The Computation Center at Madrid University, 1966-1973: An Example of True Interaction between Art, Science and Technology

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Computation and calculation centers in universities or in private companies like IBM or Siemens played a crucial role in pioneer computer art, but their history still has to be told and remains placed out of sight in art literature. Media art historians seem to have been more interested in specific computer art works than in uncovering the reasons why those art pieces were created in those computation centers. In the Fifties and Sixties only these centers had computation machines - computers -, and employed mathematicians, physicists and technicians who had the knowledge to use them for calculation purposes. These pioneer scientists knew intuitively that computers were not only calculation machines for scientific, statistic or economical applications but also amazing thinking tools that could be applied to and would transform all realms of society. Their personal interest was not only focused on searching for other possible uses and potential fields of application, but also on exploring what conceptual and sociological changes computers would bring to society. This search was also propelled by private companies that hosted those computation centers or donated computers to universities. These companies were commercially concerned about expanding the scope of computer use. So, driven by scientific spirit and mercantile interests, people at these computation centers started to explore further possibilities for computers. An interdisciplinary approach was inherent to this search. The question was: how can a computer be useful to solve problems or to push forward research in a particular domain? The format of this question fostered a natural symbiosis between mathematics, computer engineering and other disciplines. Scientists' personal pursuits influenced the fact that architecture, art and music were sometimes considered as fields that could give birth to fruitful results. Thus, the first initiatives aiming to look for aesthetic prospects of computer machines took place at computation centers and were mainly undertaken by mathematicians[1].

The Computation Center at Madrid University (CCUM) is a relevant case of how computation centers, mathematicians and some private computer companies became generators of the interaction between technology and other disciplines. In January 1966[2] Madrid University reached an agreement with IBM to set up a computation center which was, however, not officially opened to the public until March *1969*[3]. IBM would give an IBM 7090[4] and an IBM 1401[5] computer to Madrid University and would contribute the equivalent of 18.000 Euros per year for research scholarships. This center was the first computation center in Spain and these computers were two of the most advanced computers in Europe at that time.[6] Before this center was opened in Madrid, there were only small computers in some departments in different Spanish universities. This is the reason why, although this center was integrated into the Madrid University structure, it was thought to be open to all research and education centers in Spain. Its initial purpose was to foster the use of new mathematic calculation techniques in research and education in Spain[7], and to support the calculation needs of the Spanish university community. Thus, CCUM's initial activities were grouped in two main sections: calculation support for University departments, and computer and programming training for students and other professionals not only in Madrid, but all over Spain.

However, it is obvious that there were not only educational or scientific interests but also commercial and economic reasons for the setting up of CCUM. IBM had an obvious interest in selling computers to Spanish universities, the agreement and the donation being intended as just a first step towards future sales. That is why there was a clause in the agreement defining that the donated computers would be used only for research and not for routine tasks. Thus, IBM would be able to sell numerous computers for administrative work to the universities. However, as we will see later, what could initially be considered a limitation for CCUM's mission was the key for future evolution of the Centre's activities and goals.

Seven analysts, eight operators, three perforators and three administrators were the initial CCUM staff, among whom there were five mathematicians, three physicists, one chemist and one economist. As this was the first computation center in Spain, people with previous international experience in similar computers and in computer centers abroad were looked for. Its director, Florentino Briones, was a mathematician who had been working in a nuclear energy center in Italy that had a comparable computer; and the Vice-Director, another mathematician, Ernesto Garcia Camarero, had been working in the Instituto Nazionale per le Applicazioni del Calcolo in Roma some years before, and had previously been in charge of setting up the Calculation Institute of Buenos Aires University.

Although the spread of calculation techniques in Spain was the main statutory goal of the Center, the fact that IBM had stressed research as the only possible use for

