

Virtual Learning Environment: the VirCa-based Model of the Ancient Library of Alexandria



Our research objective is to invent, implement and gradually improve a three-dimensional virtual library model. We selected some prominent authors who represented the ancient Greek poetry and drama from the 3rd century BC. Their short biography and certain fragments from their works formed the selected content of the first version of the virtual library model. We have designed a four-level hierarchical and scale-free structure based on the original classification scheme of the ancient Library of Alexandria devised by Callimachus, the famous librarian and poet. We are adding selected items of verbal and/or multimedia content of different text types (e.g. commentaries, translations, adaptations, concordance and collocation tables, illustrative images, dictionary entries, summaries and so on) to improve the content of the database. These additional materials are intended to represent the background information necessary for the users to read, interpret and understand (possibly at once) the old Greek literary texts in the virtual space. We analyse how the collected items can be effectively used in language learning to improve the learners' linguistic competence, and, in general, how the spatial hypertext concept could promote the multidisciplinary use of the model in education. The virtual library model is built on PHP/MySQL technology and fully utilises the three-dimensional navigation and presentation features of the VirCA (Virtual Collaboration Arena) system.

The cultural significance of the ancient Library of Alexandria

The Great Library of Alexandria is considered to have been the most celebrated and prestigious collection of classical (Greek-Roman) antiquity. We can state that it has been embodied a library ideal since centuries representing a symbolic force for modern public libraries. In our research we made a decision to focus on this famous collection because it was an important aspect for us that all the ancient written materials brought together in this library were eternal values for human culture and erudition. The investigation of the poetical Greek works is still an open issue today. This realization has motivated us to deal with the field of ancient Greek poetry and drama in the 3rd century BC. In addition, Greek mythology gives a kind of 'common language' and symbolic basis for the better interpretation and understanding of the ancient poetical works. Finally we intended to experiment with the three dimensional environment to discover and exploit the hidden potentials it could offer for us in the presentation of the ancient Greek masterpieces. Using verbal and multimedia metadata effectively we have developed a well-searchable spatial hypertext system.

The founders of the Museion or Mouseion at Alexandria were Ptolemy I Soter and his son, Ptolemy II Philadelphus at the turn of 4th and 3rd centuries BC. The Greek word Mouseion has a meaning "Seat (Institution, Shrine, Temple etc.) of the Muses" (i.e. a place devoted to the nine Muses) which designates the home of music or poetry, a philosophical institution or a place of contemplation such as Plato's famous Academy in Athens. Originally a Greek mouseion was a temple sacred to the Muses, so it was a purely religious establishment. The Library of Alexandria had a subsidiary "daughter library" founded about 235 BC by Ptolemy III (Euergetes) in the Temple of Serapis. In Roman times the "daughter library" was operated as the main literary center. During the siege of Alexandria by Julius Caesar (in 48 BC) the greater part of the library was damaged badly by fire. The other part of the library was located in the temple of Serapis, where it remained till the time of Theodosius the Great. When this emperor permitted all the pagan temples in the Roman empire to be destroyed, the remarkable temple of Serapis was damaged badly by the Christians in AD 391. The museum and library were destroyed in the civil war that happened under the Roman emperor Aurelian in 272 AD. In 2002 a new library building, the Bibliotheca Alexandrina was established exactly on the site of the ancient Mouseion institution [1, 2, 3, 4].

The Library of Alexandria formed one of the most significant parts of the Mouseion funded by the royal treasury. As far as the Mouseion and its library are concerned, we can suppose that they played an essential role in enhancing the prestige and influence of the royal house. Note that the main museum and library were placed at this time in the palace precincts, in the district named the Bruchesium. Its mission was to gather all the Greek documents, so its ambition was to achieve completeness in written Greek literature. Soon it has amassed several thousands of papyrus rolls in its holdings. During its most flourishing period it is said to have included 490 000, or, according to another authority, involving all duplicates, as many as 700 000 volumes. Furthermore it can be mentioned that the collection included not only all Greek documents but also translations into Greek from the other languages of the Mediterranean countries, the Middle East and India. We are sure that the library of the Mouseion contained mainly Greek documents; the only translation recorded was the Septuagint (i. e. the earliest extant Greek translation of the Old Testament from the original Hebrew). The library's editorial program incorporated various elements which were as follows: namely the establishment of the Alexandrian canon of Greek poets, the division of works into "books" as they are now known (probably they corresponded to the standard length of papyrus rolls), and the gradual introduction of systems of punctuation and accentuation.

