The cathedral window in a new light

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At the intersection of science and art: the Audiovisual Communications Laboratory has developped software to observe stained glass with a light and viewing angle that have been chosen to reveal unexpected details.

Adjusting the brightness setting of the large window on the south façade of the Cathedral of Lausanne seems impossible. Yet that's what a team from the Audiovisual Communications Laboratory has achieved. It is at once unusual and promising: the team's software can see on a screen any window with a selected brightness in order to grasp every detail. Backed by Google, this work is part of eFacsimile, a research project that aims to develop a new paradigm of acquisition, representation, and rendering for high-quality reproductions of art.

As a testament to the quality of this ancient art, stained glass has the advantage of being well preserved. Colors remain almost unchanged over centuries, as evidenced by the impressive 13th century pink adorning the southern facade of the church building of the Vaud capital. Despite their translucence, in order to grasp all aspects of their colors, viewers must dedicate numerous visits over several hours – and in different weather conditions.

To overcome the physical impossibility of moving the window or choosing the weather, the researchers began by analyzing the characteristics of the microstructure of the window glass in the laboratory. While a portion of the rays came directly to the viewer's eye, others dispersed, causing the sensation of glarein some places. The analysis of photographs of the material under different light intensities

helpedhighlight the impurities and scattered rays. The researchers created a list translated into algorithms.

In conjunction with this, a camera located in the dome opposite the pink acquired images over a day and a half to capture a large range of luminosities. Simultaneously, three time-lapse cameras placed at the same level, but outside the building, captured a 180 degree view of the incident light on the window.

Ultimately, the program written by doctoral student Niranjan Thanikachalam is responsible for superimposing the images and selecting the brightness. In the example set for this experiment, seen on YouTube, a time lapse of the San Francisco Bay is placed behind the work. The result inspires ideas for other amazing unions that will transport the windows to other latitudes, luminosities, and weather conditions, thereby discovering them in a new light.

The goal now is to make a simple software to reproduce other glass windows. It is worth noting that more work around the cathedral was done in 2013 and is available on the LCAV website. A virtual tour is available there. With a simple click, for example, it is possible to hear a piece of organ in the exact acoustics of the location.

More information: lcav.epfl.ch/eCathedral

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