both computers was actually an opportunity to introduce other, initially unforeseen aims for CCUM. In 1961, in the Calculation Institute of Buenos Aires University Ernesto Garcia had had the opportunity to participate in a seminar about automatic translation where linguists, mathematicians and engineers studied together the use of computers to deal with linguistic and literary subjects[8]. This experience had been really fascinating for him due to its interdisciplinary character, and together with IBM's emphasis on research, it was the key for CCUM's development in the following four years. When Ernesto Garcia had to propose an activity program for the Center, he took advantage of this "research umbrella" and immediately suggested to set up a group of seminars in which the use of computers could be studied in other fields where the computer could be not only a mathematic or arithmetic machine but also an intelligent machine[9] [10]. It has to be said that Ernesto Garcia was also Professor of Automata Theory and Formal Languages[11] and was therefore very much interested in automation and language theory. According to their colleagues he had[12] a convincing personality together with a great power of seduction[13], so these two "weapons" together with his personal interests inspired the content and character of most of those seminars. Thus, driven by an interdisciplinary spirit and influenced by Garcia's pursuits, these seminars expanded the initial CCUM mission and tried "to study automation of research and analysis processes in fields where automation had not been brought in yet"[14]. Then, the first two seminars were set up: "Mathematic Linguistics"[15] and "Automatic Generation of Architectonic Spaces"[16].

IBM appointed one of its executives, Mario Fernandez Barberá, as the CCUM coordinator. He was a computer technician but also an art collector who knew a lot of artists. In 1968 he sent a letter to a painter, Manuel Barbadillo, who was working on abstract and modular paintings, because Fernandez Barberá was convinced that this artist would benefit from the work with computers, due to formal and conceptual characteristics of his previous work. After talking to him several times, Barbadillo submitted a research proposal to the CCUM. He was specially fascinated by the influence of cybernetics on future society and thought that computers could help him simplify the process of obtaining different modular combinations[17]. Ernesto Garcia found, in Barbadillo s proposal, certain similarities and concerns coincidental to those of the two initial seminars; and consequently, he decided to propose a specific seminar for visual arts: "Analysis and Generation of Plastic Forms".

Thus, during the first four years the CCUM was not only a calculation center and a computation training organization[18] but also a discussion place for intellectual and artistic debate about the role of computers in society. Although there were other workshops dedicated to learning, automata, the construction industry, health service, music[19] and other subjects, the most active and productive ones were the three seminars previously mentioned. Even if every group met independently every

fortnight and the number of people changed from session to session, the minutes of these meetings give the impression that there was a common, unifying spirit among those three seminars, although it might have not been clear for the participants at that time This was due to different factors. On one hand, Ernesto Garcia participated in all the groups, acting as a transmitter of ideas and as a liaison element; and similarly, other CCUM staff members[20] and some external participants [21] - strongly linked to CCUM - often took part in several of the groups. On the other hand, several strong conceptual connecting threads seem to have existed - linked to personal interests of CCUM executives and seminar participants - that unified their different pursuits: cybernetics and automation theories, information and mathematical aesthetics, and generative grammar. Seminar participants wanted to verify what was computable and automatizable in those different fields and what was not[22]; to uncover the simplest elements of vocabulary in every domain; and to find the grammar rules that would generate works according to the style of a specific artist[23] or an architectonic style[14]. They wanted to use the computer to expose a finite number of rules and elements in those fields that would generate an infinite number of possible combinations; and the role of the artist or the architect would only be to choose, to select among those infinite possibilities according to aesthetic criteria. Automation would free artists from manual repetition. Aesthetic decision making should be their only task and even aesthetic decisions should be automated as far as possible. They even tried to make programs that would reduce those infinite combination possibilities[25] in order to facilitate the artist s choices[26]. Cybernetics and contemporary language theories about generative grammar were clearly underlying these quests.

Along with theoretical debates, artists and architects worked together with programmers to try to generate programs that would help them understand their own art work or to generate their art pieces themselves[27], works that were shown in different exhibitions[28]. Barbadillo, Yturralde, Alexanco, Sevilla, Navarro, or Seguí de la Riba were some of the artists and architects that actively participated[29]. Their works were connected to predominant contemporary international artistic trends in computer art. From the beginning CCUM executives were aware of the CCUM s pioneer character not only in Spain but in the world and developed an amazing international network of experts, artists, theorists and centers specialized in many different domains to enrich thc participants experience. A number of those international professionals were invited as lecturers or exhibition participants and several CCUM staff members also Sent to international events. For example Nicholas Negroponte, who had founded MIT's Architecture Machine Group in 1967, gave a lecture in May 1971 about "Architecture and Machines"[30]; or Abraham Moles spent some days at CCUM in February 1970 and gave different lectures[31]. Or Nees, Nake, Noll, Lecci, Mezei or Milojevic participated in the exhibition

"Generation of Plastic Forms" organized at CCUM in 1970[32]. Even in February 1972, when first signs of decay in seminar activities had already emerged, CCUM together with the Goethe Institute and Siemens organized three weeks of events and exhibitions about art and computers, in which a remarkable group of international artists and theoreticians participated, including Max Bense, father of information aesthetics.