The Ptolemies wished to acquire the best, the most original, the most authoritative copies of works, and they were willing to purchase, borrow, or plunder to obtain them. They employed ethically questionable means also for procuring materials. For example during a famine in Athens ambassadors from the Library of the Mouseion compelled the sale of valuable original manuscripts owned by that city in exchange for food. Ptolemies sent people out to buy books, looking especially for rare texts and libraries which might be bought. Because older versions of the manuscripts were preferred to newer copies (older versions were considered to be more authentic and less likely to include mistakes), a miniature industry sprang up that

manufactured "old" texts. In addition to purchasing books, the Ptolemies acquired works through confiscation. It is reported that upon entering the Alexandrian harbor, ships were examined closely, and any books they were carrying were plundered. A copy was made and given to the original owner, but the original manuscript was preserved for the Great Library. Using such arbitrary means the Great Library has created a large collection of standard texts of Greek classics [1].

Knowledge organization of the ancient Greek literary works

Callimachus was born in Cyrene in Libya, but he spent the greatest part of his life at the Ptolemaic court in Alexandria. His patron was Ptolemy II, and Callimachus continued his activity in the era of Ptolemy III (246-222 BC). According to the Byzantine lexicon Suda, Callimachus was a famous grammarian and created more than 800 books in verse and prose. Ancient authors considered him as one of the greatest Hellenistic poets [5]. Under his leadership the library catalogue was created, resulted in the so called *pinakes* (tablets). Its name is originated from the appropriate parts of the catalogue on papyrus leaves which were stuck (probably written) on wooden tablets. Those tablets were placed above the library cases or shelves to support a search for papyrus rolls and to make their reshelf more flexible. The full title of the catalogue was the following: *Tables of Those Who Have Distinguished Themselves in Every Form of Culture and of What They Wrote*. It was one of the first known documents that listed, identified, and categorized a library's holdings. Within the *pinakes*, Callimachus gave a list of works alphabetically by author and genre [1, 2].

It is worth mentioning that *pinakes* as a Greek term can be used in the sense of 'list' or 'register'. In the 5th and 4th centuries BC there was a well-established tradition of compiling lists of priests, victors and dramatists. Aristotle also wrote different works in the form of lists, *pinakes* that have not survived. Only from quotations by later scholars we know about his lists which were as follows: *Winners at the Olympic Games*, *Winners at the Delphic Games*, *Victories in the dramatic contests of the Dionysia at Athens*, and *Dramatic Plays*. The latter lists recorded the history of Attic drama because they provided a list of all tragedies, satyr plays, and comedies which were performed in Athens during the 5th and 4th centuries at the most significant Dionysian festivals. So Callimachus' *Pinakes* formed part of this tradition strongly supported by the Aristotelian school [10].

Using the author's approach Callimachus added a short biography to each author's name and described the originality of each document. In modern sense we can say that he "added metadata" to each entry – writing a short biographical note on each author – which introduced the author's entry within his catalogue. Callimachus' organization principle supported to avoid confusion in the works of authors with similar or identical names, but separating materials of the original author from works of namesakes was extremely difficult. The title of the literary work was seldom clear (if it existed at all), therefore he always added the first line of the work to his catalogue and noted how many lines the given work included. A brief summary of the content was also provided about the work. Variations in author's names or titles were carefully recorded [1]. The catalogue was composed of 120 books (rolls), and it had registered approximately 200 000 papyrus rolls. Since the library of the Mouseion was practically complete as regards Greek literary works, the catalogue is thought to have been a national bibliography of contemporary Greek literature too. It also appeared as ancestor of bibliography and science history because of its biographical notes [6].

