

Giravolt, the 3D digitization program of the Catalan cultural heritage

Damià Martínez, Albert Sierra, Lluís González

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Abstract

1. The documentation and reproducibility of cultural heritage

Art in general, and particularly cultural heritage, have been susceptible to reproduction since immemorial times. Different cultures have always shown great interest in making copies that, more or less accurately, replicated originals. Roman sculpture, with its fantastic and precise point transferring system, is a good example of this, or the long tradition of medieval copyists.

Undoubtedly, the copy often carried as much meaning and knowledge as the original. However, this fruitful relationship between the two took a new turn with the reflections of Walter Benjamin in his famous and indispensable essay *The Work of Art in the Age of Mechanical Reproduction*. From the twentieth century onwards, the practice of copying was completely emancipated from the artisanal and manual dimension that had predominated in previous eras, and with the popularization of photography it fully entered the possibility of reproduction by exclusively mechanical means. Previously, with engraving and printing, the relevance of mechanical procedures had already been gaining ground. But the advent of photography suddenly established the possibility of mechanical copying, at least when it comes to the reproduction of works of art. At this point a debate appeared on the true authenticity of the work of art—the *aura*, as the philosopher of the Frankfurt school said—and it still lasts today, under new formulations and technological possibilities.

In mid-2018, aware of the great moment of change we are experiencing, in the Ministry of Culture we began to develop an ambitious program for the 3D digitization of the cultural heritage of Catalonia of all kinds, both objects and real estate. This program, jointly promoted by the Directorate-General for Cultural Heritage (DGPC) and the Catalan Cultural Heritage Agency (ACdPC), aimed not only to digitize our heritage but to make this technology known to the entire professional sector. By doing so, we advanced towards the same path that other institutions abroad had already started. Because, in a similar way to what happened with the emergence of photography, the great force for change was not its invention but its popularization—increasingly simple procedures and lower costs introduced it in a permanent way and forever to the world of cultural heritage, allowing new forms of relationship with original works for scholars and cultural heritage managers. Similarly, in the second decade of the twenty first century, 3D digitization procedures for objects and buildings were opening up new worlds of possibilities that were impossible not to use.

Dictionaries define the Catalan word *giravolt* (somersault) as the complete turn over of a body in the air. It is a

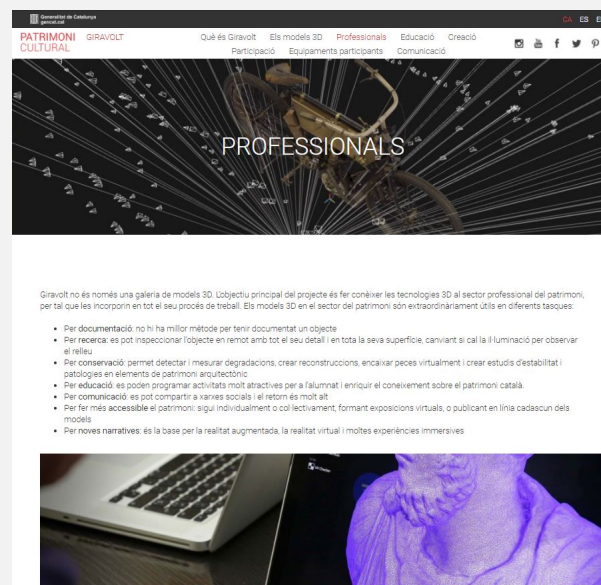
common concept in our language, which we often use applied to various meanings, from road and path turns to somersaults and childhood games, but it also has a certain poetic meaning. It is a concept that very nicely fuses two words into one: turning and spinning. It is a very illustrative concept when applied to the discovery and enjoyment of cultural heritage (especially that which is characterized by its volume) from a three-dimensional digital model. Spinning cultural heritage around is to do, in some way, what we always understood that enriches our gaze—to see things from different points of view.



. Capture of the virtual model of Josep d'Arimatea.
Erill-la-Vall Descent from the Cross.

