

From *The Technological Herbarium* (1) - *Telegarden* by Ken Goldberg

Gianna Maria Gatti

gatti.gm@virgilio.it

NOTE: Later in 2009, the AVINUS Verlag/Press of Berlin (<http://verlag.avinus.de/>) will publish Gianna Maria Gatti's book *The Technological Herbarium* in both English and German editions(the original book is *L'Erbario Tecnologico*, Bologna, Clueb, 2005). The Italian-to-English translation is by Alan N. Shapiro, and the Italian-to-German translation is by Dr. Helene Harth. Here the first of three excerpts from the book: *Telegarden* by Ken Goldberg. The next two to be published are *Osmose* by Char Davies; and *Interactive Plant Growing* and *Trans Plant* by Christa Sommerer and Laurent Mignonneau.

***Telegarden* by Ken Goldberg**

Telegarden is a telerobotic installation that enables users of the World Wide Web to see and cultivate a real garden. Conceived in 1994, it was activated in June 1995 at the University of Southern California and presented, over the course of the summer, at the leading international exhibitions of digital art and technology, among which 'SIGGRAPH '95' in Los Angeles. Since September 1996, *Telegarden* has been physically in Linz, Austria, at the Digital Media Museum of the Ars Electronica Center.

The garden has a circular form and grows on the inside of a metallic container about fifty centimeters deep, with a diameter of about two meters; at the center the robot dominates, the only manager and supervisor of this blooming flowerbed. The robot is always ready, with its swiveling arm, to carry out the orders given by the 'gardeners' scattered all over the world. To take care of the garden, in fact, it is not necessary to travel personally to the place where it is situated; the only requirement is a computer equipped with an Internet connection. Surfing to the website of *Telegarden*, it is the garden itself which enters into the homes of the users, providing them with information and instructions regarding its condition and care, as well as

guiding the users, if they so request, in the general practice of gardening. The image that appears on the screen is a simulated view of the garden from above in real time – a comprehensive graphic of the robotic arm captured in its mobile position; next to this scheme one sees the real shot of the portion of the garden made visible by the video camera placed at the extremity of the robotic arm. Clicking on any point of the graphic, the robot moves to the position indicated by the user and takes a snapshot which after a few seconds is made visible on the screen by the system. This exploration at a distance of the garden and the possibility of posting a comment are interactions open to all users, including occasional 'guests'. For those, however, who decide to become members of *Telegarden*, the opportunities for action and participation increase. Registering a personal e-mail address grants one access rights to the community of *Telegarden* and the possibility of enjoying the privileges which it offers: practical privileges relating to the care of the garden such as seminars, watering rights, monitoring the growth of the plants and advantages of a technical nature, linked to the production of the visual image of the garden.¹ The members can in addition communicate with each other, exchanging information and comments about the garden or other topics, thanks to a special chat system called 'Village Square' that fosters this dialogue.

For Goldberg, *Telegarden* is a "living model of small-planet social interactions"²: a small planet whose organization is founded on the combination of several factors, technological (informatics, robotics, Internet, telepresence) and organic (vegetation). To activate their interrelationship, an almost unlimited number of persons, navigators of the network from every part of the world, come together in *Telegarden* and interact with the shared goal of making the garden live and grow.

This is the kind of evolution that was missing in *Mercury Project*, the first interactive installation that was the fruit of Goldberg's robotic research, to which the artist applied the potential of the Internet to enable the telerobotic manipulation of a remote environment. In the course of two-and-a-half million hits on the site over seven months in which it was continuously online, the navigators were invited to dig up from the sand objects contained in a sand-filled box simulating an archeological excavation.³ In spite of the innovative conception of making a robotic artwork available twenty-four hours a day, to multiple users in real time, the project turned out to be unsatisfactory for its own creators, in that the purpose was to discover simple pre-established objects: a search that, as an end in itself, showed all of its limits in the repetitiveness of the actions and the predictability of the outcome. Therefore the concept was extended in the following work, introducing an uncontrollable, non-programmed element, which

