampling step*
Parameters that define how the input clouds should be sampled before being registered.

- Max search distance
Parameter that describes the maximum alignment error that is present in your problem. If the scans represent a building, a search distance of 0.5m is advisable. In the open pit mine scenario, a search distance of 2/2.5m is more advisable.
(See next page to know how JRC 3D Reconstructor helps you in this problem)

*The reference sampling step should be normally one order of magnitude smaller than the moving sampling step. It is important to insert parameters that match the size of the problem: the parameters pictured above will work to align scans belonging to a building; however, to align scans belonging to an open pit mine with 1000m width, it is better to choose for example 1m as moving scan sampling step and 0.1m as reference sampling step.

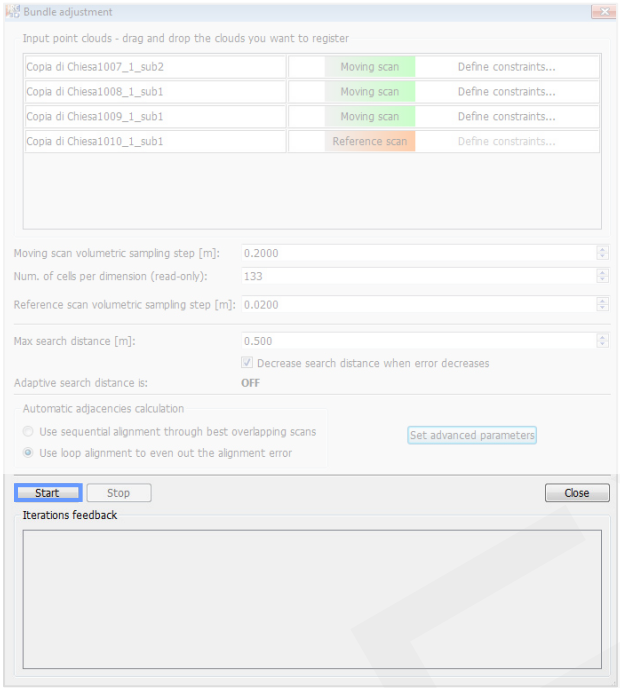


- Use sequential alignment through the best overlapping scans

To analyze the overlap among all the scan pairs and build the adjacencies so that every scan sees at least another as reference and the total overlap among scans is maximized.

- Use loop alignment to even out the alignment error

To find an alignment loop among the scans with maximized overlap. This is useful, for example, when the scans describe the exterior of a building and they are taken all around the building, so that the last scan of the sequence shares points with the first. If these scans in loop are aligned with the first method, there may be a high alignment error between the first and the last scan. If the second method is chosen, the alignment error will be minimized through all the loop at the same time, and therefore distributed nicely through the loop, getting to a good global alignment



Once the parameters are set, press **Start** to begin the alignment. In the log window, JRC 3D Reconstructor shows information about the three main steps of the process.

When the scans are aligned, JRC 3D Reconstructor asks you if you want to assign the new positions to the input clouds or copy them into new clouds with the new positions.

If you choose the first option, you are always able to go back to the positions before the bundle adjustment, because these are saved as backup for you.

If you need some more **information**, please contact

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