The program that we present in this article is a project that has a dual purpose: to do and to teach. Digitizing and simultaneously teaching how to digitize. Creating and taking advantage of this new “image” of our cultural heritage from the creative and educational spheres. The idea behind Giravolt consists of four backbones: the creation of a large digital repository of the cultural heritage of Catalonia (both objects and real estate) as wide and open as possible, the relationship with the professional sector, the link with the educational field and, last but not least, the dissemination and promotion of the usage of 3D models.

Since its public presentation at the Ideal hall in Barcelona in December 2020, the Giravolt program has come a long way, but it also has a lot of work ahead. This article allows us to explain and share with the professional community the state of this issue, what the program consists of, what are the main goals achieved and what are the next goals we set in the short and medium term. It is written by three of the five members who make up the “Giravolt commission”, an interdisciplinary work team (formed by Judit Figueras and Marta Sáez too) that allowed us to provide the program with efficient governance for a project of this magnitude and complexity.



Giravolt's website:

<http://patrimoni.gencat.cat/ca/giravolt>

2. 3D capture: background and references

Capturing 3D images of heritage (both objects and real estate) is not, as we said, a novelty strictly speaking. There are many backgrounds and references both in our country and abroad that should be mentioned and that help us to measure their usefulness. Some uses are already assimilated and have proven their solvency. Some other possibilities, however, we are just now beginning to intuit.

2.1. The usefulness of 3D models in cultural heritage

3D models are very useful tools in various phases of heritage management. Having them allows us to record and document with a high level of accuracy the state of conservation of a work at a given time. They provide us with useful support tools for the diagnosis of works of art (orthophotos, sections, untextured models, real-time measurements). They serve as a starting point for proposing virtual restorations and anastylosis focused on the dissemination of both the work of art and the investment in its conservation. These digital interventions can then be transferred to physical support through the impression of lost areas to reintegrate them in the work, or they can be turned into augmented reality, visualizing them for example with a mobile device directly on the work of the restored model. This allows us to recreate the original color that could be present in lost areas, or to make chromatic reintegrations without the need for direct intervention on the work. 3D models also make it possible to obtain reproductions without the need to directly mould the work, for example, with the utmost respect for the original or also to serve as a basis for generating tailor-made packaging.

2.2. Architecture, archaeology and palaeontology

In the conservation of heritage, it is essential to have good graphic documentation detailing the state of monuments or archaeological sites, in order to achieve the objectives set by the action of the Directorate-General for Cultural Heritage: the protection, conservation, growth, research and dissemination of heritage.

Traditionally, and still today, this documentation consists of the elaboration of 2D planimetry that represents the graphed part of a monument. As it is essential that this documentation is of the highest quality and accuracy, fifteen years ago DGPC decided to scan monuments. In this line, first contacts with laser scan technology were initiated with the aim of acquiring total graphic and physical information on the monuments. At first, they were follow-ups on work already carried out. Later came the first orders to companies to execute this kind of documentation, which continued with the first pilot tests carried out by the technicians of the department. Now, after much effort, we have available all the material, equipment and training needed to carry out this kind of documentation on a regular basis.

Some examples of this work are the documentation of the monastery of Escornalbou, the cloister of the royal monastery of Santes Creus, the interior of the basilica of Santa Maria del Mar or the Palau Moja, among others.



Capture with a laser scanner of the Claustre de
Santes Creus, 1,200 million points

In terms of archaeology and palaeontology, DGPC also has experience in scanning in various situations all over the territory. The Mollet menhir or the dinosaur footprints at Fumanya are two of the first examples in which the findings were documented in three dimensions. The Archaeology Service currently has technicians trained to carry out these tasks. In Catalonia, other entities such as the [Catalan Institute of Classical Archaeology](#) or different units of the [Polytechnic University of Catalonia](#) have long used 3D in their research work on Catalan heritage architecture.

