Photographic and Cinematographic Film Repository (FiRE): identification of films for digital restoration

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Abstract

Among the great variety of our Cultural Heritage, photographic and cinematographic materials are fundamental and direct witnesses of the past. The classification and restoration of these materials are often needed as they can undergo severe deterioration, aging and fading.
In the work of film and photo restoration, conservation and preservation, it is fundamental to analyse and study the original materials, in order to perform a retrieval or a correction faithful to them. In this context, the lack of technical information (especially for the oldest materials) and the absence of open source archives of the production companies, underlines the actual and concrete need of a database of physical, chemical and sensitometric data of films and photos. The aim of this work is the creation of a big database of cinematographic and photographic technical materials, in order to support the work of conservators, restorer and researchers, as the availability of information is essential for the preservation of our Cultural Heritage.

Keywords: film restoration, film database, sensitometry.

Introduction

Film restoration is a complex process involving many different fields, from the physical and chemical aspects to the cultural background in which the film has been produced.
For instance, the first step of film restoration is historical and philological research, as usually many different copies of the same photo or motion picture are available: some of them may have suffered censorship, some others may present intertitles, etc.
On the other hand, over the years, the film industry has faced a lot of innovations in many fields, such as the development of different film base materials, the introduction of different colouring techniques and the advance of many acquisition and projection instruments as well as printing and developing machines. The latest step of this evolution is the introduction of digital technologies, which today is going through a deep development in the acquisition and fruition techniques. In this context, it is fundamental to analyse, study and understand the chemical and physical composition of the different films to set up restoration workflows which are faithful to the original materials also employing modern acquisition and fruition instruments.
For these reasons researchers and restorers often relay on public archives to collect all the information needed for their work, as the documentation process is fundamental to perform a correct film restoration. However, the lack of strict international guidelines make this a hard task for the professional figures working on it as *film restoration still struggles to establish a binding professional code, comparable to those already in place in fine art restoration and heritage conservation* (Busche, 2006). The main goal of this work is the creation of an open source technical database of cinematographic and photographic materials, in order to support the work of conservators, restorer

and researchers. So far, the database includes technical data coming from different photographic archives, partial databases and websites, which have been supplemented with more detailed and useful information.

Working methodology

Through the history, many works have been already done and published, to catalogue and organize the different techniques and materials used along the history of photography and cinema. Nevertheless, many technical information on film sensitometry and emulsions has been lost and even if some efforts have been made to create dataset collections and catalogues, very few works are open source and have been published (Plutino A., Rizzi A., 2020).
Starting from this need, different existing databases have been merged and different sensitometric and technical information about films have been added, to create and unique open source database available for every researcher.
The proposed work has been developed in 4 different steps:

1. Preliminary analysis of the films collected by R. Gschwind in *Historische Kleinbildfilm Datenbanke* archive, then updated with more information included in B. Flueckiger's database *Timeline of Historical Film Colors* and with the work of N. Mazzanti (Mazzanti, 2009).
2. Creation of a unique identification code for each catalogued film, to combine and collect all the information related to every indexed material. The code is based on the leading features of the film, as explained in the following section.

3. Implementation of a website to share the collected material, with a main goal: the creation of a public and free database always evolving and updating with new information. HTML/CSS/JS were used as coding languages.

Results

The data processing and development process were divided into four main steps.

Preliminary analysis

The first step consisted in the coherent reorganization of the collected material and was possible thanks to the creation of a first simple database in Microsoft Excel. The films were initially divided by brand and a table was created that listed the significant fields of each film (figure 1). Due to the lack of information available, not all fields could be completed.

code	PCNAGFAC1
name	Agfacolor CN 17 (Universal)
date	1956-1975
origin	Germany
photo/movie	photo
type	CN
colouring principle	
ISO	40
grain	
pose latitude	f 8-2,8
contrast	
fortmat	
n° camere films	
soundtrack	
use	

Fig. 1 – attribute's table

Additional research

The research for useful information and technical and physical characteristics about the films led to the collection of attached files of various kinds, including photographs (mainly from the database created by Rudolf Gschwind), technical datasheets and sensitometric graphics useful for defining the qualitative aspects of a film such as exposure, wavelength of the dye used, spatial frequency and spectral density of the dye.