Another striking feature is suggested by the extant fragments. Callimachus did not compile a register of books, but of authors and of their works. So it can be said that his *Pinakes*' aim went beyond the actual collection of the Alexandrian Library. His famous catalogue might be considered as a portable Alexandrian library in our days which was reduced to an endless inventory of author names and of titles. Today the Library of Congress online catalogue or OCLC WorldCat service can be regarded as the equivalent of Callimachus' work. These resources make possible for any reader in the world to identify or authenticate a book from its ISBN, from its author name, or from a part of its title. For librarians, scholars, book-sellers or book-collectors in the Hellenistic world, Callimachus' *Pinakes* fulfilled the same analogous function as the above mentioned information tools do [7]. Using the *pinakes* a library user could find out if the library contained a work by a certain author, how it was categorized, and where it might be found [1]. Relying on the literary works gathered in the Alexandrian Library, Callimachus' objective faced a great challenge since the map of the extant Greek literature corresponded to the territory, and the bibliography of the library was relevant only for a short span of time. There was a high demand for supplements and corrections to be prepared soon. Aristophanes of Byzantium, the great Alexandrine grammarian was responsible for accomplishing this task. The *Pinakes* survived the Ptolemaic period and later became an authoritative reference work for anyone who was concerned about the authenticity or authorship of a Greek literary text or the number of the book-rolls composing it. In the 2nd century AD, Athenaeus gives evidence that Callimachus' *Pinakes* remained a standard reference tool for later scholars interested in old Greek texts [7].

The structure reflecting the contemporary scientists' and literary men's intellectual system was separated into two levels:

- At the higher level there was a categorization of the writers that provided a 'skeleton' of the division.
- At the other level each category was arranged in alphabetical order by the author name.

Callimachus divided the library documents into two main parts: poets and prosaists. In both categories he introduced six sub-groups separately:

- poets: epic poets, elegists, satirical poets, lyrical poets, tragedians, comic playwrights;
- prosaists: historians, speakers, philosophers, physicians, natural scientists, miscellaneous literature (involving also writings on cooking and dining) [6, 8].

Collected and edited content in the virtual library model

First we decided to implement Callimachus' hierarchical structure in our virtual library model. We selected three illustrious Greek ancient authors who would stand for each sub-group within the „poets“ main category. We followed the same author's

approach as Callimachus used in his catalogue by connecting the author's image or her/his bust with the author's name, and added a short biography to her/him. Using this approach we imitated the same content layout once available in Pinakes.

We have integrated the collected and edited content into this library model in the following way:

1. We tried to find images closely related to the authors' life and poetical works. These images covered a wide spectrum of artistic works: statues, graphics, marble reliefs, paintings and maps.
2. Then we gathered and edited a short biography of the selected authors. Referring to their significance in Greek literature, we provided a short overview about their life and listed the most important masterpieces they created. Entries in Encyclopedia Britannica and in Wikipedia online sources¹ were used and checked for this task.
3. Considering the copyright restrictions, we retrieved proper English translations of Greek poetical works. For this aim we could use the electronic version of literary works which was available in various digitization projects e.g. Perseus Digital Library Project (Tufts University)², Project Gutenberg, Google Books Library Project, California Digital Library (University of California). Among them we emphasize the importance of Perseus Digital Library Project which has built a retrievable database from the old Greek texts both in native language and in English. They have also developed 3D data models with an intention to incorporate them into Perseus Digital Library. In this comprehensive project standardized schemas are used for describing ancient Greek texts [9]. Then we edited these English translations in one page (A/4) length and in the suitable format.

All of the collected and edited library content was loaded into the VirCA system in a certain logical order and means according to the special characteristics of the software.

Implementation of the virtual library in a 3D environment

In the implementation of our three-dimensional virtual library model (3DVLM) more than four years ago [11, 12] we decided to use the excellent 3D presentation and navigation features of the **Virtual Collaboration Arena** (VirCA) system developed in the 3D Internet-based Control and Communications Research Laboratory at the Institute for Computer Science and Control (MTA SZTAKI) [13, 14]. In the further development of the library model, the 3D environment of the VirCA system remained the base of the implementation, although we added new presentation features to the model (e.g. different images in the left and right image corridors which serve dual function, browser windows provided by the new version of the VirCA system etc.) [15, 16] and we have been developing alternative web-based presentation interfaces as well [16]. In addition, there is a brand new and efficient tool of cyber learning with excellent 3D presentation capabilities called the *MaxWhere Seminar* system developed by the professionals of the VirCA system. The MaxWhere system uses the 3D virtual space as a general context and allows us to present online interactive content as well as vivid and intricate details of the presented material. This new 3D presentation tool might also be effectively used for supporting our virtual library model in the future.