2.3. Scanning museum objects

If we talk about 3D scanning of museum objects, it must be said that the aim of the first relevant examples was to obtain copies. We are referring, for example, to the [Aesculapius of Empúries](#), or later to the altarpiece by Bernat Saulet of the Episcopal Museum of Vic. If we talk about research, however, two museums of natural sciences have also been pioneers in the usage of 3D—the [Catalan Institute of Palaeontology](#) Miquel Crusafont and the [Museum of Natural Sciences of Barcelona](#).

As for the entities that make up the Catalan Cultural Heritage Agency, the [Center for the Restoration of Movable Property](#) has used 3D documentation on several occasions, but what has had a more prominent activity is the scanning and dissemination project undertaken by the Museum of Archaeology in Catalonia, which later spread to the Arqueoxarxa, a collection of more than a hundred objects that were published on the Internet on the [Sketchfab](#) channel and also [on its website](#).

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2.4. International benchmarks

However, if we talk about background on an international scale, in terms of 3D documentation and its subsequent use in different tasks, there have been two pioneering experiences that have definitely marked the way for other institutions that have worked on three-dimensional documentation.

The first case is the [Scottish Ten](#) project of the Historic Environment Scotland, which, since 2009, scanned ten major monuments in the world declared World Heritage. With this ambitious project this Scottish institution achieved a valuable background and extended its experience and mastery to the management of the more than three hundred monuments in its charge. Thus, HES built a digital documentation team that is currently one of the major European benchmarks.

The second case is the documentation project for the Smithsonian Institution's immense collection. This organization, which manages nineteen American museums, began a powerful policy of digitizing its diverse collection in 2009, first in 2D and after in 3D, and is a true pioneer both in terms of methodologies and, especially, with the publication of its [open access](#) models, which has also set a trend.

3. The Giravolt program

3.1. The beginnings of the program

In 2018, the Ministry of Culture, ACdPC and DGPC considered 3D technologies to be a strategic value. Giving this relevance to a technology and all the possibilities it offered was the real starting point to begin a series of pilot actions, on the one hand, and the training of technicians through a set of different courses and the presence in

international conferences, on the other. This assistance and participation of some technicians from both institutions in, for example, the meeting of users of Leica scanners in Madrid in 2018, in the international conference on 3D documentation [Digidoc 2018](#) in Stirling (Scotland) or in the [2+3D Photography Congress](#) at the Rijksmuseum in 2019 in Amsterdam (Netherlands) were, in this sense, key.

Shortly afterwards, DGPC, after experimenting with Leica scanners on and off for a few years, decided to acquire one of its own, the Leica RTC360. Besides, in 2018, a series of pilot scans with photogrammetry were carried out, which served as a test and a basis for the subsequent planning of the program. Objects from the collections of the mNACTEC, the Museum of Performing Arts, the Museum of History of Cambrils and the MAC-Barcelona were scanned.

In this initial phase, all these experiences served to evaluate the results obtained with each work methodology and to check the limitations and problems, the needs of human, technical and evidently economic resources, as well as the possible uses of the resulting models. From here, throughout the year 2019, intense work was done to conceptually define the axes of action of the program and to begin to structure them as a well-planned action strategy, with clear and measurable objectives that could be presented to the respective addresses in order to receive the corresponding validations and allocation of resources.



Vídeo presentation of the Giravolt program

3.2. Objectives and actions of Giravolt

Giravolt's primary goal is to facilitate the introduction of 3D technologies throughout the cultural heritage work chain. The intention of the program is:

- To achieve that in three years the whole sector of the Catalan cultural heritage knows these technologies and applies them on a standard basis.
- To generate a corpus of digitized objects from many museums and centers that are central to the Catalan heritage, and make it accessible to all audiences on an open platform. This corpus must show the quality and diversity of the Catalan heritage, collecting all its epochs, themes, geographical origins, and types of heritage.
- To obtain a 3D model, in a point cloud, of all the buildings owned by the Government of Catalonia that are declared Assets of National Cultural Interest.
- To create standards for applying 3D to heritage that are benchmarks for the industry.
- To attract international attention to the Catalan cultural heritage.
- To promote the use of these models in educational activities, interactive and artistic applications, augmented reality, and virtual reality.
- To establish the conditions for the creation of a 3D ecosystem in the Catalan cultural heritage made up of museums, entities, professionals, companies, universities, and research centers.
- To launch a project that will allow the ACdPC to lead the 3D digital scanning of cultural heritage in Catalonia and collaborate with other existing initiatives.

