COLOURS TOOL

Lenticular Colour Reconstruction Tool (doLCE 2.0)

Digital restoration of early lenticular film formats like Kodacolor.

Lenticular Film Restoration | Kodacolor Reconstruction | Digital Film Colorization | Audiovisual Heritage Preservation | Computational Image Processing

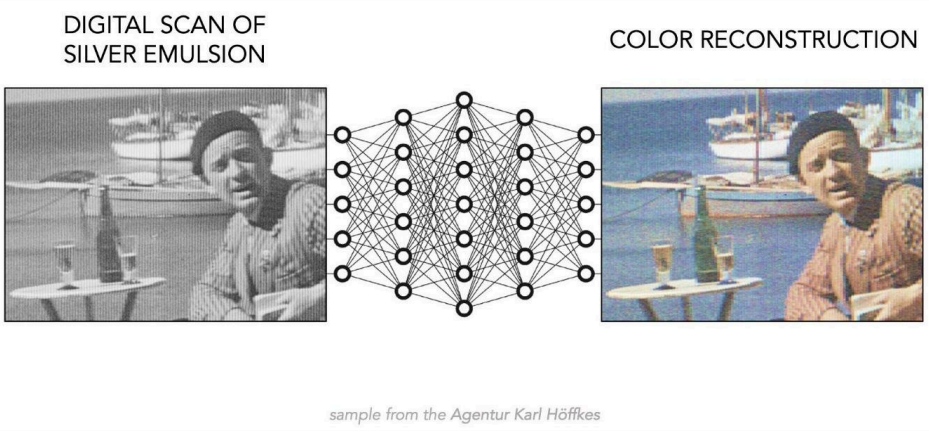


Fig. 1: From the digital scan of the silver emulsion to the colour reconstruction.

OVERVIEW

doLCE 2.0 is a digital restoration tool dedicated to the recovery of colour information embedded in early lenticular film formats such as Kodacolor. In the COLOURS project, the tool was initially referred to as Kodacolor Colorizer.

Kodacolor, introduced in the 1920s, used a black-and-white film embossed with microscopic lenticules. When combined with a red-green-blue filter during filming and projection, these lenses encoded colour information as fine vertical RGB components within the monochrome emulsion.

doLCE 2.0 computationally extracts and reconstructs this hidden chromatic data. By analysing the lenticular structure and separating encoded RGB signals, the tool digitally reassembles full-colour frames from deteriorated or fragile historical films.

The system supports heritage professionals in restoring rare home movies and archival footage, ensuring accurate colour recovery while preserving original material characteristics. It represents a bridge between historical optical technologies and modern digital preservation methods.

KEY FEATURES

- Automated detection of lenticular structures in scanned film frames
- Extraction of embedded RGB components from monochrome emulsions
- Digital reconstruction of full-colour imagery from Kodacolor films
- Correction of optical distortions and lenticule misalignment
- Frame-by-frame restoration workflow for archival films
- Integration with high-resolution film scanning pipelines
- Non-destructive processing preserving original film data
- Cloud-compatible processing for large audiovisual collections

IN PRACTICE: A USER STORY

Elena works at a national film archive. Recently, the institution digitised a collection of 1920s home movies shot on Kodacolor film. The footage appears black and white, but documentation confirms it was originally recorded in colour using a lenticular process.

Funded by the European Union under Grant Agreement No 101233413. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them. COLOURS is part of the ECCCH initiative, coordinated by the ECHOES project.

Elena uploads the high-resolution scans and launches doLCE 2.0. The tool automatically detects the fine lenticular pattern embedded in each frame. Using calibrated algorithms, it separates the encoded red, green, and blue components recorded as vertical stripes in the emulsion.

On her screen, a preview window shows the gradual reconstruction of colour. What first appeared as a grey-toned garden scene slowly reveals green foliage, blue sky, and warm skin tones. Elena adjusts alignment parameters to compensate for slight deformation caused by film shrinkage over time.

The tool processes frames in sequence, applying geometric correction and chromatic reconstruction. A side-by-side comparison allows her to evaluate the restored colour against the original scan.

Later, she shares the reconstructed footage with historians studying early amateur cinema. The restored film is archived together with metadata documenting the reconstruction parameters, ensuring transparency and reproducibility.

Through doLCE 2.0, Elena is not artificially colourising black-and-white film; she is recovering authentic historical colour information embedded in this optical technology, bringing early colour cinema back to life.

WHY ON THE CULTURAL HERITAGE CLOUD?

Within the COLOURS framework, tools are designed to operate as interoperable, cloud-based services. Hosting doLCE 2.0 on the ECCCH ensures scalable processing of high-resolution film scans, secure storage of audiovisual assets, and structured metadata management.

The reconstruction of lenticular films requires computationally intensive frame-by-frame analysis. Cloud infrastructure enables distributed processing and version-controlled workflows, while preserving links between original scans and restored outputs.

ECCCH integration also allows collaboration among film archives, researchers, and restoration laboratories across Europe, facilitating shared datasets, reproducibility of results, and long-term digital preservation.

WHO CAN USE IT

doLCE 2.0 primarily serves film archives, audiovisual heritage institutions, cinematheques, and restoration laboratories working with early colour film technologies. Conservation scientists and imaging specialists benefit from advanced reconstruction algorithms tailored to lenticular processes.

Within a cloud-based European ecosystem, additional users may include universities, digital humanities projects, and SMEs specialising in audiovisual digitisation.

EXPECTED TIMELINE

Alpha 2026
RGB extraction and alignment

Beta 2027
Pilots with partner film archives

Release 2028
Production-ready on the ECCCH

Under the COLOURS project, doLCE 2.0 will evolve into a fully operational restoration service.

An Alpha version (2026) will implement core RGB extraction and lenticular alignment algorithms, tested internally on selected archival materials.

A Beta version (2027) will support pilot deployments with partner film archives, integrating ECCCH storage and collaborative workflows.

By 2028, a production-ready release is expected, fully cloud-integrated and interoperable within the Cultural Heritage Cloud infrastructure.

CONTACT

Sinha Saptarshi Neil, Fraunhofer IGD · saptarshi.neil.sinha@igd.fraunhofer.de
Giorgio Trumpy, HSLU/NTNU · giorgio.trumpy@ntnu.no

All COLOURS tools:
colours-eccch.eu/tools

Funded by the European Union under Grant Agreement No 101233413. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them. COLOURS is part of the ECCCH initiative, coordinated by the ECHOES project.