

Get from concept to creation faster with Microsoft Surface Studio

Surface Studio provided a better user experience than the Apple iMac in common Adobe application tasks

Time, hard work, and inspiration are key tools in the creative professional's arsenal. The right kind of workstation can enable you to complete work faster and with more control, giving you much-needed time to find your inspiration and perfect your next opus.

At Principled Technologies, we looked at two different creative workstations: Microsoft® Surface® Studio and the Apple® iMac®. In our hands-on tests, Microsoft Surface Studio offered several workflow improvements over the Apple iMac, including greater consistency and speed when tracing images in Adobe® Photoshop® and faster 4K video rendering in Adobe Premiere® Pro. In addition, we completed familiar tasks in new ways thanks to the innovative features of Surface Studio—such as its crisp PixelSense™ display, which allowed us to directly manipulate images with Surface Pen and interact with menus via Surface Dial.

Surface Studio offers a lot to creative professionals looking to hasten their work without losing quality. Let's discover more.

Improve your work

21% better tracing precision*
24% less time to trace**



*without undos
**with undos

Wait less

Rendered 4K video in
16 fewer minutes



Innovate your work: Introducing Surface Studio

For many creative professionals, Surface Studio can introduce a new way of working that takes your process to the next level. Here are a few key features that make Surface Studio unique.

Ultra-sharp PixelSense display

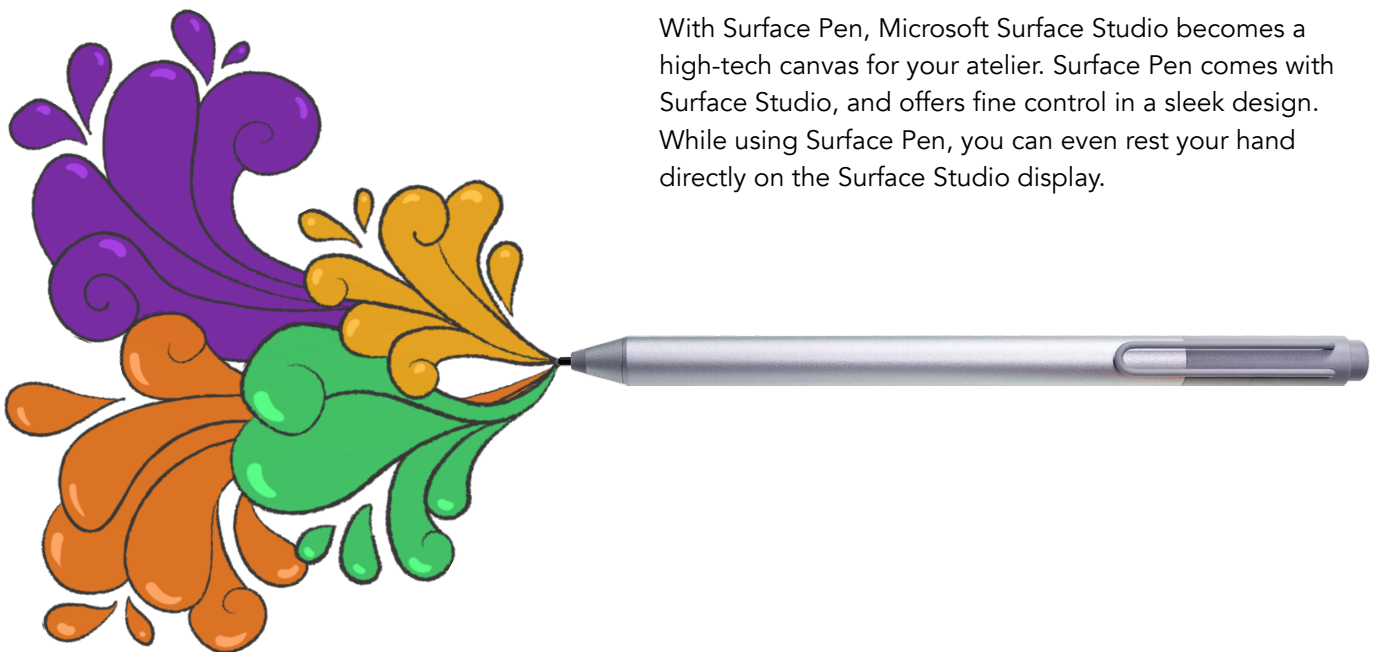
Microsoft Surface Studio boasts a thin, 28-inch display that uses Microsoft PixelSense technology to give users an enhanced experience. According to Microsoft¹, the PixelSense screen includes the following features:

- **Crisp color**—switch between sRGB, DCI-P3, and Vivid color profiles to suit your project-to-project needs.
- **Direct interaction**—use system features without a mouse or keyboard.
- **10-point multitouch**—interact with multiple points on the screen simultaneously.
- **Object recognition**—allows the Surface Studio to recognize accessories such as the Surface Pen or Surface Dial.



Draw the natural way

With Surface Pen, Microsoft Surface Studio becomes a high-tech canvas for your atelier. Surface Pen comes with Surface Studio, and offers fine control in a sleek design. While using Surface Pen, you can even rest your hand directly on the Surface Studio display.



Faster, more precise drawing in Adobe Photoshop

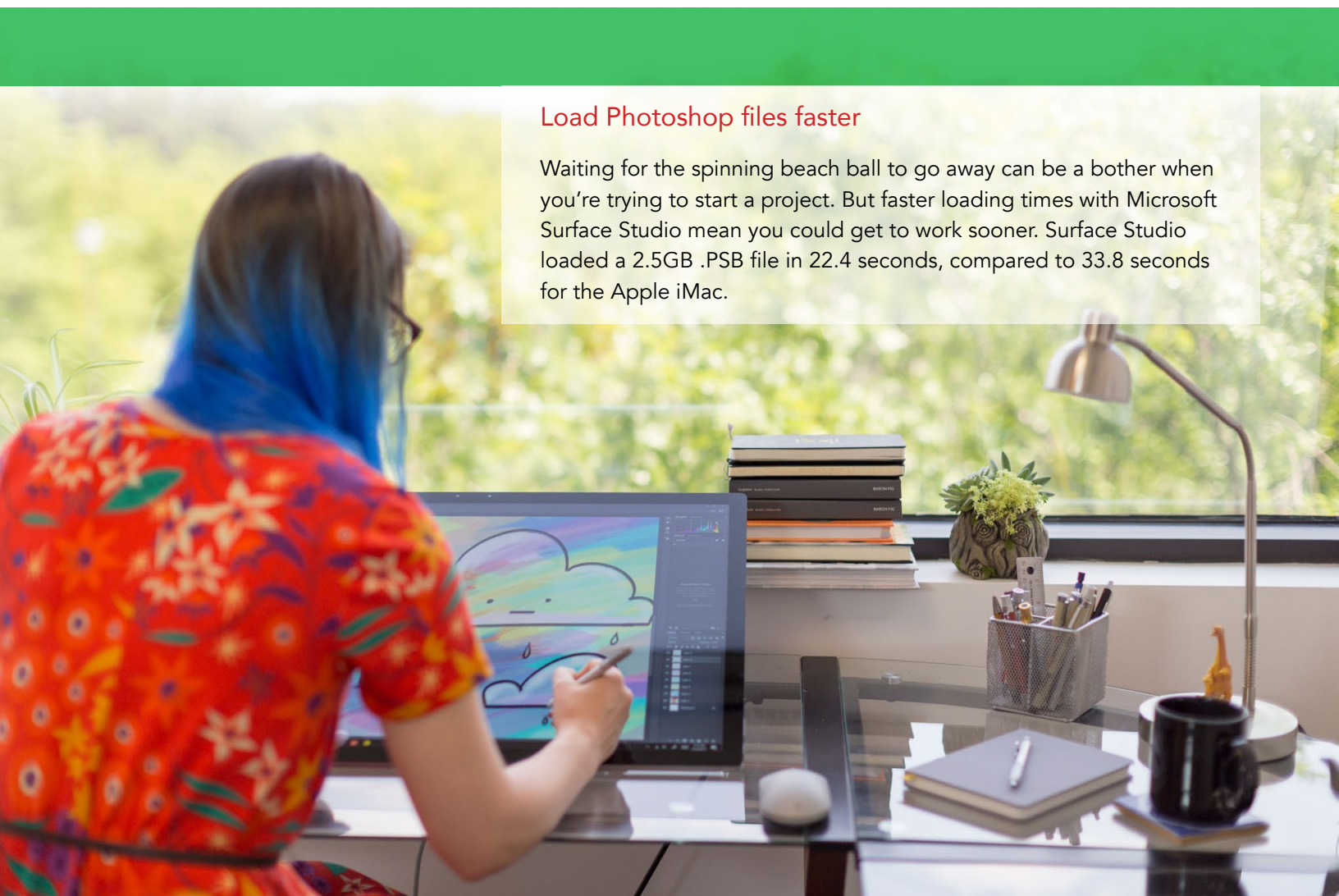
If your work requires a lot of drawing, you might use two workflows: drawing on paper, then scanning and importing the line art; or drawing a digital image using an intermediary device such as a drawing tablet. These solutions often work well enough, but Surface Studio offers a more direct route via its Surface Pen and PixelSense screen.