To achieve these goals, four axes of action have been established (creation of digital corpora, relationship with the professional sector, relationship with the field of education and dissemination) in which a series of actions are ordered:

- Scans: the project is articulated around different scanning actions in various museums and heritage organizations throughout Catalonia.

- 3D digitization of the Architectural and Archaeological heritage of the Government of Catalonia with the aim of revitalizing the heritage sectors and new technologies.
- Delivery of the models: museums receive a copy of all the models, their basic information (the photographs), the high-resolution model, a low-resolution model for dissemination, a file with the metadata of the whole process and a user guide.
- Introductory workshops: coordinated with the scans, workshops are offered for museum technicians and other geographically or thematically related entities in which an introduction to photogrammetry and its heritage use is made.
- Specialization workshops: Museums or professionals with experience in photogrammetry will be able to attend workshops to improve their technique and update content taught by specialists.
- Publication: scanned models (the low-resolution version) are published on the Internet under Creative Commons Attribution licenses that encourage the reuse of these models.
- Internationalization: the international visibility of the Catalan cultural heritage and the project is promoted, establishing contacts with international entities that also work in this line and presenting it to international forums.
- Education: agreements with different educational entities for the use of 3D models at different educational levels and for possible training in the technology of photogrammetry linked to scanning actions are promoted. These actions can range from primary school to arts or vocational training as well as university training.
- Dissemination: the reuse of all these 3D materials in different areas is promoted, also in multimedia and creation.

3.3. Governance

The Giravolt program is promoted by the Directorate-General for Cultural Heritage and the Catalan Cultural Heritage Agency. In order to make the governance of the program possible, a joint commission has been set up, consisting of five technicians from each of the two bodies (museum services, architectural and archaeological heritage from the DGPC and public and communication areas from the ACdPC). It gathers periodically in a work and coordination committee to monitor the project, propose lines of work, and approve the annual actions, with the appropriate validations by its respective departments.

3.4. Calls

The Giravolt program works on calls. As for museums, every year a call for digitizations is set with the project's own resources addressed at members of one of the museum's thematic networks. In 2020, the first call went for the Network of Ethnology Museums of Catalonia, while in 2021 the agreement was signed with the Network of Art Museums of Catalonia.

In addition to these calls for digitizations, there are also annual calls for other entities that may have projects of general interest in which the 3D digitization of works and/or buildings can play a relevant role. All these requests are evaluated and assessed within the framework of the commission, and are raised to the respective directions, depending on the available resources.

The aim of Giravolt is not to scan all the Catalan cultural heritage with these calls. It has neither the resources nor the time to make a work of this magnitude. Giravolt's intention, however, is twofold: on the one hand, to create a corpus, limited but diverse and representative, of the best of Catalan cultural heritage, and to use these digitizations to show on set and to the highest possible number of entities in the country the advantages of this technology. On the other hand, to promote the knowledge and use of 3D digitization and the working methodologies, protocols and information guides that Giravolt makes available, so that other institutions and equipment, when necessary, can enter to be part of this moment with criterion and full awareness. And so, in the medium term, we hope that the 3D digitization of heritage will be in the hands of all its managers in an open and collaborative way.

The criteria for the selection of proposals therefore derive from the following intentions:

- That these proposals are on objects that have public repercussion, with presence in bibliography, collections, or selections of reference.
- That they have the capacity to be part of different narratives about heritage (historical, technological, social, gender, cross-disciplinary).
- Its typological and thematic diversity of heritage.
- The representativeness of the object with respect to the collection of origin.
- Territorial diversity.
- That its 3D visualization is a real contribution to the knowledge of the object.
- The prevalence of institutions that initiate a 3D capture policy.
- A special attention to the ensembles that are currently scattered among different entities (like the Descent of Erill la Vall between MEV and MNAC, for example).