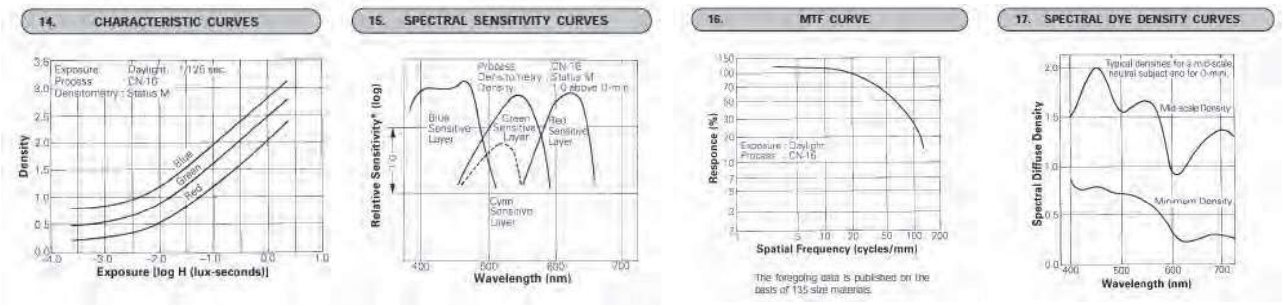

Fig. 3-4 –Sensitometric graphics of Fujicolor Superia 100

Identification code

A unique identification code to define each film was created, as they often have long and similar names. The attached files were collected in folders, named by this code. The unique nine-character code summarizes the main characteristics of each film: the use for photo (photo = P) or video (movie = M); the type of film, i.e. color positive (CP), color negative (CN), color reversal (CR), or the term negative-positive (NP) for films that have both positive and negative version; the production company, indicated by the first three letters of the name (for example Kodak = KOD); and three alphanumeric signs indicating the model of the film itself. Developing a code that referred to the film model was not easy due to the extreme ease with which identical codes could be created.

Fig. 2 – exemplum of code creation

Website

The most important step, however, was the creation of a website containing the proper database, created primarily to make the results of this research available to the community of restorers, archivists and professionals in the field of film restoration. The aims were to create a database that is public and free of charge, useful for promoting research and the development of new knowledge. It also claims to become a place for sharing technical information and it invites the user to become a participant in the project himself. The proposed framework wants to promote the exchange of material in order to encourage the sharing of knowledge in film restoration. The creation of this platform is also placed as a base for growth and integration with future studies as development of sensitometric analysis and scientific investigations on new materials. The site, renamed Photo FiRe - *Film Repository for Digital Restoration* - and available both in Italian and English, is organized in a *Home page* from which it is possible to access the sub-sections *About us, Archive, Help us and Contacts*. The structure of the site is visible in figure 3.

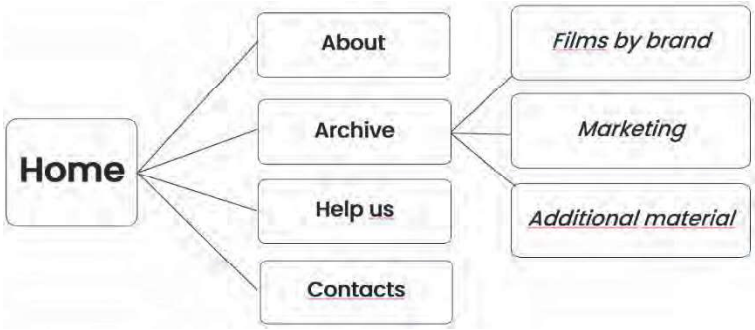

Fig. 3 – website structure

Notably, the *Archive* section is the backbone of the site as it contains the main products of research such as films and technical data. Currently the section contains a further subdivision by brand of films with their respective characteristics and folders containing the attachments, linked to these ones through the code. In addition, and unrelated to the singularity of a specific film, there are sub-sections dedicated to marketing, advertising and additional material. An outline of the structure of this section can be seen in figure 4.

Fig. 4 – archive structure

The possibility of involving other subjects in the research and creation of the archive, is underlined in the *Help us* section, which is dedicated to anyone in possess of material useful to enrich the database: collaboration is very simple and takes place through a form compilation. There is always a control procedure for submitted material prior to publication.

Conclusions

The presented work is therefore developed around the creation of a single large technical database that collects the historical, physical and sensitometric data of the films, to be used as a starting point for such studies. The researches led to the cataloguing of 457 films, each one provided with useful specifications and many of them also with attachments, collected in 161 folders including photographic images, illustrative sheets, links to useful sites or sensitometric graphs.
However, this study was not free from problems, such as the difficulty in finding technical data, both online, but also in the archives of the production houses, inexistent or often inaccessible.
The scarce availability of public archives led to various gaps with the consequent impossibility of attributing a structured code to all films. The current research lays the basis for a future development of the project, i.e the creation of a real relational database, programmed through PostgreSQL, to make the search and download of the material easier and more immediate. First of all, the realization of this website wants to provide an access point for the sharing of knowledge, a key aspect in scientific research. The archiving and classification of any kind of material are also fundamental activities in the field of Cultural Heritage, not only to maintain a trace of the past, but also to support the activities of restoration and conservation itself.

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