

DIGITAL HERITAGE

INTERNATIONAL CONGRESS 2013
28 Oct - 1 Nov, Marseille, France



Proceedings of the
2013 Digital Heritage International Congress
(DigitalHeritage)

federating the
19th Int'l VSMM, 10th Eurographics GCH, & 2nd UNESCO Memory of the World Conferences,
plus special sessions from
CAA, Arqueologica 2.0, Space2Place, ICOMOS ICIP & CIPA, EU projects, et al.

Volume 1

- Track 1** Digitization
- Track 2** Visualization & Interaction
- Track 3** Analysis & Interpretation

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Volume 1

28 Oct – 1 Nov 2013
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IEEE Catalog Number: CFP1308W-USB
ISBN: 978-1-4799-3169-9

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Alonzo C. Addison Gabriele Guidi

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Preface

Bienvenue à Marseille et à DigitalHeritage 2013 – the first International Congress on Digital Heritage. It is our honor and pleasure to welcome you to this multi-disciplinary global gathering on the application of digital technology to the documentation, conservation, and understanding of humanity's shared past. Spanning heritage in all its rich variety, from the *built*, to *intangible traditions*, and *museums and collections*, to *documentary archives*, and *creativity and art*, this unique Congress bridges research and practice, industry and government, and art and science.

It was 15 years ago that some of us first spoke of the value of trying to bring the many exciting but disparate young events and communities around heritage and technology together. As the field has grown, and a new domain of Digital Heritage has slowly formed, the need to bridge the naturally self-segregating vertical domains has only increased. After a few false starts, finally in late spring of 2013, less than 8 months ago, a critical mass of forward-looking leaders from across the heritage and technology worlds came together and agreed to unite their respective communities under one roof in a shared experiment in Marseille. It is important to note that DigitalHeritage is a test in cooperation and shared governance for this new domain, and neither replaces nor supersedes any of the existing events or communities. It was agreed at the outset that a joint event would not be held in 2014, so that the federating groups could refocus on their individual strengths before any future global gathering might be convened.

Under the patronage of UNESCO, this unique Congress federates over a dozen 'Digital Heritage' communities, encompassing three leading scientific events in the field:

VSMM 2013 – the 19th Int'l Conference on Virtual Systems and Multimedia

GCH 2013 – the 10th Eurographics Symposium on Graphics and Cultural Heritage

MEMORY OF THE WORLD the 2nd UNESCO Int'l Conference on Memory of the World in the Digital Age

plus two major public exhibitions:

ARCHAEOVIRTUAL – the 7th Exhibition on Virtual Archaeology and Museums

DAW – the 7th Digital Art Week

and complemented by a rich array of regional and special events:

ARQUEOLÓGICA 2.0 – the 5th Int'l Mtg. on Archaeology, Cultural Heritage & Information

CAA Fall 2013 – Computer Applications & Quantitative Methods in Archaeology Symposium

From Space to Place – the 6th Int'l Symposium on Remote Sensing in Archaeology

ICOMOS/ISPRS CIPA – Heritage Documentation Int'l Scientific Committee meeting

ICOMOS ICIP Panel – ICOMOS Int'l Committee for Heritage Interpretation & Presentation

Museum & Technology – a special session organized by V-MUST.NET

DISH – a special Workshop of the Digital Strategies for Heritage Conference

Heritage Policies & Digital Technologies – a special event of the French Ministry of Culture & Communication

and multiple **EU Projects** – including: v.must, Eagle, Archaeolandscapes, AthenaPlus, 3dIcons, EuropeanaPhotography, 3nCult, emap, LaCloud, et al.

Over 600 submissions, the largest ever in this field, were received from close to 70 countries in response to the scientific call. An International Program Committee of over 150 experts from across the heritage and technology spectra read through this vast body of works, conducting over 1500 reviews. Seeking to highlight the very best in this new domain, the Congress accepted **101 Full Papers**, **110 Short Papers**, and **82 Poster abstracts** for publication. In addition the Committee accepted approximately **50 Panel, Workshop, Tutorial, and Special Session** presentations.

The resulting 350 plus works are grouped in 6 thematic Tracks in this two-volume Proceedings: **Digitization; Visualization & Interaction; Analysis & Interpretation; Policy & Standards; Preservation;** and **Theory, Methods & Applications;** plus **Special Sessions.** An international exhibition of 30 cutting-edge projects spanning 700 square meters is detailed in a separate third volume.

