

Bio-Sketch: A new medium for interactive storytelling illustrated by the phenomenon of infection Supplementary Material

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Description of the demonstration video

Below, we describe how we created our demonstration video, focusing on user interaction and its consequences on the environment.

Step 1: Creating the background field of fibers

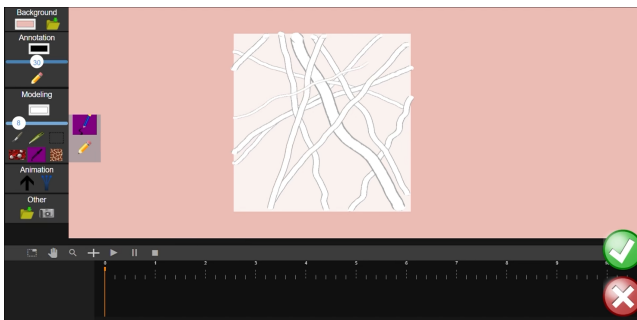


Figure 1: Creating the fiber distribution.

UI selection

- Modeling -> Pipette tool: activate the 2D stroke sample mode.
Canvas mode -> Blue pencil: unbounded stroke.
Canvas mode -> Yellow pencil: bounded stroke.
- Modeling -> Color tool
- Modeling -> Width slider
- Green button: validate the sample.
- Red button: cancel the sample.

The user initially sketches a fiber distribution, which serves as a sample for our background (as depicted in Fig. 1). Once validated, this sample is expanded, first in 2D and then in 3D, to generate our 3D field of fibers. Subsequently, the user can zoom in or out within this 3D background and manipulate the camera to customize the environment to their preferred view, which will remain consistent throughout the subsequent steps.

Step 2: Creating the main vessel

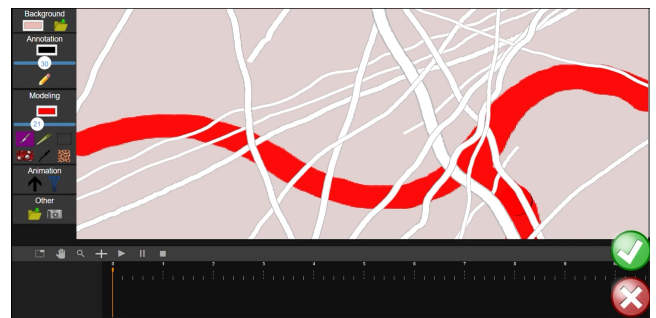


Figure 2: Painting the 2D region from which the main vessel is modeled.

UI selection

- Modeling -> Brush tool: activate the implicit surface modeling mode.
- Modeling -> Color tool
- Modeling -> Width slider
- Green button: validate the drawing.
- Red button: cancel the drawing.

As shown in Fig. 2, the user paints a 2D area from which we derive an implicit surface (for further details, please refer to the main paper). After configuring color and width parameters, the user initiates a stroke by clicking anywhere in the environment. This action triggers the display of a 2D canvas, which is automatically positioned in depth. As depicted in Fig. 2, the white strokes visible on the 2D canvas correspond to the projection of the 3D fibers that extend in front of this canvas.

Step 3: Outer texturing on the main vessel

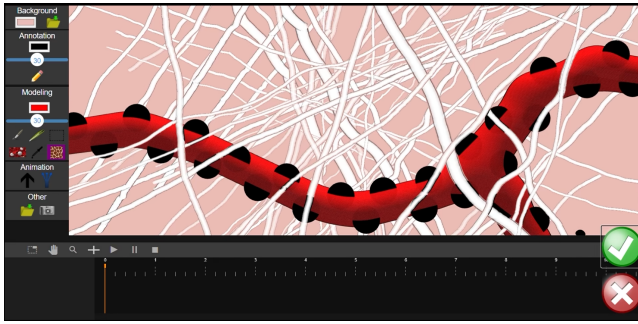


Figure 3: Texturing the vessel.

UI selection

- Modeling -> Texture tool: activate the texture mode.
- Green button: validate the kernel positioning.
- Red button: cancel the kernel positioning.

To texture the vessel, the user clicks on parts of the implicit surface to position dots (see Fig. 3) serving as kernels for the Voronoi tessellation.