consisted in adding an organic component to the high technology of the web: the development of growth of a plant, in fact, has a speed which, unlike the electronic one, can be neither compressed nor accelerated. One of the principal objectives of *Telegarden* is to emphasize the properties of the two opposed realities, the living organism and the technological component, in order that, after having been compared with and related to each other, they combine in a reciprocal exchange, one supporting the other. Moreover, the entire process leads the user to experiment with a different approach to both, empowering him to discover a new mode of interpreting both the old consolidated practice of gardening as well as the more recent but by now familiar navigation of the net. The garden, characterized by being situated in a stable way in a place, and by having a slow biological dynamic of growth, is entrusted by Goldberg to the Internet, the omnipresent media of communication the speed of which guarantees the continuous and constantly updated flow of information. And that is exactly what plants need to live: several people who take care of them with regularity and tenacity, the process made easier by being able to do it comfortably from one's own computer. On the other hand, offering Internet users a natural goal made up of cells and delicate vital equilibria, of which they take care step by step, permits them to make a different use of this media.

Goldberg points out the two modes of behavior that are typical of navigation in the network: 'hunting' and 'gathering'. Pierre Lévy provides a useful explanation here: the former consists in the search for circumscribed information that one wishes to reach as quickly as possible. This is equivalent to purposive action that has the goal of obtaining a specific result. The latter, by contrast, is a search that starts out without any well-defined goal, and precisely for this reason, ends up losing itself in the variegated supply of alternatives which circulate on the web. The aimless wandering from site to site is transformed into a composite gathering of often unforeseen data.⁴ To these two emblematic attitudes of the navigator, which can also involuntarily coexist, is counterposed the ethics of *Telegarden*, which makes the user return to the same site over and over again, seduced by the lure of participating in the unusual cultivation at a distance of a garden, and being able to verify the consequences of one's actions. Dialogue with the web is not exhausted by the mere discovery and exchange of data. In this case, it becomes a sharing of material resources aimed at the maintenance of the site itself, essential to its physical survival.

On the indispensable interaction between user and garden is founded the second of the objectives pursued by the *Telegarden* team: that of making users realize that they are not alone in taking care of the living installation. In *Telegarden*, as the

authors make clear, the people become aware of the electronic presence of the others while engaging in the shared goal of taking care of the plants, interrupting their 'skipping' around from one site to the next, stopping to 'smell the roses'. If navigation is usually impersonal and renders invisible the reality that there are other users connected to the same site, *Telegarden* attempts to reduce this feeling of 'solitude'.⁵ *Telegarden* does not limit itself to awakening awareness in its users of how the web can be used at the same time by several persons. The installation makes sense only in so far as it is a community of navigators who collaborate together, grouped around an environment. The configuration of *Telegarden* leads its members to understand the importance of interacting and encountering each other. The state of self-management in which they are left tries intentionally to make them responsible for their choices, bringing them face-to-face with the problems of a virtual community: for example, acts of sabotage.⁶ "Despite the horticultural setbacks, the *Telegarden* succeeded in its goal of propagating a 'post-nomadic' community, where survival favors those who collaborate."⁷

The authors go back through the history of humanity, gathering as a reference point for their community the Neolithic Revolution, which around eight thousand years B.C. saw prehistoric man abandon the condition of nomadic hunter-gatherer in favor of allocated settlements devoted to cultivation and animal breeding.⁸ Hence the parallel with *Telegarden*, which carves out its own territory from inside the Internet, returning to the 'agricultural dimension' the users who wander about the web like nomads in continuous 'hunting and gathering'. Goldberg's installation can in this sense be related to the notion of Territory elaborated by Pierre Lévy, which is part of his theory of the four anthropological spaces: "*Territorial* space arose during the Neolithic Period with the development of agriculture, the city, the state, and writing. This second space did not eliminate the great nomadic Earth but partially covered it and attempted to turn it into something sedentary, domesticated. Hunting and gathering were no longer a source of wealth, but the possession and exploitation of fields... The pivot of existence was no longer participation in the cosmos but the link to a territorial entity (affiliation, property, etc.) defined by its borders."⁹