Since interaction, debate, and discussion with colleagues both old and new is as important as research, your program over the week-long Congress has been supplemented with time for interaction in the company of local culture and gastronomy, from lunches on the Esplanade, to evening cocktails and a gala dinner, plus an array of cultural visits in the region.

As you gather in the 2013 European Capital of Culture, we invite you to look beyond the *digital* and take time to experience the very *real* heritage, customs and life of this ancient “Ville” and cultural crossroads of the Mediterranean. France’s second largest city and metropolis, Marseille has also been called France’s oldest. Fittingly, our Congress venue at the gateway of the ancient port spans the old and new, from the picturesque historic Fort Saint-Jean to the technically innovative architecture of the just-opened Villa Méditerranée and MuCEM.

Such an event would not have been possible without the generous contributions and support of many colleagues and partners, especially in such a short time. To the Congress Chairs and Commissioners we owe a huge debt of thanks for the countless hours they gave to bring this event together. To our many corporate and government sponsors and patrons, and especially CNRS, our thanks for the financial support that made this event possible. To our publisher and partner IEEE we extend our gratitude for the special alliance to make this first DigitalHeritage Congress *open access* so that the entire world can learn and benefit from this emerging discipline. Finally, we would like to thank the Local Organizers (CNRS in collaboration with local research institutions Provence : Aix-Marseille University, Arts et Métiers ParisTech, CICRP, School of Architecture and INRIA) and especially the teams at CNRS-MAP and CNR-ITABC who have worked tirelessly for many months to bring this event together.

In closing, we welcome you to Marseille and to the first International Congress on Digital Heritage and wish you an enriching, stimulating, and enjoyable week of discovery.

Alonzo C. Addison,
Livio De Luca,
and Sofia Pescarin

Congress Co-Chairs
Marseille, October 2013

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IEEE Catalog Number : CFP1308W-USB
ISBN : 978-1-4799-3169-9



Aspects of the Digitalization of the Documentation and Research of Lithuanian Historical Organs

Girėnas Povilionis

Centre for the Organ Heritage, Centre for the Lithuanian Cultural Heritage
Vilnius, Lithuania
girenasp@yahoo.com

Rima Povilionienė

Lithuanian Academy of Music and Theatre
Vilnius, Lithuania
r_povilioniene@yahoo.com

Abstract—About 450 historical organs have survived to the present day in Lithuania. Some of them are almost completely authentic instruments which constitute valuable heritage and have been recognised as being unique in European context. Currently the digitalisation of the data about the Lithuanian organ heritage is being implemented at the Centre for the Lithuanian Cultural Heritage since 2000 (until then non-digital data were accumulated) and is oriented towards the promotion of this part of the country's heritage, and scientific research. The most valuable instruments included on the heritage list are registered in detail: comprehensive photography of their separate parts and equipment, engineering data, as well as that of the surviving authentic mechanism and parts. A research into the instrumental part of some of the most valuable organs (the organs in the church in Joniškis, the churches of the Holy Spirit and the Bernardine in Vilnius) is introduced. By the drawings it is possible to recreate an organ or make a copy-replica in case it is destroyed; the data can be used to make a new instrument according to old organ-making traditions.

Keywords—digitalisation of the data of Lithuanian Historical Organs, engineering data, photogrammetric measurements, organ recreation, organ copy-replica.

I. INTRODUCTION

At present there are about 700 Roman Catholic, 53 Evangelical Lutherans and 10 Evangelical Reformers churches with 500 historical organs in Lithuania, surviving fully or in fragments. Their historical significance and value differ greatly. Some organs have survived in the almost original form, i.e., both the instrument and ornate façade. Others have survived only in fragments: only valuable façades remain, while the instruments themselves were substituted by new ones or completely destroyed during Soviet rule. Most of the surviving organs date back to the 19th–20th century (~80%), some to the 18th century (~19%; see Figure 1), while from the 17th century only fragments or parts of separate instruments have survived (~1%, e.g., the organ in the Franciscan Church in Kretinga, the portative organ in the church in Akmuo

village, façade of the organ in the church in Videniškiai village; see Figure 1).



Fig. 1. 18th century historical organ in Balbieriškis church (burned in 8 August 2013, master unknown, 1802); 17th century portative organ from Akmuo church (master unknown, end of 17th c.)

