# Discovery Explore: Fidelity Settings

A frequent question we have, is how I can capture the thinner features in geometry. The fidelity controls the solution grid density. With higher densities, additional geometric details can be captured, such as thinner parts and gaps. This document explains how to optimize performance using fidelity settings.

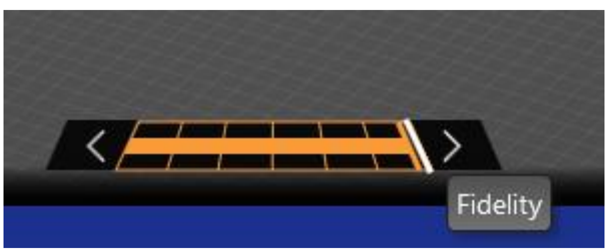
## / Solution

ANSYS Discovery Explore stage applies a unique approach and leverages GPU computing to instantly simulate a wide range of geometry and physics. The minimum feature length that you can capture depends on the GPU VRAM your system has. It is important to note that because Discovery Explore is designed to provide an interactive workflow for a wide range of supported graphics cards, it adjusts the available fidelity range (minimum and maximum) to keep a fine balance between performance and level of detail. This means that depending on the available graphics memory and computational resources, the limit on what Discovery Explore can resolve geometrically changes.

**Here are things you can try to capture thinner details in Discovery Explore Stage:**

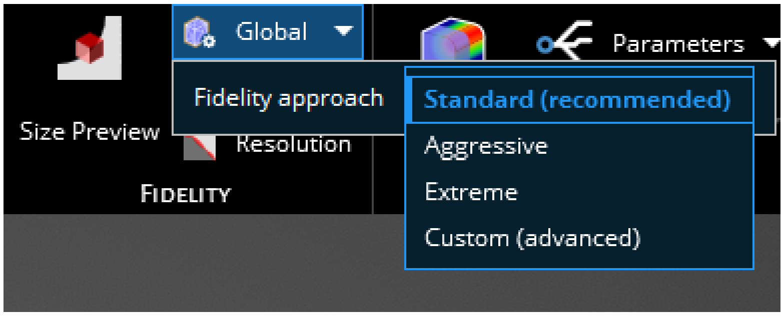
1. **Optimizing the solution Fidelity with the fidelity slider:**

The fidelity of the solution is controlled primarily using the slider in the stage navigator. This acts differently depending on if you are in Explore or Refine stage. In both cases an increased fidelity will capture additional detail but will take longer to produce a result. You can control the fidelity of your solution by sliding it to the right for higher precision, or to the left for a quick solution. You can use the Spacebar on the keyboard to display and/or enter the fidelity value.



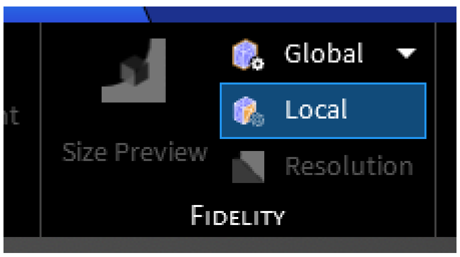

2. **You can also choose the global fidelity approach from Fidelity options:**
By default, you will be in the standard setting, this is also the recommended setting. When you are in Standard approach, Discovery algorithm uses around 80-85% of the available VRAM for computation, for further control, you can choose the desired level of your solution accuracy by selecting a fidelity setting from the Global drop-down menu in the Simulation tab ribbon. Although Aggressive or Extreme capture more geometric details and yield higher-fidelity results than the Standard setting, it runs the risk of running out of GPU memory when solving on lower

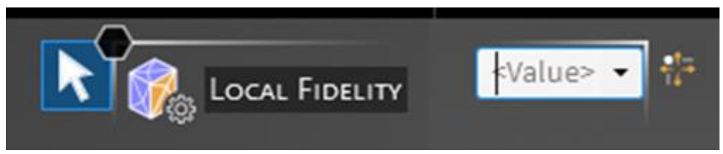
specification graphics cards. You can define the fidelity level using Custom. Specifying a value over 1, combined with a high-fidelity slider position, may cause the simulation to run out of GPU memory.