4. 3D capture in 2021

3D capture technologies today are essentially no different from those used a decade ago. However, the access that cultural entities have to it did experience a revolution. What ten years ago was extremely complex and economically prohibitive, now, due to radical advances in the graphic processing power of computers and the continuous improvement of 3D software, has become affordable.

Another of the fundamental changes in the use of 3D models on a social scale has been the progressive use of common formats (.obj and .gltf for objects, .stl for printing, and .usdz for augmented reality) and the consequent appearance of internet platforms that publish them easily.

The process of generalizing the use of 3D models has reached even mobile phones, with applications that are far away from heritage but that do use exactly this technology, such as Snapchat's or Instagram's [three-dimensional](#) filters, or the blurring of the background of portrait photographs. Thus, it is not difficult to predict that capturing 3D reality from a mobile phone in a few years' time will be as widespread and widely used as video capture is now. Another factor that has also helped the explosion of this technology is the possibility of publishing on the internet easily. Five years ago you had to install specific programs on your own servers to generate 3D viewers, but now you just have to drop the files in the window of a free platform for heritage entities such as [Sketchfab](#), the YouTube of the 3D.

The two most common 3D capture methods are laser scanner and photogrammetry, which we will briefly detail, although there are also other methods that are used less frequently, such as magnetic resonance imaging or structured light scanners. Laser scanners stand out for their accuracy and capturing speed, but they are very expensive devices. In contrast, photogrammetry is a method based on photographic capture and image processing on a computer, which makes it very easy to start with very little investment in material. Finally, there is another method of generating 3D models of cultural heritage—modeling with 3D design programs made with previous data (drawings, photographs, sizes) from which a technician models this element.

4.1. The laser scanner

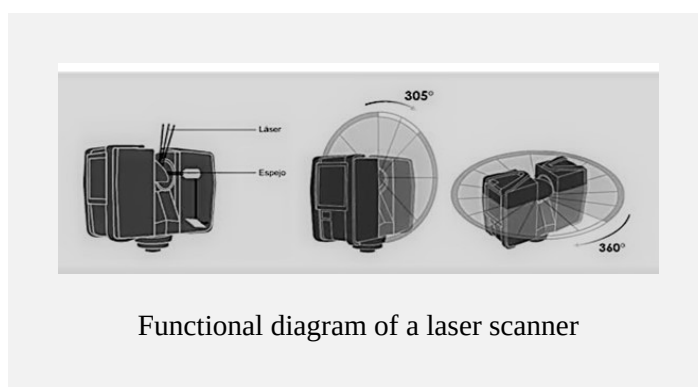
One of the most reliable techniques today for making three-dimensional documentation is the laser scanner. It is a technology that is highly developed and is currently used by a large number of documentation professionals in various fields. Its measurement accuracy is absolute, and it gives us the exact position of each point in space, its values x, y, z. Also noteworthy is its speed in obtaining data, because it can take up to two million measurements per second. It is important to note that this type of capture is a non-invasive method, i.e. at no time is there physical contact with the surface to be measured. In the case of cave paintings or engravings, this becomes fundamental.

The scanner bases its technology on the properties of a laser beam, which we use for mass and discrete data capture in a very short time, which will result in a cloud of dots. Depending on its use a scanner can be:

- Mobile. It is used on a vehicle, be it an airplane, a helicopter, or a car. Used to capture large areas.

- Manual. Small in size, it can be moved by hand. It is suitable for small objects.
- Terrestrial. It is installed on a tripod and captures data from a fixed point. This is the one we use at DGPC, specifically a [Leica RTC360](#).