A brief summary of the basic concepts of the 3DVLM is as follows. The central part of the 3D model is a **virtual room** where the selected library content is presented in carefully arranged boxes called **cabinets**. Each cabinet contains a (verbal or multimedia) text, an image or a browser window inside, and they are curtained or 'veiled' by an appropriate **curtain image** identifying the content of the cabinet (e.g. by the author and title of the presented text, the portrait of the author etc.). Each cabinet has a **label** which identifies a corresponding category (e.g. epic poets, elegists, lyrical poets etc.) selected from the ancient classification system of Callimachus. We attached on both sides a maximum of four relevant images to each cabinet in order to help the users find the cabinet they are looking for more easily (if possible, "at first glance" in the 3D environment), or understand and memorize the represented content more clearly and effectively. We called the sequence of images **image corridors** because they might as well fulfil a kind of 'navigator' function in the 3D environment directing the users to those cabinets which they consider to be important or interesting (see Fig. 1).

The images displayed in the image corridors achieve two different purposes. The images in the *left image corridor* and the content of the cabinet belong to form a coherent whole (i.e. a 'small world') where the function of the images is to illustrate, explain or complete the content of the cabinet. The images can be ancient maps, paintings, antic sculptures, reliefs, papyruses, book covers, illustrative graphics etc. on the one hand, and selected quotations, explanations, commentaries, plot diagrams or maps, brief summaries or reviews of stories etc. on the other hand. The images in the *right image corridor* may (and usually does) belong to more than one cabinets (or, to be more exact, to the content of the cabinets represented as searchable library items). The basic function of the images is to connect the related library items in order that the users can see or recognize the possible relationships of a selected item and, in turn, memorize its content more easily (with as many associations as possible). The images can present the main source of the content (e.g. as a form of a montage, composite or collage of the corresponding web or book pages or covers), lists of selected sources or references, bibliographies, dictionary or encyclopedia entries etc. on the one hand, and a specific group of concordances, collocation tables, portfolio diagrams, mind maps, semantic graphs or hypergraphs etc. on the other hand. Note that, in addition to the image corridors, the careful arrangement or juxtaposition of the cabinets themselves are also of vital importance with regard to the accessibility to the relevant library content in the two- or three-dimensional space [17, 18].

In order to take full advantage of the 3D environment we need a dynamic server-based system which can manipulate the database of the virtual library content, offers an interactive interface for the users to compile and send a search query, and generates multiple views of the search results respectively – using the features of both 2D (i.e. web pages) and 3D (i.e. the

¹ <http://www.britannica.com/EBchecked/topic/14417/Library-of-Alexandria> (et passim); http://en.wikipedia.org/wiki/Library_of_Alexandria (et passim) (2018-05-26)

² <http://www.perseus.tufts.edu/hopper/> (et passim) (2018-05-26)



Fig. 1 Cabinets on the front wall of the virtual room with image corridors on their left side

VirCA system). The visual grouping of the displayed library content depends on the display interface selected. Using 2D environment, the main emphasis is on the selected cabinet and the items displayed in the image corridors of the selected cabinet on both sides (note that most items on the right image corridors refer to a certain group of cabinets expressing a given relationship among their content). On the contrary, using 3D (i.e. the VirCA) environment, the spatial arrangement of the searched cabinets in the virtual room expresses a certain global relationship among them depending on the search query that resulted in the given arrangement.

The hypertext representation of the 3D virtual library model

Using HTML, CSS, JavaScript (and PHP) technology, we have created a hypertext representation or projection of our three-dimensional virtual library model (Fig. 2, 3). In a web browser window, we can navigate in a two-dimensional projection or 'map' of the virtual space. The main navigation tool is a **selector table** (see Fig. 2, below) which consists of two parallel rows each containing nine cells symbolizing the selected cabinets. Every cabinet can be selected interactively by simply clicking on the corresponding cell in the table. Note that the content of the table is generated automatically (in fact, by a PHP script) according to the query the user has sent to search the database. To avoid the continuing and unpleasant use of the vertical scrollbar, we focus on only one cabinet which is selected by the user or by default. The selected cabinet (its curtain image or its content) is displayed in a **main cell** (see Fig. 3, in the centre) which can be considered as the 'dynamic magnification' of the corresponding cell in the selector table. The function of the main cell is to display the curtain image, the content of a selected cabinet or any image selected by a mouse click from the left or right image corridor of the cabinet (see Fig 3, on both sides).