To see what Microsoft brings to the table, we brought in members of our own professional creative team to try out drawing functions on Surface Studio and the iMac. Three of our graphic designers sat down to trace over photographs with each device, using Surface Pen with Surface Studio, and using a Wacom® tablet with the iMac. For the first test, designers traced an agave plant and were not allowed to use the undo button. Next, the designers traced a photo of a zebra, but were allowed to use the undo button (using Surface Dial on Surface Studio).

Once the designers finished, we collected their tracings and exported them as .PNG files. Using a Python script, we calculated the mean squared error (MSE) between each designer's drawings, and then compared how each designer fared on Surface Studio and the iMac. The direct input afforded by Surface Studio enabled our designers to trace with an average of 21 percent greater consistency, implying an enhanced precision. Our designers also worked faster with Surface Studio, completing the task in 24 percent less time on average for the portion of the test that allowed undos. For a full breakdown of these results, see [Appendix B](#).

Load Photoshop files faster

Waiting for the spinning beach ball to go away can be a bother when you're trying to start a project. But faster loading times with Microsoft Surface Studio mean you could get to work sooner. Surface Studio loaded a 2.5GB .PSB file in 22.4 seconds, compared to 33.8 seconds for the Apple iMac.

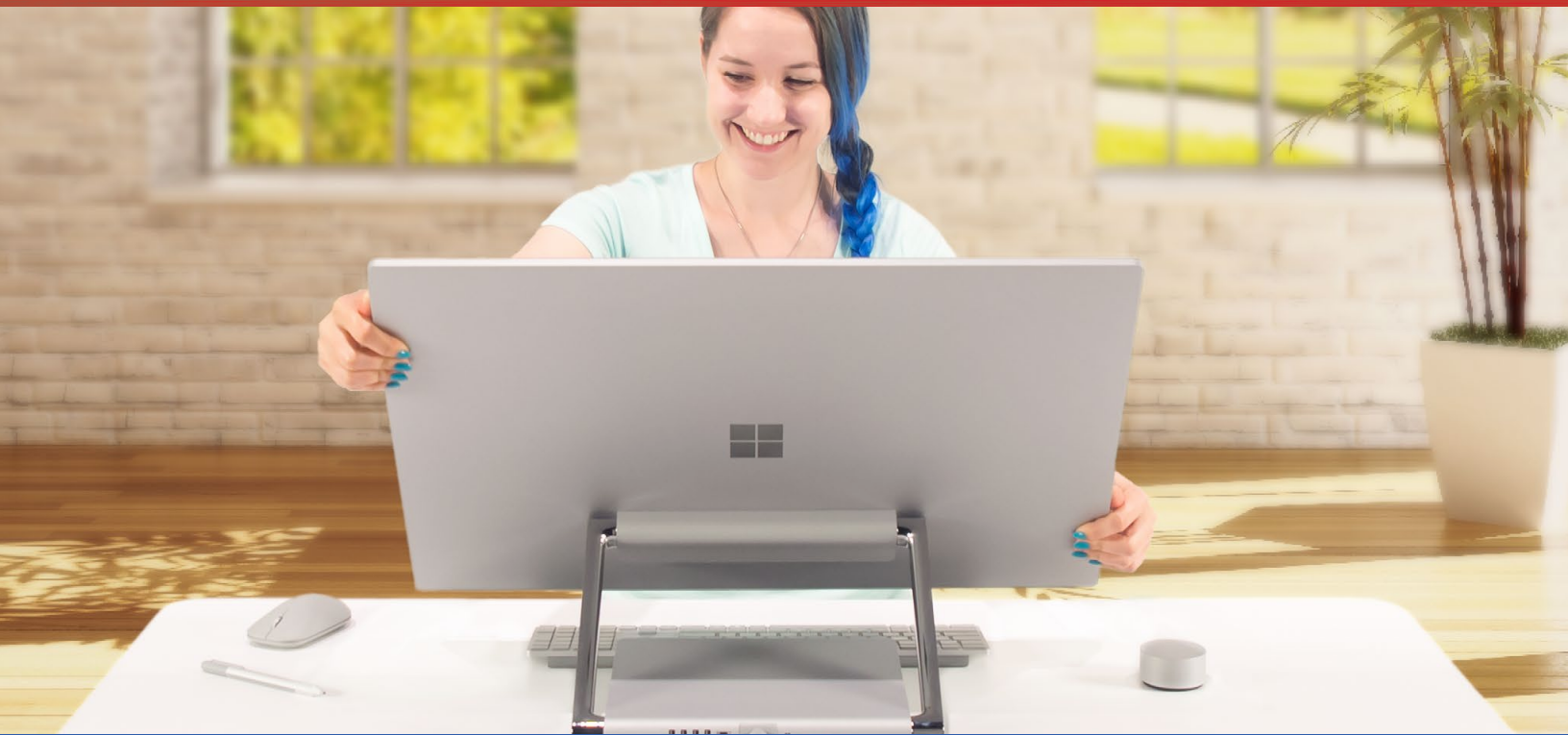


Faster video rendering in Adobe Premiere Pro

You can probably find productive ways to spend the dozens to hundreds of minutes it takes to render your video work—but none will be as satisfying as just having the video done sooner. Waiting for rendering can prevent you from doing other work, as your video takes up precious computing power. But with Surface Studio, your HD and 4K videos could render faster, giving you peace of mind and wiggle room before your next deadline.

Using Adobe Premiere Pro, we tested each machine's video rendering capabilities when encoding a 16-minute video with different file configurations. Surface Studio saved time in each scenario: 16.6 minutes encoding to 4K H.265; 3.8 minutes encoding to 1080p H.265; and 3.1 minutes encoding to 1080p H.264. For a full breakdown of these results, see [Appendix B](#).