However, although interdisciplinary collaboration between creators and scientists was productive and fruitful, the technology was not so advanced and processes were too slow, which discouraged and frustrated artists and architects.[33] Additionally, the visual arts seminar[34] had to face multiple critiques from different sectors. On the one hand, some artists argued that the use of automatic devices and scientific methods would denaturalize art and refused the idea of any interaction between computers and art. On the other hand, scientists claimed that art is not a scientific problem and therefore, to apply scientific methods to art was not serious or necessary.[35] Some of the hardest criticism came from art critics who commented that the CCUM experience did not correspond to our cultural and scientific reality at that time, and criticized the emphasis on scientific research shown by cybernetic artists.[36] Moreover, interdisciplinary activities had never been completely understood inside Madrid University. Unfortunately, seminar activity decreased gradually in 1973, and in 1974 the CCUM was restructured. Since then, the CCUM would only focus on computing and calculation.[37] Nevertheless, lively memories about an exceptional and creative period in Spanish art history still remain in some of their participants, and the CCUM's interdisciplinary spirit is an inspiration for a new generation of artists who dream about having a place where truly interdisciplinary and high-level discussion can take place on a permanent basis.

Endnotes

1 Georg Nees, Frieder Nake, A. Michael Noll or Leslie Mezei were all mathematicians and linked to computation centers in different parts of the world. Georg Nees was even Director of the Computation Center of the Siemens Company in Erlangen (Germany). Nake was a scientific assistant in the Institute for Mathematics and Computation Center in Stuttgart University and also worked for IBM for two months. Simultaneously, these computation centers acted as attractors for artists who started to be fascinated by computers. At that time the idea of a personal computer had not appeared yet and computers were extremely expensive for individuals; so, artists had to approach those centers if they wanted to experiment with these computation machines. Thus, for example, Auro Lecci used the IBM 7090 computer at Centro Nazionale Universitario di Calcolo Elettronico in Pisa (Italy) or Petar Milojevic worked at the Computation Center in McGill University in Canada.

2 The formal agreement was signed on January, 13th 1966.

3 The building that would host the Center had to be built. It was designed by a prestigious Spanish architect Miguel Fisac. Activities and seminars started in 1968, when the building was finished, around the time when the famous "Cybernetic Serendipity" exhibition, curated by Jasia Reichardt, took place in London.

4 It could read 250 cards per minute and stored 33.768 words of 36 binary digits. Its printer could print 150 lines per minute.

5 It could read 800 cards per minute. Its printer could print 600 lines per minute.

6 In the opening speech its director compared this equipment and installations to those in Pisa University, Copenhagen or Nuremberg Universities and the Imperial College of London.

7 CCUM Annual Report 1969/1970, p. 5

8 Bulletin "Informativo" n° 6 - Calculation Institute Buenos Aires University, p. 3, [www.elgra-nerocomun.net/articlc160.html], 30 September 2007.

9 García Camarero, E. "El ordenador y la creatividad en la Universidad de Madrid a finales de los sesenta" in *Cultura y Nuevas Tecnologías* (1986), catalogue of *Procesos* exhibition at Centro de Arte Reina Sofía, Madrid, May 1986, pp. 177-183. [www.elgranerocomun.net/article104.html], 30 September 2007.

10 The machine was seen as a tool to save repetitive and mechanical work and to substitute man in these boring tasks. Man should be working in creative activities leaving all mechanical tasks to computers.

11 At the Mathematics School, Madrid University.

12 ... and still has...

13 The Director Florentino Briones considers that the success of the seminar was due to Garcia s intelligence and seduction. Florentino Briones in the Conference "Homenaje a Eusebio Sempere. De la experiencia del Centro de Cálculo de la Universidad de Madrid (1968-1973) al binomio arte y tecnología actual", Museo de la Universidad de Alicante, 19-20 December 2005, p. 21.

14 CCUM Bulletin n° 1. December 1968, p. 1

15 Its main goal was the study of syntax and semantics of artificial languages. They were trying to build a syntactic scheme of the Spanish language, and to study the most simple elements of a language.

