

OLIVE (OpenCV **LIVE**) is a web-based, visual programming tool for real-time image, video, audio and 3D processing. It uses **nodes** to represent functions and **wires** (connections) to define the flow of media data between them, leveraging **OpenCV.js**, **Three.js** and **MediaPipe**.

I. System Requirements and Setup

- **Browser:** A modern web browser that supports **WebGL** and **JavaScript**.
- **Dependencies:** The application loads external libraries including `opencv.js` and `three.js`.
- **Status Check:** When the editor loads, the **OpenCV status** will be displayed in the interface, turning green once the library is ready.

II. Core Editor Concepts

Component	Description	Interaction
Node	A block representing a specific function.	Add: Drop the Node into the Graph Editor . Remove: Select and Right-click or press Delete (<i>continuous click on touchscreens</i>).
Port	Connections for data flow. Inputs (left) receive data; Output (right) sends data.	Create Connection: Drag from an Output Port to an Input Port (<i>on a touchscreen, click the output first and then the input</i>).
Wire	Defines the flow of data from an output to an input.	Delete Connection: Right-click on the Port (<i>continuous clicking for touchscreens</i>).
Fullscreen	View media output in full screen.	Double-click on the image/video/canvas (<i>continuous click when on a touchscreen</i>).
File	Load and save graphs in JSON format.	Click the Save (💾) icon to save the project. Click the Open (📁) icon to load a project. Local media files must be manually uploaded as soon as the project (.olive) file is ready.

III. Node Catalog and Basic Functionality

Nodes are organized into categories based on their role in the workflow.

1. Input Nodes

These nodes provide the starting media source for your graph.

- **Image / Video / Audio:** Upload a static image, a video or a sound file (or provide a link).
- **Camera:** Capture a live video feed from your device's camera.
- **Parametric Lines:** Change the parameters and generate animated curves.

2. Processing Nodes

These nodes perform image and video manipulation using **OpenCV.js**.

Node Title	Primary Functionality	Key Controls & Parameters
Gamma Correction	Changes pixels' intensities.	Adjust γ value.
Histogram Equalization	Equalizes the histogram, globally or locally.	Adjust the Grid Size for CLAHE (Contrast Limited Adaptive Histogram Equalization)
Color Adjustment	Manipulates the HSV color space.	Use the Color Picker to define the color (or the target range) and the sliders for new Hue and Saturation values. Includes Full Range and Invert options.
Convolution	Applies spatial filtering.	Select Filter Type (e.g. Gaussian Blur, Sobel Edges) and adjust Kernel Size or define a Custom Kernel .
Morphology Rank	Applies morphological operations and ranking filters.	Select Filter Type (e.g. Erosion, Dilation, Median), Kernel Size , and Kernel Shape (Rectangle, Ellipse, Cross).
Polar Transformation	Wraps the image using coordinate transformations.	Select Effect Type (Fish Eye, Cone, Swirl) and Effect Strength .
Glitch Effects	Applies dynamic visual distortions.	Select Effect Type (Shaking, Aberration, Fade, Glass) and Effect Strength .
Thresholding	Binarizes the color channels, using a global or local threshold.	Adjust the Threshold Value and select the Type (Binary, Otsu, Adaptive).
Matrix Operations	Adds, subtracts, multiplies, divides two images or applies min/max operations.	Select the Operation Type and the Weights for the inputs.
Channel Mixer	Remixes the RGB channels.	Adjust the Percentage of Red, Green and Blue at every color channel.
Color Blending	Replaces the color (e.g. Hue, Saturation) of an image with the color of another.	Select the HSV channels (Hue, Saturation, Value) to be replaced.

Concatenation	Merges the input images either horizontally or vertically.	Adjust the percentage of Overlap with the slider.
Transitions	Classic WebGL transitions between two inputs.	Select Transition Type (e.g. Fade, Wipe, Radial, Dissolve) and adjust the Transition Duration .
Superpixels	Applies K-means clustering to the pixel colors.	Adjust the Clusters K-Value (<i>number of colors</i>).
Background Subtraction	Removes non-moving objects (background) from the input video.	No controls.
Optical Flow	Visualizes the optical flow with arrows.	Adjust the Block Size .
Skeleton	Applies the Distance Transform to the RGB channels.	No controls.