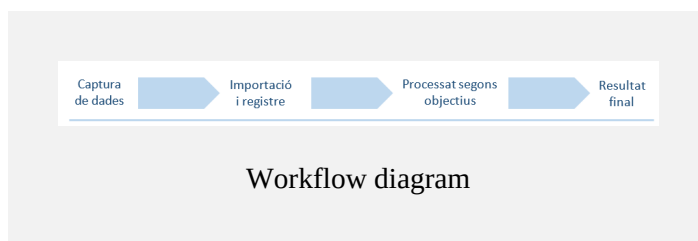
The operation of the laser scanner consists of emitting a beam that is deflected by a rotating mirror located in the center of the device, and is projected outward until it encounters an obstacle where it bounces and returns to the scanner, where, from calculations of measurements and angles, a point is generated in space for each ray. This operation is repeated vertically until the entire vertical range of 305 degrees is completed (360 is not reached due to the presence of the tripod at the bottom). The scanner then rotates horizontally and repeats the vertical pickup procedure, covering the 360 degrees of the surface. By doing so we get a three-dimensional point cloud of exactly the same dimensions as the reality of the scanned object. This procedure can be done with different point densities: taking as a reference a distance of 10 meters, the highest density is 1 point every 3 millimeters, the intermediate every 6 millimeters and the lowest every 12 millimeters



Once this procedure is complete, images are captured with the cameras built into the device to give color information to the resulting point cloud. A spherical image is generated which, when calibrated with the point cloud, gives a color value to each of its points.

Once this process is complete, we can say that we have an emplacement made. To obtain the three-dimensional model of a heritage building or archaeological space, several emplacements must be made to cover all the spaces and surfaces.

The data generated is imported and recorded in specific software and processed according to the desired end result. The results that can be obtained can be a 2D planimetry, orthoimages or a three-dimensional model, made up of points, of polygonal surfaces or also incorporating photographic texture. These results can be used for technical studies, restoration proposals or dissemination, or other applications that may arise.



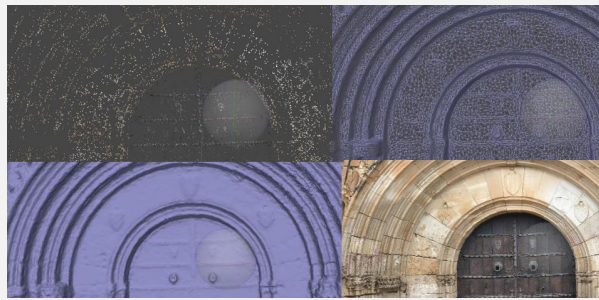
4.2. Photogrammetry

When it comes to 3D capture of heritage objects, the most widely used method today is photogrammetry. It has traditionally been considered a less accurate method than scanners based on laser or structured light technology, but developments in recent years show that, when used rigorously, it can achieve submillimeter accuracy, perfectly useful for heritage documentation.

Photogrammetry is based on capturing, in the best possible conditions, hundreds (or sometimes thousands) of

images of an object or building from different points of view. Each point on the surface of the object we want to represent in 3D must be present in at least three images. These images are processed in a specific photogrammetry program, which performs the following process:

- Identifies recognizable points (features) in each image.
- From the geometric calculation of the relationship between the points, it identifies the location from which each of the photographs was taken and places it in space (alignment of cameras).
- Starting again from the geometric calculation of the position of the cameras, it locates in the virtual space each of the recognizable points in a position x, y, z, creating (as in the case of the laser scanner) a cloud of points that defines the shape of the object.
- This cloud of points can be meshed, joining the points creating triangles, which gives it a surface.
- This surface can incorporate a photographic texture, built from the images that are the origin of the method.



The phases of the photogrammetric process.
Identification of points, mesh creation, solid
surface and photographic texture

Because it is based entirely on photographic capture, photogrammetry can be applied to most objects, from very small sizes to large formats, and even to buildings. You just need to get the necessary photographs for each item. For the same reasons, however, photogrammetry does not get good results with objects with reflective surfaces, or which are completely smooth and uniform, translucent or transparent. Shiny metals such as chromates or uniform lacquers, or materials such as glass, do not allow the identification of specific points, and therefore photogrammetry does not work in these cases. On the other hand, wood, matt ceramics, or stone are materials with an excellent response.