Conclusion: Save time and improve your work with Surface Studio

For the creative professional, the Microsoft Surface Studio has the potential to add a whole new dimension to drawing work. In our own creative space, Surface Studio enabled professionals like you to get drawing work done up to 24 percent faster and with up to 21 percent enhanced precision in Adobe Photoshop. With Surface Studio, our videographers spent 16 fewer minutes waiting for video to render in Adobe Premiere Pro. Getting certain tasks done sooner will enable you to spend more time perfecting your creations, or give you time to move onto the next project that much faster. Furthermore, features such as Surface Pen, Surface Dial, and the PixelSense screen offer new innovations over the Apple iMac while setting up for potential expanded functionality in the future.

1 <https://www.microsoft.com/en-us/surface/devices/surface-studio/innovation>

2 <https://www.microsoft.com/en-us/surface/accessories/surface-pen>

On April 27, 2017, we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears. For older systems, we chose configurations representative of typical purchases of those systems. We concluded hands-on testing on May 16, 2017.

Appendix A: System configuration information

System	Microsoft Surface Studio	Apple iMac
Processor		
Vendor	Intel	Intel
Name	Core i5	Core i5
Core frequency (GHz)	2.6 – 3.5	3.2 – 3.6
Number of cores	4	4
Cache	6 MB L3	6 MB L3
Memory		
Amount (GB)	8	8
Type	DDR4	DDR3
Graphics		
Vendor	NVIDIA	AMD
Model number	GeForce GTX 965M	Radeon R9 M390
VRAM	2 GB	2 GB
Storage		
Amount	64 GB SSD with 1TB HDD	24 GB SSD with 1TB HDD
Connectivity/expansion		
Wired internet	Intel I219-LM	Broadcom Gigabit Ethernet
Wireless internet	Marvell AVASTAR Wireless-AC	Airport Extreme 802.11ac Wi-Fi
Bluetooth	4.0	4.0
USB	4 x USB 3.0	4 x USB 3.0
Thunderbolt	N/A	2
Video	1 x Mini DisplayPort	1 x Mini DisplayPort
Display		
Size (in.)	28	27
Type	PixelSense Display	Retina 5K display with IPS technology
Resolution	4,500 x 3,000	5,120 x 2,880
Touchscreen	Yes	No
Operating system		
Vendor	Microsoft	Apple
Name	Windows 10 Pro	macOS Sierra
Build number or version	15063	10.12.4