3. **Defining local Fidelity at the area of interest:**

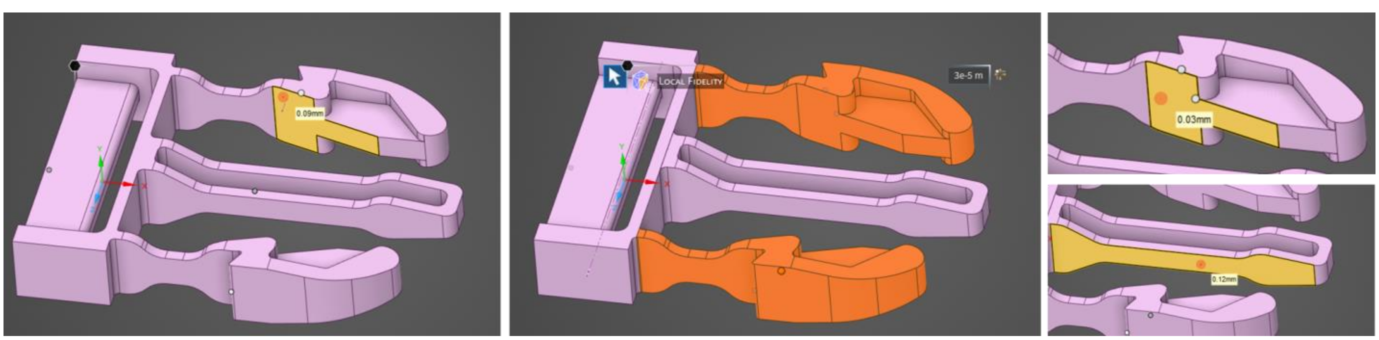
   You can define local sizing on faces for fluid simulations, and on bodies for Structural simulations (in Discovery 24.1 onwards)



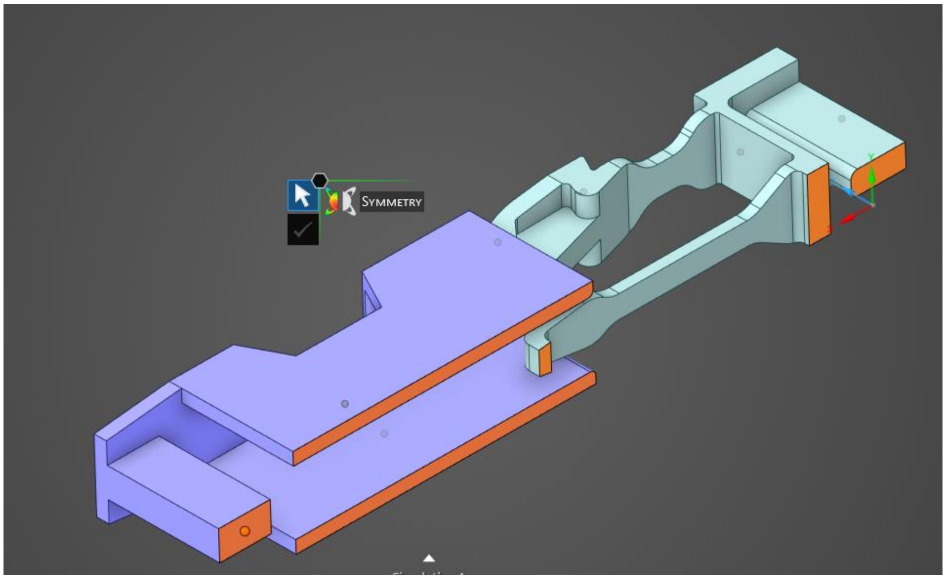

4. **Approximating the domain of interest:**

   **a.** Reduce the domain of interest or reduce the complexity of the bulkier geometry: For structural simulation you can split the portion of the geometry where thinner or important features are present and apply local sizing to that portion and define coarser mesh on the remaining geometry to achieve better mesh distribution. This can also be paired with the global fidelity settings (aggressive and extreme, with local sizing to optimize the GPU usage further). When you are using local sizing and global fidelity settings, keep in mind the probability of simulation to run out of memory.



In the aforementioned example, we have split the snap buckle such that the important portions of the geometry can be separately given a local refinement.

   **b.** If possible, try using symmetry boundary condition so that you can capture minimum mesh size on same GPU and fidelity settings.




5. See if you can try out a bigger GPU VRAM machine (more memory and faster clock speed), as more VRAM, thinner features it will capture at highest position in fidelity slider. Please refer to this document that [lists the supported GPUs for Discovery](#).

Since the Explore stage relies on the GPU, it will solely depend on that VRAM, how the features are captured. You can always use the Resolution option in fidelity to see which features are getting ignored in the simulation.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Keywords: Explore, thin features, GPU, VRAM, minimum feature length, global fidelity settings, Extreme, aggressive, custom, standard, Refine, Mesh, Fidelity

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