Step 4: Cutting the main vessel

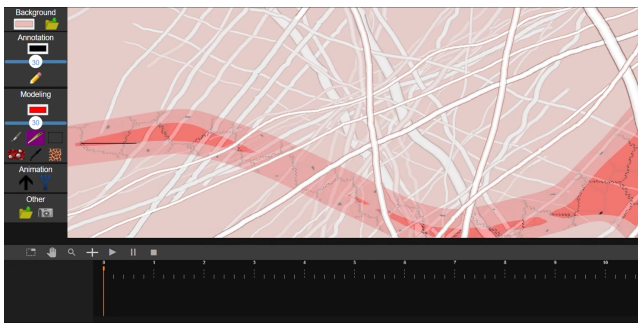


Figure 4: Cutting the vessel.

UI selection

- Modeling -> Cut tool: activate the cutting mode.

As illustrated in Fig. 4, the user draws a stroke on the vessel to delimit the cutting part. This cutting tool can be used on any displayed implicit surfaces.

Step 5: Creating a distribution sample of cells inside the vessel

UI selection

- Modeling -> Brush tool: activate the implicit surface modeling mode.
- Modeling -> Color tool
- Modeling -> Width slider
- Green button: validate the drawing.
- Red button: cancel the drawing.

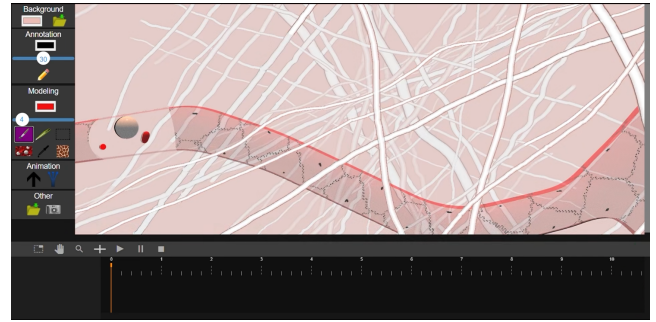


Figure 5: Creating a sample of cell inside the vessel.

As shown in Fig. 5, in this example, we create a sample of cells inside the vessel in the area that was previously cut.

Step 6: Propagating this distribution along the vessel

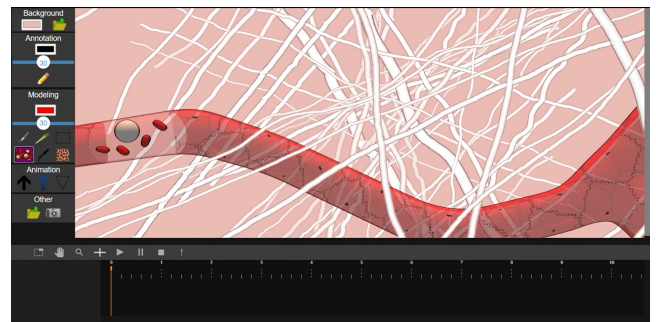


Figure 6: Activating the propagation of the cell sample.

UI selection

- Modeling -> Cell distribution tool: activate the implicit surface modeling mode.

The tool selected in Fig. 6 is specific to the volumetric distribution inside a container shape. If there is only one container shape and one distribution, our method automatically takes as a sample the distribution that is inside. Otherwise, the user can select the container shape and the sample distribution with the rectangle tool (Modeling -> Selection tool).

Step 7: Inserting flow inside the main vessel

UI selection

- Animation -> Flow tool: activate the flow mode.

The user begins by selecting the point where the future flow arrow will be placed. He then uses mouse movements to fine-tune the arrow's orientation and length. Additionally, he can sketch an extra stroke to specify damping properties along the container's borders.

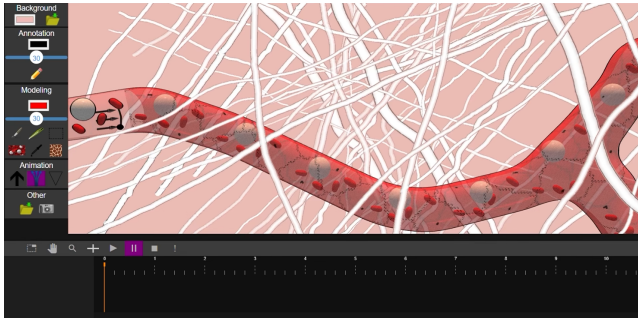


Figure 7: Sketching the flow arrow.