Let us see an example of the use of the 2D environment. After 'Sappho' has been selected in the selector table, the main cell would display the curtain image of the selected cabinet (in our case, the portrait of Sappho). The main cell is surrounded on the left side by thumbnails representing images which are attached to the left image corridor of the corresponding cabinet in the 3D space. We can select every image by simply clicking on the thumbnail on the left; for example, if we select the image of Sappho (that is, the fourth thumbnail) which is actually the same as the curtain image, result can be seen in Fig. 3.

An example of the possible application of the virtual library model

Now that we have introduced the main concepts and basic functions of the 3DVLM let us turn our attention to its possible applications. Concerning the virtual three-dimensional environment and the knowledge base of ancient and related materials around which the implementation of the 3DVLM is organized, our primary goals or mission can be described as follows:

"There is a considerable and increasing need for a kind of efficiently preprocessed, 'ready-made' knowledge which is suitable for understanding, learning and/or memorizing the processed content 'as is'. Which is, in our case, one of the most important

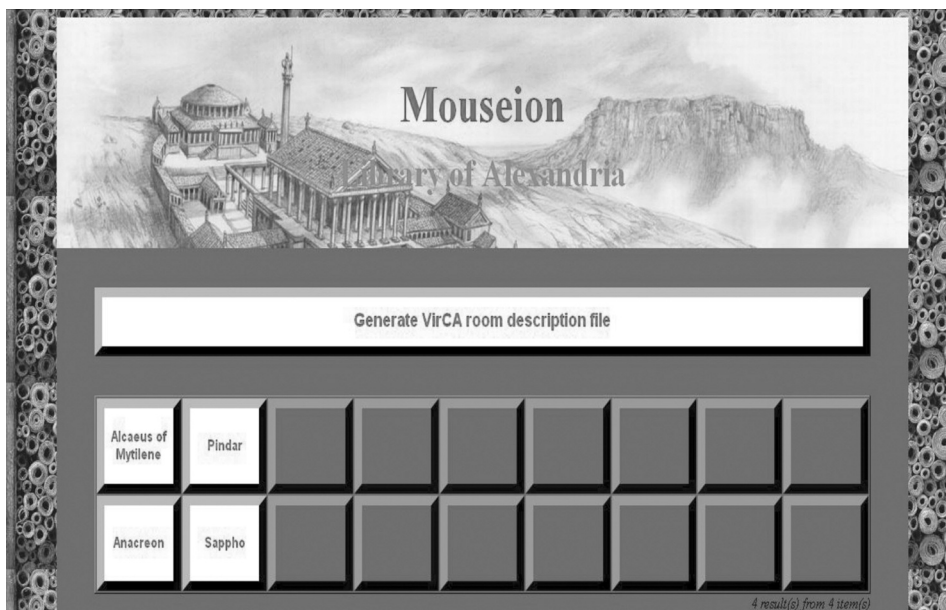


Fig. 2 The hypertext representation of the 3D library model as a result of the search for 'Lyrical poets'



Fig. 3 The portrait of Sappho in the main cell of the hypertext representation with the left and right image corridors

cultural heritage of the western civilization – to say nothing of other important 'side effects', e.g. the outstanding educational role of the provided literary texts in language learning. During the development and implementation of our virtual library model we have been focusing on a kind of 'read and learn at once' strategy which is perfectly supported by the three-dimensional and spatial representation of the provided knowledge (using both verbal and multimedia texts)." [16]

Let us focus now on verbal texts, in our case a poem by Sappho, to demonstrate the possibilities of the 3DVLM. During the reading process, we need a certain amount of dictionary and background knowledge to understand and interpret the text we are just reading. To support this, the selected material should be carefully preprocessed to provide the necessary (or presumed) dictionary and background knowledge for the reader in order that the text could be read (and understood) at once and without much effort [19].