And that is what develops the small flowerbed of *Telegarden*, in which a certain number of strangers initially find a space to make their own, within the infinite routes of the web, displaying a need to stop and commit to something stable. The garden becomes a reference point for which one's affection grows, in which there are other members who express these same sentiments and with whom one can form new friendships. The desire to construct something together and to confront oneself as a

group reinforces the bond of community that has been created: this sharing generates a whole series of dynamics of socialization, exchanges, and moments of complicity. This new post-nomadic community dedicated to agriculture adjusts to its own times, reflects its own cultural technological epoch, and acts making use of the tools that set it apart: information technology and robotics. Contact with the Earth passes through a mouse, a computer screen, the Internet. Although the sensorial pleasure arising from direct manipulation, olfactory perception and, in some cases, the tasting of products is lost, Goldberg's purpose is not to make *Telegarden* a substitute for true gardening but, on the contrary, to present it as a valid alternative and partner to 'the real', an incentive for the rediscovery of this practice.

Cultivation also occurs via a robotic arm physically in contact with the garden that distributes the material substances necessary to the life of the plants. The original symbiosis established among robot, Internet and nature is interpreted ironically by Goldberg: "A garden is meant to be a refuge from technology. Robots are meant to go into places that are dangerous – places we don't want to be. So sending a robot into a garden is probably the most absurd application of telerobotics!"... The *Telegarden* is a metaphor for the deepening intrusiveness of technology, in particular the Internet."¹⁰ An Adept robot simulating human arm structure, usually engaged in productive industrial activity, therefore very fast, has been personalized and equipped with special devices by the computer scientist Jeff Wiegley to make it skillful at digging, sowing, and watering as well as satisfying in the shortest time possible the requests of all the gardeners who maneuver it from their computers via the Internet. The so-called 'collective intelligence' flows together into a single executor, a single arm corresponding to hundreds of minds. Steven Gentner comments: "When viewing the robot physically it certainly does appear that it is alive and knows what it is doing. However it is simply responding to a collective intelligence that exists in many different locations. Two heads are better than one... imagine if you have thousands!"¹¹

The great support for the community of *Telegarden* - after only one year it numbered nine thousands members - persuaded the staff to regulate the sowing to avoid the overcrowding of the plants. Cultivation privileges were granted based on the number of contacts made, attesting to the real attachment to the garden, and on the registration as a member for a given period.¹² The gardeners of *Telegarden* cultivate with the mouse but the result is an authentic garden, completely natural and in continuous evolution: flowers and edible vegetables such as tomatoes and radishes grow there, insects circulate there. The garden has its own demands which must be respected. The environment must maintain a constant temperature and a regular

illumination composed of solar light as well as light artificially produced by lamps for a duration of fifteen hours a day.¹³ Periodic maintenance is also necessary: weeding, pruning, and transplanting when the growth becomes too dense. Every six months a complete replacing of the soil is indispensable, an operation that, on the one hand, facilitates the control of the mechanical components of the installation, which inevitably wear out, on the other hand, it permits the upgrading of the informatic apparatus. Direct action on the spot by a staff of assistants is unavoidable because the set of actions triggerable via the Internet that the robot can carry out are limited. Knowledge of this has fueled the attitude of a group of skeptics, incredulous that the commands imparted at a distance are actually those which provide for the garden. There is a second group of skeptics who have raised the doubt that the garden does not really exist, that it is only a transmitted image.