16 Its main goal was to analyze architectonic forms and to study their automatic generation, creating spaces and buildings.

17 Barbadillo, M. "El ordenador. Experiencias de un pintor con una herramienta nueva" in *Ordenadores en el arte* (1969), Centro de Calculo de la Universidad de Madrid, p. 13-16. Barbadillo was trying to find the morphemes of his language and the computer was a tool for analyzing his own work. The artwork was created when the artist decided what combination is valid or not.

18 Together with these seminars there were courses to train staff in software writing and system analysis; they also provided consultancy for problem analysis and program drafting and accepted research proposals for which a computer was needed. They gave scholarships to attend programming courses, research, and monograph writing.

19 They tried to study the possible applications of computers to music: the computer as a composer or help for composition; or the computer as a player, a performer. They even tried to design a machine capable of producing sounds with enough quality from the minimum possible information, and tried to record those sound on magnetic tape.

20 As some analysts and the director.

21 For example, Javier Gomez de Liaño (philosopher and writer) or Violeta de Monte (linguist).

22 Conference "Homenaje a Eusebio Sempere. De la experiencia del Centro de Calculo de la Universidad de Madrid (1968-1973) al binomio arte y tecnologia actual", Museo de la Universidad de Alicante, 19-20 December 2005, p. 37-42.
23 For example, Manuel Barbadillo.
24 For example, Gómez de Liaño's study about Spanish plateresque atrium
25 They tried to uncover what subjective rules were used (by every artist) to choose among several possible combinations in order to generate only those combinations that would please the artist.
26 Garcia Camarero, E. (1969). "Generation automática de formas plásticas", in *Generation automática de formas plásticas. Resumen de los seminarios celebrados durante el curso 1968-69* (1969) Centro de Cálculo dc la Universidad de Madrid June 1969.
27 Thus, in the visual art seminar there were three main artistic research lines: one focused on modular generation and development, another concentrated on mathematics equations and the last one was interested in the psychology of perception of modular forms.
28 E.g. the exhibitions "Formas computables" (1969) and "Generation de Formas Plásticas" (1970) that took place at the CCUM.
29 There is a long list of architects, artists and theoreticians who participated not only in those seminars but also in lectures and conferences organized at CCUM. See meeting minutes in CCUM Bulletins from 1969 to 1973.
30 At CCUM, 28-05-1971. CCUM Bulletin n° 16.
31 CCUM Bulletin n° 10, "Heuristic definition of cinematographic image". Abraham Moles was Professor at Strasbourg University at that time. Moles showed the movie titled "Computer generated movies" at the Computation Center in Madrid, in which it was explained how a movie could be fully generated by computers. Furthermore, he gave a lecture in which he expounded his theory of signs and super-signs.
32 Exhibition "Generation automática de formas plásticas", June-July 1970.
33 Artists and architects had to explain to programmers what they wanted to do. (Although some courses were organized to teach programming languages (as Fortran IV) to artists, only one of them, Alexanco, learned to program. Computer languages were difficult at that time for people with no background in mathematics). Then, programmers had to write programs that had to be transferred, by perforation, to cards that could be read by computers. Computers did not have screens, only printers. As there was a long queue of programs from different university departments and other professionals that had to be processed, it could take weeks to know the final outcome of a program, or to find out if there was a mistake in it.
34 This seminar has been the most studied up to now as its participant artists have been considered the main Spanish media art pioneers. The most complete study about this seminar is a thesis: Castaños Alés, E. (2000) Los orígenes del arte cibernético en España: el seminario de Generación Automática de Formas Plásticas del Centro de Calculo de la Universidad de Madrid: (1968-1973). Malaga University. [www.cervantesvirtual.com/FichaObra.html?Ref=3162&cext=pdf&portal=0], 30 September 2007.
35 Garcia Camarero, E. (1969) "Clausura del Seminario sobre Generaci6n de Formas Plasticas" Lecture given at the CCUM closing ceremony, 26 June 1969. [www.elgranerocomun.net/article153.html], 30 September 2007.
36 Juan Manuel Bonet, "Esplendor y fracaso de nuestro arte tecnológico (y 2) in *Estudio de estructura arquitectónica,* n° 7, Madrid, March 1974, p. 19-23.
37 CCUM Bulletin n° 25, December 1974.