We present an English translation of the poem 'To a maiden' by Sappho which is part of the knowledge base of ancient texts. We attached explanatory texts to two selected points of the poem (underlined below) which serve as both dictionary entries and commentaries.

Sappho: To a maiden. (Translated by J. Addington Symonds, 1885) [20]

*Peer of gods he seemeth to me, the blissful
Man who sits and gazes at thee before him,
Close beside thee sits, and in silence hears thee
Silverly speaking,*

Laughing love's low laughter. Oh this, this only
Stirs the troubled heart in my breast to tremble!
For should I but see thee a little moment,
Straight is my voice hushed;

Yea, my tongue is broken, and through and through me
'Neath the flesh impalpable fire runs tingling;
Nothing see mine eyes, and a noise of roaring
Waves in my ear sounds;

Sweat runs down in rivers, a tremor seizes
All my limbs, and paler than grass in autumn,
Caught by pains of menacing death, I falter,
Lost in the love-trance.

explanation and commentary for line 1 and 2

Peer of gods he seemeth to me, the blissful / Man ... = A passionate and jealous woman (probably Sappho herself) is envious of the man who is sitting close beside a striking girl, the object of passionate love. That man looks to the woman so extremely happy, so joyful, that he seems to be equal to the gods as though he is one of them.

explanation and commentary for line 4 and 5

... Silverly speaking, / Laughing love's low laughter = The striking girl behaves like she would be one of the ancient goddesses of love (Aphrodite, Circe, or perhaps one of the Sirens known from Odyssey). She is flirting with the man who is sitting close behind her. Her soft speaking and laughter, her low and silvery tone serves to tempt and enchant the man in order to either seduce him or keep him in the eternal state of listening to the stunning voices in silence.

Of course, the main function of the above texts is to explain those parts of the presented English text the meaning of which might be a bit unclear or ambiguous. Although they provide mainly linguistic (or dictionary) knowledge it is worth noticing the emergence of some references to Greek mythology. In this sense, the explanatory texts also include some important elements of the necessary background knowledge, and therefore they provide not only explanatory but commentary function as well.

The cabinet containing Sappho's poem can be searched for and selected using either the 2D or the 3D display interfaces of the 3DVLM. Then the explanations and commentaries presented above can be found as inherent parts of the left image corridor of the selected cabinet. They will surely support the process of reading and understanding the poem, and the success (and the explored beauty) should give enough motivation for the reader *to repeat the process more than once*. It is actually the essence of our 'memorize at once' strategy of learning which involves the development of both the linguistic competence and the background knowledge of the reader. And although this is a very simple (and obviously limited) demonstration of the possibilities of our model, we firmly think that it clearly shows how the gradual development of the knowledge base and the inclusion of carefully preprocessed materials might and would contribute to the achievement of our mission in the future.

References

- P. Heather, "The Great Library of Alexandria?", *Library Philosophy and Practice*, University of Nebraska–Lincoln. 2010 (August).
- T. Grüll, "Könyvtárak és könyvkiadás az ókorban," [Libraries and Publishing of Books in the Antiquity,] in *Bevezetés az ókortudományba 1*, [Introduction to the Study of Antiquity 1,] Debrecen: Kossuth Egyetemi K., 1996, pp. 223–231.
- G. Novelli, "Alexandriai Könyvtár. Egyiptom, Alexandria," [Library of Alexandria. Egypt, Alexandria]. in *Az építészet csodái: Az ókortól napjainkig* [Wonders of Architecture: From Antiquity to Our Days]/ [összeáll., szerk. Alessandra Capodiferrp] [compiled, edited by Alessandra Capodiferrp]; [ford. Getto Katalin] [translated by Getto Katalin], Pécs : Alexandra, 2010, pp. 164-167.