3. Rendering Nodes

They render the input texture onto a **3D geometry** using **Three.js**.

- **Projection:** A specialized node that uses the input as a **projected texture** onto the scene. Use the mouse to **orbit and zoom** the camera. A spherical indicator represents the **Projector** which can be dragged using **Drag Controls**.
- **Mapping / Lighting:** UV mapping of the input image/video on a **GLTF Model** or a Plane, Cube, Sphere etc. The spherical indicator represents a **Point Light**. Adjust light's color and intensity with the color picker and the sliders.
- **3D Text:** renders custom 3D text. Adjust content, font, color, size and camera position.

4. Pose-Estimation Nodes

They track the human body using the **MediaPipe** library.

- **Human Pose:** Applies segmentation to the person (if any) and removes the background.
- **Character Animation:** pose-driven movement of an uploaded **VRM humanoid model**.

5. Output Node

This node does not have an Output Port.

- **Canvas Viewer:** This is the final step in the graph. It displays the result of the connected node. Click the **Pop-Out** (⊗) icon to open the content in a new Window.

IV. Additional Functions

In this section, special features (not described above) are presented.

1. Node Bypass

To temporarily deactivate a connected node, uncheck the box next to the Node Title (top right corner). This allows you to *test* the effect of a particular node on the data flow.

2. Control Ports

The **Human Pose Node** sends *pose estimation result data* through its Control Output. Connect this port to the Control Input (if available) of any node, in order to trigger specific events (e.g. *play* a video/sound or a transition, *pause* a video/sound already playing or *reverse* a transition, *position* the camera, *adjust* a slider value, *move* the model in a Character Animation Node etc.). You may change the default gesture, that is raising and waving the right hand, from the **Settings** (⚙) menu on the top right corner of the Graph Editor.

3. Keyframes

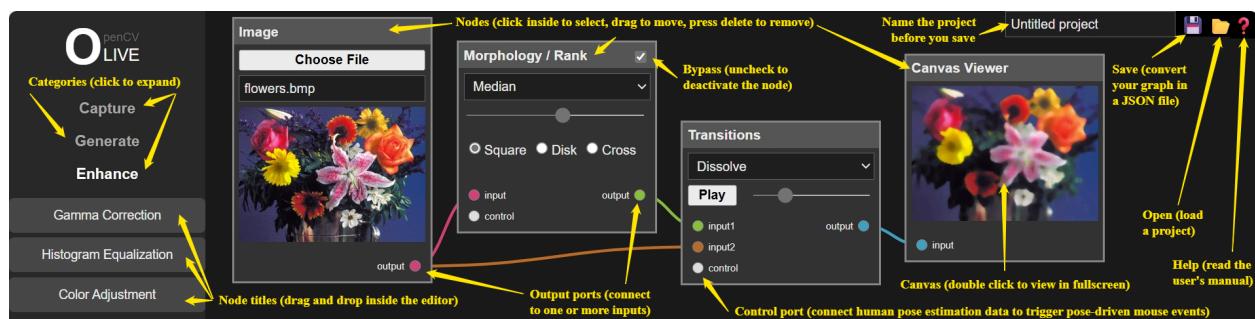
The **Countdown / Keyframes Node** allows for *time-driven* events triggering. Set the **Countdown Timer**, determine a **Target Value** (or two) for the affected parameters and connect the Control Output to any node's Control Input (except from the Character Animation Node that accepts only MediaPipe data from the Human Pose Node). The countdown starts by clicking the node's **Trigger Button**, or by another node's Control Output. To generate periodic triggers (**loop mode**) either connect the node output to *its own input*, or create a *chain of nodes* and connect the last output to the first (or any other) input.

4. Sound Filters & Effects

This node takes an audio (or video) as input and applies audio processing (e.g. Band Pass, Reverb, Flanger, Panning). It has a Control Port as well and no output. No more than one such node may be connected to a video/audio Output Port.

V. Graphical User Interface

<https://opencv-live.github.io/examples/images/gui.png>



VI. Examples

<https://github.com/opencv-live/opencv-live.github.io/tree/main/examples>

To run the examples: hover over the **Open** (📁) icon at the top right corner of the Graph Editor and select a **Sample Graph** from the list. You may also download the **.olive files** (not the images folder) to your PC and then load any of them.

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