Depending on the usage of the 3D model, its capture requirements can vary widely. If we want the model just to post on social media, even a good capture made with a mobile phone can be enough. If we want it as an element of documentation, we will need to use a camera—any of the current mid-range cameras would suffice. However, if we want to have a high-precision model for use in the research or conservation field, we must use high-resolution cameras, specific lighting and rigor when capturing the images.

4.3. Photogrammetric captures in Giravolt

In the Giravolt program captures are made with the aim of being useful for any need that a museum has, including the scientific ones. For that reason, the capture is done with a high level of exigency that allows the creation of a high-resolution master model which is suitable for research, and a second low-resolution model suitable for

dissemination and publication on the internet.

The basic criteria used are: around 400 high-resolution photos per object, with color correction and precision scaling, processed in Reality Capture or Metashape to achieve master models of about 40 million polygons and models of simplified dissemination to 100,000 polygons but with 8K textures. Files and metadata are archived according to an adapted schema from the Smithsonian Institution's [3D Metadata Model](#). A copy is provided to the institution that manages the property and another copy is kept at the Ministry of Culture.



Capture of the Crist of Erill-la-Vall Descent of the Cross at the Episcopal Museum of Vic

4.4. Publication and license

All 3D models generated by the Giravolt project are published on their [Sketchfab channel](#). However, in order to enrich the repository this channel is also open to hosting the digitizations that other museums and heritage organizations want to make themselves with the standards of the Giravolt program. Conversely, museums and heritage organizations are encouraged to host models on their own websites and are supported in the event that they want to start their own channel.

The publishing license for all models is [Creative Commons Recognition \(CC-BY\)](#), consistent with the digital strategy of the Government of Catalonia in other areas. Needless to say, this topic has been studied and debated in detail. In the cultural heritage sector, there is a growing movement in support of open knowledge and the communication of works without restrictions to allow, in addition to their free access, the reuse of this material.

For example, the [Smithsonian Institution](#) has published in the public domain (completely royalty-free) more than 2.8 million records including 3D models. At [Sketchfab](#) twenty-seven museums around the world have published their 3Ds also in the public domain. In Catalonia, as we said, the [Catalan Government](#) has always been one of the entities that has given the most support to open access to information, following European directives in this regard. And so, it has strongly promoted publication on the internet in the public domain and under Creative Commons. The [Heritage Fund](#), the UK government agency that funds major heritage projects, has recently made the Creative Commons Attribution license mandatory for their projects.

Given all these factors, the CC-BY license was considered the most appropriate for the Giravolt program as well. It allows all uses of the information, even commercial ones, but always citing its origin, and thus preserves the traceability of the 3D model (a fact that we consider essential to ensure its credibility and authenticity).

5. The first results of the Giravolt action

The Giravolt program was publicly presented to the media and the professional community on December 1, 2020. Its public presentation, after having spent many months working on it, made it possible to give an official status and recognition to the project, its brand, and its available resources (such as the microsite available on the Patrimonigencat.cat website or publications on paper and digital format). From that moment on, Giravolt has continued to move forward, and we can even say that it has experienced a remarkable acceleration in the achievement of its planned milestones. In fact, a first presentation of the achieved results was made to the respective directorates of DGPC and ACdPC. We attach a brief summary of these below.

5.1. The presentation at Ideal - Visual Arts Center (Barcelona)

On the occasion of the public presentation of the project, an immersive audio-visual production was commissioned, made from digitized models. It premiered that same day. This production, lasting five minutes, served to accompany the explanation of the main lines of action of the project and, at the same time, as a demonstration of the high potential that all this digitized heritage can have, also from a contemporary creation point of view. Precisely, the re-screening of this piece is planned for the next few occasions, given the interest it aroused among the attendees and the people who could not see it.