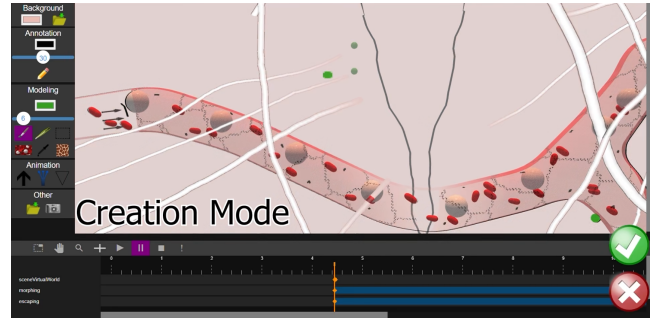


Figure 9: Sketching the bacteria

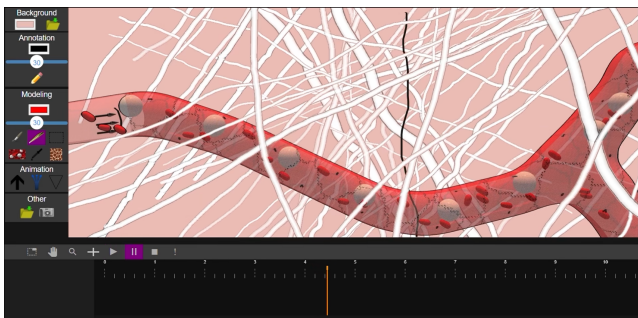


Figure 8: Sketching the vertical cut

Step 10: Inserting gradient forces to the environment

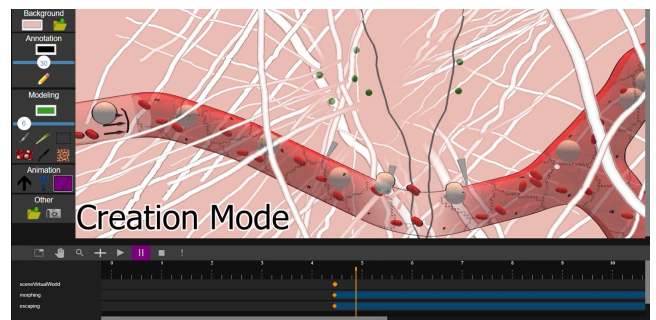


Figure 10: Sketching the gradient symbol

Step 8: Adding a vertical cut to the environment

UI selection

- Modeling -> Cut tool: activate the cut mode.

When a cutting stroke intersects multiple elements, we categorize it as a vertical cut, in contrast to the horizontal cut described in Step 4. Any slight shift observed during the visualization of the vertical cut can be attributed to the projection camera. As demonstrated in Fig. 8 (refer to the timeline), the creation of the vertical cut represents the primary event in the phenomenon we are describing. Furthermore, in the absence of gradient symbols, cells simply exit the vessel through this cut.

Step 9: Adding bacteria to the environment

UI selection

- Modeling -> Brush tool: activate the implicit surface modeling mode.
- Modeling -> Color tool
- Modeling -> Width slider
- Green button: validate the drawing.
- Red button: cancel the drawing.

As depicted in Fig. 9, the user is modeling implicit surfaces around the cut. It is important to note that this action occurs after the vertical cut. Therefore, our method categorizes these new elements as bacteria. In addition, bacteria shapes exhibit random motion and will be the target of the white cells.

UI selection

- Animation -> Gradient tool: activate the gradient mode.
- Modeling -> Color tool

The user positions gradient symbols along the edge of the vessel to facilitate the escape of white blood cells to combat infectious diseases. The user can play with the play/pause buttons to place gradients at different time steps. The gradient's color corresponds to the type of cells it affects. When a white cell enters the gradient's influence zone, it is attracted toward the vessel's border, where it can deform to escape. When the white cell moves beyond the vessel's borders, it is initially guided solely by the gradient and gradually becomes attracted to a bacteria until it reaches it. We rely on transparency variation to represent the destruction of bacteria by white cells.

Step 11: Replaying the action

UI selection

- Timeline -> event button: activate the rewind to the previous event

We have separated the creation mode, in which the user creates bacteria and positions the gradient, from the playback mode, in which the animation plays without any intervention. As shown in Fig. 11, playback mode is triggered by clicking on the event button in the timeline. This rewinds the environment to the latest event.

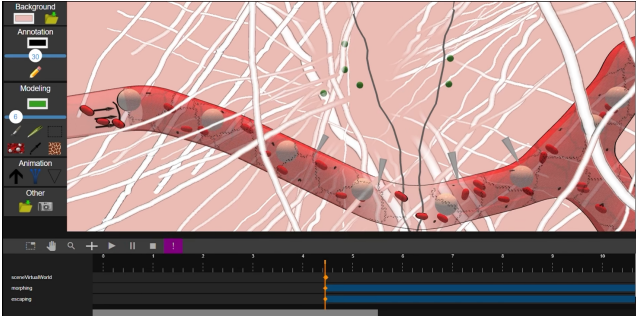


Figure 11: *Going back to the previous event*