Appendix B: Detailed results

Adobe Photoshop tracing times and mean squared error (MSE)

The table below shows detailed test results for Adobe Photoshop testing. We recorded the time each designer took to finish tracing an image. Below the time, we show the average mean squared error data, comparing each of the designer's traces to each other.

	Microsoft Surface Studio		Apple iMac	
	Time without undos (m:ss)	Time with undos (m:ss)	Time without undos (m:ss)	Time with undos (m:ss)
Designer 1	6:37	5:25	6:51	7:13
	5:50	4:58	7:07	6:31
	6:40	4:52	6:33	6:35
Average time	6:22	5:05	6:50	6:46
Average MSE	134.20	106.00	163.40	146.90
Designer 2	2:02	4:05	3:47	5:21
	2:15	3:37	3:17	4:51
	2:11	4:07	3:13	5:06
Average time	2:09	3:56	3:25	5:06
Average MSE	386.50	180.50	483.20	235.30
Designer 3	4:27	6:00	4:27	6:46
	4:00	5:28	4:19	7:21
	3:59	5:24	4:21	8:33
Average time	4:08	5:37	4:22	7:33
Average MSE	212.31	164.91	289.10	142.20

Adobe Premiere encoding times

The table below shows detailed results for our Adobe Premiere Pro test. We recorded the time it took for each system to render and encode a 16-minute video using three file configurations. All times are displayed in minutes.

Encoding to 1080p H.264	Run 1	Run 2	Run 3	Average
Microsoft Surface Studio	13.8	13.7	13.7	13.7
Apple iMac	16.8	16.8	16.8	16.8
Encoding to 1080p H.265	Run 1	Run 2	Run 3	Average
Microsoft Surface Studio	30.9	30.9	30.9	30.9
Apple iMac	34.7	34.8	34.8	34.7
Encoding to 4K H.265	Run 1	Run 2	Run 3	Average
Microsoft Surface Studio	129.1	130.1	129.3	129.5
Apple iMac	146.3	145.8	145.7	145.9

Appendix C: Adobe Photoshop tests

Tracing tasks

For the tracing tasks, we used images sized to 2400 × 2400 pixels at 300 ppi. We set our brush tool to 5 pixels at 100 percent hardness, and we disabled pen pressure dynamics. Before performing the tasks, we created a reference tracing for each image so that each user could trace the same portions of the images. As one user focused on tracing, a second user timed the task. Users could zoom and rotate the canvas according to their personal preference.

Saving the tracings

We asked users to perform each tracing task three times. For each user's set of three tracings, we saved only the tracing images (without the background images) as PNG files named `Trace1`, `Trace2`, and `Trace3` in a folder named `images`.

Tracing without using Undo or Redo functions

During this task, users could not use the Undo or Redo functions, allowing us to assess the quality of the tracing with the styli of each solution.

1. Open the first image in Photoshop CC.
2. In the Layers panel, set the opacity of the image to 50 percent.
3. From the top menu, select `Layer→New→Layer`.
4. Name the layer `Tracing`, and click OK.
5. From the Tools panel, select the brush tool.
6. Simultaneously start the timer and trace the image on the new layer by using the stylus.
7. When the tracing matches the reference image, stop the timer.
8. Save the image as a PSD file.
9. Repeat steps 1 through 8 twice, and record the average time.

Tracing with Undo and Redo functions

During this task, users could use the Undo and Redo functions, allowing us to assess the ease of using the styli with each solution. On the Microsoft Surface Studio, users performed Undo and Redo functions by either rotating the Dial or pressing it once. On the iMac + Wacom solution, users performed Undo and Redo functions by using the keyboard shortcut `CMD+ALT+Z`.