Currently about 200 organs are included in the Register of Lithuanian valuable cultural objects. A large number of these organs were built by masters of the Vilnius Late Baroque organ building school that encompasses a hundred years – from about 1740 until about 1840–1850 and has been recognised as being unique in European context. The multisided impact of this stylistic school, its masters and the heritage is seen in the history of the organ building art in Central and Eastern Europe that is mostly connected with the geographic and political boundaries of the Grand Duchy of Lithuania and zones of influence at that time ([1], [2], [3]; see Figure 2).

The so-called Vilnius masters established their own tradition characteristic of the area: the organs are distinguished by the original architecture of the two-tower façade composition. It is dominated by two polygonal side towers and straight flats surrounding them, this is a double form of a three-part compositional element (3x2) with an extra central tower. This seven-part form is the architectural base of façades that changed depending on the size of the instrument, id est it was

narrowed, widened or flats were moved to different places. It is likely that this composition came from Eastern Prussia.

Today the research of the Lithuanian organ heritage carries out the preservation and gathers technical information. Currently the digitalisation of the data of the organs is implemented in several directions that are connected with the promotion and publication of this heritage and scientific research.

II. FORMS OF DIGITAL PROMOTION OF THE LITHUANIAN ORGAN HERITAGE

A large number of instruments stand in remote village churches in Lithuanian provinces. Therefore it is important to educate the public, forming attitude and understanding of organs as a unique cultural object. Several public institutions are active in this field: the Centre for the Organ Heritage, the New Organ Forum, and the National Organists Association. Some results of their activity:

1. Audio and video review projects of Lithuanian historical organs: the CD recording “Lithuanian Historical Organs” of nine organs and a comprehensive booklet (2008); the educational-historical film “The Old Organs of Lithuania” (2008); the CD with the great organ in the Church of St John of Vilnius University (2008), the CD “Organ Landscape” with 10 historical organs (2009); the CD with recordings of the instrument by Adam Gottlob Casparini (1715–1788) (2010).
2. The creation of the website www.vargonai.com as online database or comprehensive virtual information complex of the Lithuanian extant and non-existing organs. The material is meant for three groups of users according to special information: organists, organ buffs, organ researchers and masters. The data is grouped geographically; lists of

masters are arranged alphabetically; a detailed photo fixation of separate parts of organs is presented. In some cases there is also audio material indicating separate registers. Plans to expand this database with: measurements and drawings of separate organ pipes, catalogues of the pipes of the registers of organs built by various masters.

III. DIGITALISATION ON THE BASIS OF SCIENTIFIC RESEARCH

In order to record fully or partly surviving valuable instruments as they are now, since 2000 the Culture Heritage Centre has been gathering, systematising and documentation of the digital data about Lithuanian organs, with a priority of making inventory lists of concrete instruments (before 2000 only non-digital data was collected). The most valuable organs are included in the Register of the Cultural Values of the Republic of Lithuania with comprehensive descriptions of organ cases, technical specification of the instruments, data about the authentic mechanisms and parts, their constructions, photographs of separate parts and mechanisms. Close attention is devoted to descriptions of specification and the pipe system: lists of the pipes, indicating where possible authentic pipes and the ones of later periods, all the missing pipes are also included, inscriptions on them researched; sometimes there are audio recordings of separate stops; in cases when the organ is inoperative there are audio recordings of separate pipes. In addition to traditional measurement tools (such as rulers, gauge or protractor) are used USB digital vernier calipers (with MS Excel), micrometers, portable manometer, digital sound level meter with data logger, tuner, thermo-hygrometer etc. The electronic measuring devices transfer the data directly to the computer for storage and processing of data ([4], [5], [6]).