5.2. Outstanding scans with laser scanner

So far, most of the scans carried out have been linked to the need to intervene in a monument, but these actions are combined with those of strict documentation on the state of spaces, to which archaeological sites have also been incorporated. In this regard, the captures in the castle-monastery of Escornalbou, the Romanesque church at Sant Joan de Boí or the royal monastery of Santes Creus stand out. Work is currently underway on the comprehensive documentation of the Palau Moja, which will be the first of the Catalan Government's monuments to be fully documented in 3D.

5.3. Outstanding scans with laser photogrammetry

Scanned objects so far have been as diverse as the Catalan cultural heritage, from the first motorcycle made in Catalonia, [the Villalbí](#), to a dress released by [Margarida Xirgu](#), from a [magic lantern](#) to the [hanger at the Casa Calvet](#) designed by Gaudí. One of the uses of these scans, however, is to bring together scattered ensembles, like the [clay sketch](#) made by Miquel Blay for his sculpture "Els primers freds" (The first cold), which is preserved in the Girona Art Museum, and the same [piece finished in marble](#), which is in the MNAC. The most paradigmatic case, however, is that of the meeting of the seven figures of the Descent of Erill la Vall, which are divided between the MNAC itself and the Episcopal Museum of Vic, but [scanned one by one](#) and [virtually reunited in the space of the apse](#) of the church, with a lighting that wants to recall the one they must have had in origin. One of the last actions carried out by the program is the scanning of all the existing fragmented remains of the Iberian monument of Cal Posastre (Sant Martí Sarroca). From these 3D models it has been possible to define a new hypothesis of the shape and constituent elements of the monument, which has been virtually reconstructed and presented for the first time in May 2021 in the exhibition "The Iberian Enigma. Archaeology of a Civilization" by the Catalan Museum of Archaeology in Barcelona.

5.4. Actions with the professional sector

Various online and face-to-face training sessions have been held for heritage management professionals. In 2021 we continued along this line to bring Giravolt and the whole world of 3D digitization closer together.

5.5. Actions with the education sector

3D models are a very powerful tool in their teaching application, so one of the axes of the program is its relationship with schools, institutes, and universities as a possible research tool. There have been many training sessions for teachers, one face-to-face in Tarragona and three online, which have generated several pilot projects in which students are scanning with simple tools the heritage of their municipality and are incorporating their resulting models in different environments, for example on the [Mobile History Map](#) platform.

5.6. Dissemination and participation actions

On the occasion of the celebration of the XXIX European Heritage Days, ACdPC promoted the design and creation of a very versatile educational activity to bring the phenomenon of 3D digitization to society in a participatory way, especially to young people and children, with their mobile devices. This activity, called “Desperta el patrimoni” (Awake heritage—more information and teaching material available at <http://patrimoni.gencat.cat/ca/jep2020/despertaelpatrimoni>), generated great interest during the conference, with more than thirty sessions and [one hundred models](#). So far, several sessions have been scheduled in different contexts and adapted to school uses in different age groups.

5.7. Impact

The appearance of the program has aroused a great response within the sector, with a dozen proposals for collaboration by institutions and universities and also in its communication on social networks, with more than eight thousand interactions in the first three months.

6. Conclusion

Giravolt is a program that probably would have been invented by someone else if it didn't exist. Most leading countries in managing their cultural heritage are already pursuing powerful digital strategies along its same lines. Not only do 3D models have a myriad of possible uses for conservation, restoration, research, and dissemination, but in a sense, they are beginning to become even more mandatory. It is a similar phenomenon, as we explained at the beginning, to what happened with the emergence of black and white photography first, then in color, and finally with the use of its digital format. Giravolt is a very good tool that, of course, still requires time to develop and improve and pick up cruising speed, but it has certainly experienced a very noticeable acceleration in its first months of life. As a tool, Giravolt must be useful, and this utility will be determined not only by the number of models that we are able to generate, but also by the quantity and quality of complicities and alliances we can establish. Public alliances (with other administrations and other institutions), but also alliances within the private sector and, of course, also in the field of educational research and innovation.