1. Open the second image in Photoshop CC.
2. In the Layers panel, set the opacity of the image to 50 percent.
3. From the top menu, select `Layer→New→Layer`.
4. Name the layer `Tracing`, and click OK.
5. From the Tools panel, select the brush tool.
6. Simultaneously start the timer and trace the image on the new layer by using the stylus.
7. When the tracing matches the reference image, stop the timer.
8. Save the image as a PSD file.
9. Repeat steps 1 through 8 twice, and record the average time.

Comparing the tracing results

We ran the following `compare.py` program in Python (modified from <http://www.pyimagesearch.com/2014/09/15/python-compare-two-images/>) and edited the `path_to` to match the path to the images folder. As each comparison plot appeared, we noted the MSE value on the plot and averaged the three MSE values for the three side-by-side image comparisons the program performed. We report that result as the average MSE for the user on that tracing task.


```

compare.py
import matplotlib.pyplot as plt
import numpy as np
import cv2

def mse(imageA, imageB):
    err = np.sum((imageA.astype("float") - imageB.astype("float")) ** 2)
    err /= float(imageA.shape[0] * imageA.shape[1])

    return err

def compare_images(imageA, imageB, title):
    m = mse(imageA, imageB)
    s = ssim(imageA, imageB)

    fig = plt.figure(title)
    plt.suptitle("MSE: %.2f" % (m))

    ax = fig.add_subplot(1, 2, 1)
    plt.imshow(imageA, cmap = plt.cm.gray)
    plt.axis("off")

    ax = fig.add_subplot(1, 2, 2)
    plt.imshow(imageB, cmap = plt.cm.gray)
    plt.axis("off")

    plt.show()

trace1 = cv2.imread("path_to/images/Trace1.png")
trace2 = cv2.imread("path_to/images/Trace2.png")
trace3 = cv2.imread("path_to/images/Trace3.png")

trace1 = cv2.cvtColor(trace1, cv2.COLOR_BGR2GRAY)
trace2 = cv2.cvtColor(trace2, cv2.COLOR_BGR2GRAY)
trace3 = cv2.cvtColor(trace3, cv2.COLOR_BGR2GRAY)

fig = plt.figure("Images")
images = ("Trace1", trace1), ("Trace2", trace2), ("Trace3", trace3)

for (i, (name, image)) in enumerate(images):
    # show the image
    ax = fig.add_subplot(1, 3, i + 1)
    ax.set_title(name)
    plt.imshow(image, cmap = plt.cm.gray)
    plt.axis("off")

compare_images(trace2, trace3, "Trace2 vs. Trace3")
compare_images(trace1, trace2, "Trace1 vs. Trace2")
compare_images(trace1, trace3, "Trace1 vs. Trace3")

```

Opening a 2.5GB.PSB project file

1. Open Adobe Photoshop CC 2017.
2. Click File > Open.
3. Navigate to the project file's directory and select the project file.
4. Simultaneously start the stopwatch and click Open.
5. When the project file fully loads and is visible in the workspace, stop the stopwatch and record the result.

Appendix D: Adobe Premiere Pro tests

Between test runs, we deleted all the files in the Adobe Premiere folders “Media Cache” and “Media Cache Files” (located in C:\Users\username\AppData\Roaming\Adobe\Common on Windows, and in \Users\username\).

Before testing, we prepared a ~16-minute 1080p video file in Adobe Premiere Pro.

Rendering 1080p in H.264, 1080p in H.265, upscaling 1080p to 4K in H.265

1. Launch Adobe Premiere Pro.
2. Open the existing project.
3. Click inside the Timeline view.
4. Click File→Export→Media.
5. Set the export settings depending on the test run:
 - a. For H.264 at 1080p, set the format to H.264, and set the Preset to Match Source – High bitrate.
 - b. For H.265 at 1080p, set the format to HEVC (H.265), and set the preset to Match Source – High bitrate.
 - c. For upscaling 1080p to H.265 at 4K, set the format to HEVC (H.265), and set the preset to 4K UHD.
6. Simultaneously start the stopwatch and click Export.
7. When the encoding process finishes and the window disappears, stop the stopwatch and record the result.

This project was commissioned by Microsoft.



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