- W. Wiegand and D. G. Davis: *Encyclopedia of Library History*, New York: Routledge, 1994.
- M. Berti and V. Costa, "The Ancient Library of Alexandria: A model for Classical Scholarship in the Age of Million Book Libraries" in *International Symposium on the Scaife Digital library*. (Lexington Kentucky, USA, March 13, 2009,) [Preprint version of the paper]
http://www.perseus.tufts.edu/publications/Berti-Costa_Alexandria_Kentucky.pdf (2018-05-21)
- "The Library of Alexandria: Center of Learning in the Ancient World," ed. by R. MacLeod, New York: I. B. Tauris & Co Ltd., 2010.
- Ch. Jacob: *Fragments of a history of ancient libraries*, in: *Ancient Libraries*, J. König, K. Oikonomopoulou and G. Woolf, Eds. Cambridge: Cambridge University Press, 2013. pp. 57-81.
- M. El-abbadi, "The Life and Fate of the Ancient Library of Alexandria," 2nd illustrated ed., Unesco/UNDP, 1990.
- S. Horn-yeu, R. J. K. Jacob, G. R. Crane, "The 3D Vase Museum: a New Approach to Context in a Digital Library", in *JCDL '04. Proc. of the 4th ACM/IEEE-CS joint conference on Digital libraries*, New York, NY, USA : ACM Press, 2004. pp. 125-134.
- R. Blum: *Kallimachos: The Alexandrian Library and the Origins of Bibliography*, Madison WI-London: The University of Wisconsin Press, 1991. [original edition: *Kallimachos und die Literaturverzeichnung bei den Griechen. Untersuchungen zur Geschichte der Biobibliographie*. Frankfurt am Main: Buchhändler-Verein GmbH, 1977].
- I. Boda, M. Bényei and E. Tóth, "New dimensions of an ancient Library: the Library of Alexandria," in *CogInfoCom 2013. Proc. of the 4th IEEE International Conference on Cognitive Infocommunications*, (Budapest, Hungary December 2-5, 2013,) pp. 537-542.
- I. Boda, E. Tóth, M. Bényei and I. Csont, "A three-dimensional virtual library model of the ancient Library of Alexandria," in *ICAI 2014. Proc. of the 9th International Conference on Applied Informatics*, (Eger, Hungary, January 29-February 1, 2014,) vol. 1, pp. 103-111.
- VirCA: 3D Virtual Collaboration Arena. <http://virca.hu/> (2018-05-22)
- P. Galambos and P. Baranyi, "VirCA as Virtual Intelligent Space for RT-Middleware," in *AIM 2011. Proceedings of the 2011 IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, (Budapest, Hungary, July 3-7 2011,) 140-145.
- I. Boda, E. Tóth, M. Bényei and I. Csont, "A 3D virtual library model: representing verbal and multimedia content in three dimensional space," in *QQL2015. 7th Qualitative and Quantitative Methods in Libraries International Conference*, (Paris, France, May 26-29, 2015,) published in *Qualitative and Quantitative Methods in Libraries*, vol. 4. issue 4. (December 2015) 891-901.
- I. Boda, E. Tóth, I. Csont and L. T. Nagy, "Toward a knowledge base of literary content focusing on the ancient Library of Alexandria in the three dimensional space," in *CogInfoCom 2015. Proc. of the 6th IEEE International Conference on Cognitive Infocommunications*, (Győr, Hungary October 19-21, 2015,) pp. 251-258.
- M. Bernstein, "Collage, Composites, Construction," in *Hypertext '03. Proceedings of the 14th ACM Conference on Hypertext and Hypermedia*, (Nottingham UK Aug 26-30 2003,) 122-123.
- J. N. Matias and P. Williams, "Comparing Spatial Hypertext Collections," in *Hypertext '09. Proceedings of the 20th ACM conference on Hypertext and Hypermedia*. (Torino, Italy June 29-July 1 2009,) 45-50.
- István Boda, Erzsébet Tóth, István Csont and László T. Nagy, "Developing a knowledge base of ancient literary texts in virtual space," in Péter Baranyi (ed.): *CogInfoCom 2016. Proc. of the 7th IEEE International Conference on Cognitive Infocommunications*, (Wrocław, Poland October 16-18, 2016,) pp. 263-270.
- Sappho: *To a Maiden*. Translated by John Addington Symonds. In: *The John Addington Symonds Pages*. <http://rictornorton.co.uk/symonds/translat.htm#maiden> (2018-05-24)

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