Since 2000 a very detailed research of two rather valuable Lithuanian historical organs in the church of the Holy Spirit

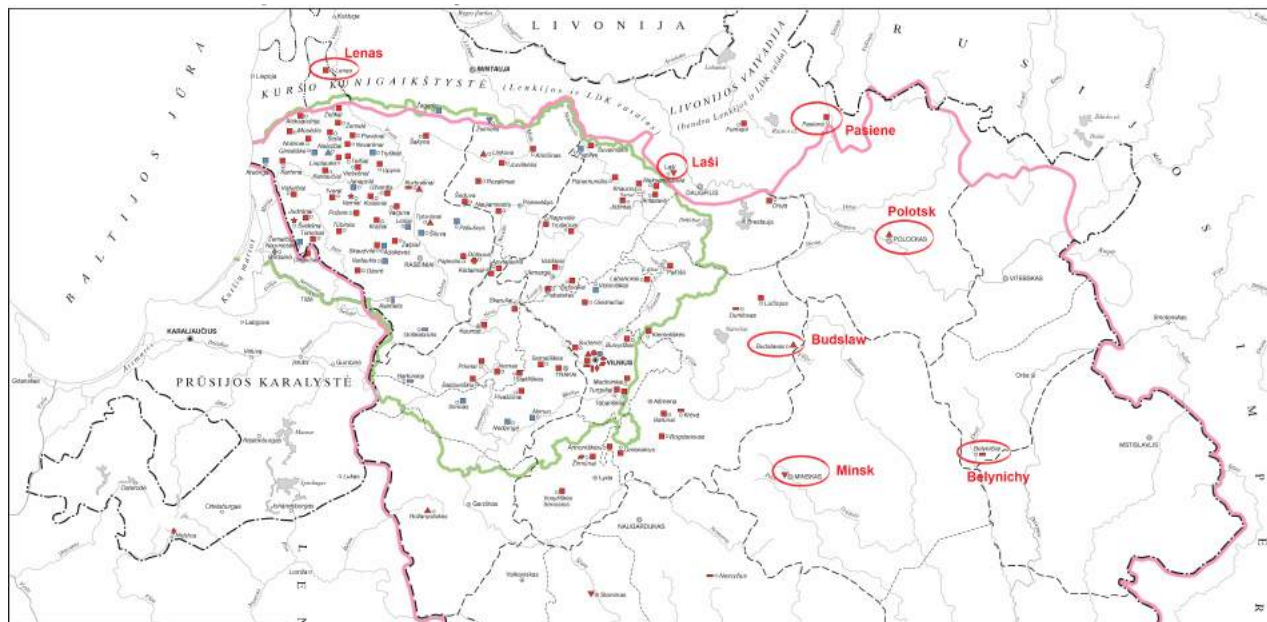


Fig. 2. A map of Lithuanian historical organs built in 18th–1st half of 19th centuries. The highlighted points with organs built by Vilnius masters outside present-day Lithuania (Lēnas, Laši and Pasiene in present-day Latvia; Polotsk, Budslaw, Minsk and Belynychy in present-day Belarus).

(Vilnius, 1776) and church of Joniškis village (Molėtai District, ~1770) has been conducted. (In the church in Joniškis has survived the oldest two-tower organ.) The research consisted of the preparation of technical documentation (in the case of both organs) and the gathering and systematisation of archival/historical material (in the case of Joniškis' church). The data for technical documentation was obtained analysing the organs:

- Drawings of separate parts,
- Photogrammetric measurements of façades,
- All pipes of all stops have been fully measured with electronic measuring devices (10-15 measurements of every pipe; see Figure 3),
- Wood used in the instrument determined and named (e.g., oak, pine, birch),
- Composition of the metal used determined and named, preliminary purity level of tin and lead recorded, chemical metal study of several stops made in a special laboratory,
- All inscriptions on pipes that show the name of the stop, sound pitch, later remakes recorded, calligraphic alphabet of the letters discovered made,
- Wind chests and all their small mechanical parts documented: slider, pipe rack, upper board, pallet, guide pin etc.,
- Mechanic parts measured: tracker and his wire, square, roller, stop action, drawstop rod, stop-trundle etc.,
- System of the bellows and air pressure described: bellows' folds, type of wood, peculiarities of leather use, air feeder mechanisms,
- Detailed measurements of the manual and pedal keyboards made: measurements of keys, type of wood etc.,
- Lists of additional parts (e.g., drum, bells, coupler) and their measurements made,
- Remakes, losses and shortcomings of separate fragments of organ façades studied and named,
- Peculiarities of polychrome painting and spots of gilding determined.

Based on the inventory lists of these data drawings or sketches of the main parts, photogrammetric photographs, drawings, sketches, diagrams, tables etc. were made. Besides, technical documentation of the organ in Joniškis church was expanded with a detailed historical study – analysis of archival sources and expeditions in the territories of the former Grand Duchy of Lithuania (Belarus, Poland Latvia and Ukraine).

By the drawings such organs can be easily recreated in cases when they were destroyed or replicas built. For instance, drawing on the detailed organ documentation that was carried out by Göteborg Organ Art Center (GOArt) in cooperation with the Ministry of Culture of the Lithuanian Republic in 2000 and 2001 [7], a replica of one of the most outstanding examples of the baroque organ art, the only remaining and almost entirely original organ by Casparini in the Church of the Holy Spirit in Vilnius has been built in the Christ Episcopal Church in Rochester (USA) (see Figure 4).

Analysing Lithuanian historical organs, it became possible to effectively conduct research of the organ façade, i.e., possible reconstruction, thanks to digital technologies. The results obtained give the chance to return rebuilt instruments to the original state and thus to establish the authorship that was unknown or hypothetic before research. For instance, because of the composition of the façade of the organ built by Casparini in the Church of the Holy Spirit (Vilnius) that was characteristic of the Königsberg organ building school, which was stylistically similar to the Vilnius organ building school, the authorship of another instrument – the great organ in the Church of St John in Vilnius was linked with this master for a long time. However, computer reconstruction of the instrument's façade showed a two-tower façade model typical of the Vilnius baroque organ building masters, which made it possible to settle the issue of the instrument's authorship and it was attributed to Nicolaus Jantzon (Mikołaj Janson, Jantzen, 1720–1791), one of the most distinguished masters of the the Vilnius organ building, because the reconstructed type of organ façade is very close to the so-called organ façade “triple” by

BK22		F	G	H	I	J	K	L	M	N	P	R	T	V	X	Z	AB	AD	AF
1	narvelio Nr.	Garso Pavadinimas	Nr.11 Tiltelis I	Tiltelis II	Sklende I	Sklende II	Oro deže I	Oro deže II	Nr.10 Tiltelis I	Sklende I	Oro deže I	Nr.9 Tiltelis I	Sklende I	Oro deže I	Nr.8 Tiltelis I	Sklende I	Oro deže I	Nr.7 Tiltelis I	
4	1	ds0	14.49		14.68		14.46		12.73	8.99	9.82	12.72	9.53	10.22	11.63	11.88	12.58	14.03	
5	2	H	16.56		16.54		16.01		12.17	10.54	10.62	12.65	10.23	10.11	12.27	13.09	13.52	13.74	
6	3	G	18.79		17.86		17.38		12.07	10.94	10.80	12.70	10.69	11.24	13.93	14.20	13.92	13.88	
7	4	Ds	21.65	27.92	15.84	26.63	14.80	26.37	12.90	11.92	10.82	12.84	12.14	12.21	13.96	15.09	15.21	14.39	
8	5	Cs	22.01	29.20	16.43	27.37	16.33	27.32	12.98	12.39	11.55	13.55	12.64	12.50	14.56	16.40	15.47	14.85	
9	6	F	21.86	30.73	15.31	25.98	15.13	25.75	12.96	11.45	11.18	12.15	12.10	11.36	14.90	15.10	14.35	14.87	
10	7	A	17.95		17.99		17.23		12.06	10.15	10.29	11.79	10.01	10.54	13.27	13.50	13.63	13.21	
11	8	cs0	15.86		16.25		15.90		10.65	8.72	8.97	10.04	8.98	9.12	12.39	11.71	11.79	13.11	
12	9	f0	15.37		15.72		15.10		9.67	8.56	8.47	9.83	8.29	8.26	10.97	10.74	9.60	12.72	
13	10	h0	12.85		13.02		12.72		9.84	7.70	8.60	10.05	8.25	7.91	10.43	9.90	10.00	13.66	
14	11	cs1	13.52		13.28		12.05		10.35	7.52	8.53	7.45	7.37	6.51	9.41	9.56	8.96	13.32	
15	12	ds1	11.66		12.60		11.36		9.09	7.36	7.52	8.29	6.49	6.63	8.89	9.16	8.10	12.15	
16	13	fl	11.94		11.60		11.35		8.25	7.59	8.35	8.55	7.80	7.94	8.95	8.05	8.70	12.73	
17	14	g1	11.83		11.66		11.04		9.05	7.78	7.77	8.13	7.35	7.78	8.10	8.19	8.83	12.91	
18	15	a1	11.97		10.98		10.65		7.85	7.17	7.30	8.13	6.92	6.69	8.98	9.20	8.97	10.16	
19	16	h1	10.39		10.23		10.13		8.17	6.88	7.02	7.51	8.04	8.69	8.52	8.77	8.97	10.21	
20	17	cs2	10.48		9.09		9.17		8.38	7.19	7.34	7.48	7.14	6.88	7.76	7.86	7.73	10.24	
21	18	ds2	9.74		9.22		9.16		7.92	7.09	5.94	7.21	7.11	6.74	7.54	6.85	6.39	10.12	
22	19	f2	10.23		8.85		8.75		8.52	6.90	6.88	8.13	7.08	6.91	7.46	6.73	6.62	10.24	
23	20	g2	9.05		8.36		8.39		7.95	6.87	5.99	7.10	7.12	7.23	7.48	6.86	6.92	10.89	
24	21	a2	8.53		7.70		7.50		7.91	6.95	6.90	7.44	7.19	7.30	7.33	6.86	6.95	9.89	
25	22	h2	8.53		7.50		7.68		7.04	6.90	6.59	7.32	7.25	7.50	7.31	6.76	6.96	10.41	

Fig. 3. Fragment of organ pipe rack documentation with digital vernier caliper connected to MS Excel (in Joniškis church, ~1770).

Jantzon in Troškūnai (1787–1789) and Tytuvėnai (1789) and by Mateusz Raczkowski (the master's life dates are unknown, mentioned in archival documents between 1787–1803, probably he worked together with Jantzon) in Kurtuvėnai (1792–1794) (see Figure 5). (Another digital reconstructions of organ façade: in Vilnius Cathedral [authorship from Casparini → to Jantzon]; in the Basilica in Seinai [authorship from Königsberg/Vilnius masters → to a small organ without any clear features of a definite school]; see Figure 6 & 7).

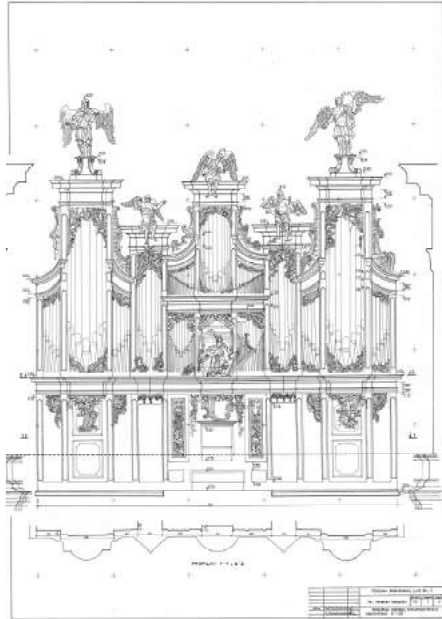


Fig. 4. Photogrammetrics of the organ façade in the church of the Holy Spirit in Vilnius (Casparini, 1776).



Fig. 5. The reconstruction of the façade of Jantzon's organ in the St John Church (Vilnius, 1766).



Fig. 6. The reconstruction of the façade of the Vilnius Cathedral organ (hypothetically attributed to Jantzon, 1780–1785).



Fig. 7. The reconstruction of the façade of organ in Basilica in Seinai (18th c., without any clear features of a definite organ building school).

IV. CONCLUSIONS

Nowadays researching in the history of organ building in Lithuania the issue of whether to consider not only Lithuanians, but also Poles, Belarusians, Germans, Latvians and others as part of the country's culture does not arise. The surviving large organs by Jantzon define the characteristic features of the instruments in terms of the architecture of the organ façades. Since about 200 organs are included in the Register of Lithuanian Cultural Values (complex register of valuable cultural objects) and are protected by the state. The technical information of these organs is carried out for their preservation and restoration. According to the law of the Republic of Lithuania, only certified experts are allowed to work with organs that are listed in the Register. Therefore, such work has to be done according to professional programmes drawn up for a concrete instrument. The digital documentation of the organs in the church of Joniškis and the St. Francis and Bernardine Church in Vilnius is especially suitable for organs for which analogues have to be found in order to recreate the lost parts of the instrument, for instance the missing pipes or all the stop (it is applied in cases of the restoration of instruments built by the same master), elements of the ornamentation of the organ case or even to establish the authorship of an anonymous master.

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