Goldberg has responded to these doubts by making them an object of reflection. He has converted the accusations, which could have given rise to sterile polemics, into an analysis of knowledge at a distance examined in its various implications. According to the artist, philosophical interrogations must run parallel to technological evolution: "As the telescope and microscope raised epistemological questions that inspired Descartes' method of doubt, web cameras and telerobotic systems on the Internet suggest new epistemological terrain."¹⁴ Goldberg has dubbed "this sub-genre of meta-knowledge 'telepistemology', how we know what we know when our perception is technologically mediated."¹⁵ On this concept, Goldberg has published the study *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet*, which assembles a series of contributions by philosophers, art historians, and scientists. Several successive installations by Goldberg have been marked by Telepistemology, elaborations of what he has theorized.¹⁶

Goldberg's inquiry is situated in an epoch which is constantly confronting itself with everything that is 'tele-' or 'remote'. As he asserts with irony: "We are entering a 'tele'-centric age. We have teleconferencing, telecommuting, and telepresence. Even preschoolers have Teletubbies... One of the Teletubbies executives says that 'the beauty of Teletubbies is that they offer children a mirror on their world'. "¹⁷ An age that places at its center everything that is at a distance, and whose purpose is none other than the shortening of distances - geographical, temporal, cultural - with all the media that increasingly evolved technology offers to it.

Notes

1 - The members can in fact personalize the interfaces improving the quality of the visualization based on a wide choice of options (tonality, saturation, contrast, dimensions, zoom); they can maintain their own preferences saving in the 'bookmark list' the URL containing the query parameters and their values; they can access the Movie page, a section where all the videos of the garden are collected, to view them or to realize new videos (in two different ways: from existing videos filmed at time intervals of a few weeks, or from the overview camera according to a trajectory specified by themselves). Personalizable interfaces together with videos choreographed by the user constitute along with multitasking (that eliminates long waiting queues and allows multiple simultaneous access) the three innovations that distinguish *Telegarden* from coeval sites. See K. Goldberg, J. Santarromana, G. Bekey, S. Gentner, R. Morris, C. Sutter, and J. Wiegley, "A Tele-Robotic Garden on the World Wide Web," Technical Brief, SPIE Robotics and Machine Perception Newsletter, March 1996, Reprinted in SPIE OE Reports 150, June 1996.

(Note by Alan N. Shapiro:) The information below is taken from
<http://goldberg.berkeley.edu/garden/Ars/>:

the telegarden

"Il faut cultiver notre jardin." Voltaire

Co-directors: Ken Goldberg and Joseph Santarromana

Project team: George Bekey, Steven Gentner, Rosemary Morris Carl Sutter, Jeff Wiegley

Ars Electronica team: Erich Berger, Gerold Hofstadler, Thomas Steindl, Gerfried Stocker

Archivist: Hannes Mayer

[Note: after 9 years of continuous operation and exhibition at the ars electronica museum in austria, the Telegarden was retired in August 2004].

The Telegarden won the Kobe Prize from the first Interactive Art Festival (in 1995) and the First Prize in the Festival of Independent Visual Arts (FIVA), 1995. Details on press and publicity, as well as videos, are available on the website mentioned above.

2 - E. Mankin, "Cybereden," in USC Press Release, July 25, 1995. (Note by Alan N. Shapiro:) Goldberg says that he and the other collaborators conceived *Telegarden* "as both an engineering prototype and as an art installation." E-mail from Ken Goldberg to Alan N. Shapiro, December 30, 2008.

3 - *Mercury Project - Robotic Tele-excavation* was realized by Ken Goldberg and by the anthropologist Michael Mascha, assisted by Steven Gentner, Nick Rothenberg, Carl Sutter, and Jeff Wiegley. Set up in an engineering laboratory of the University of Southern California, it remained online from September 1, 1994 to March 31, 1995. The buried artefacts - a clock, a pipe, a mirror, sea monsters, etc. - were inspired by the adventures narrated in Jules Verne's book *Journey to the Center of the Earth* of 1864; the challenge posed to the users was precisely that of discovering the artefacts, identifying among them a common thread, and tracing it back to the literary source. The action happened by manipulating at a distance, via commands prepared for use on the site, a robotic arm provided with a pneumatic device shooting out jets of air necessary to raise the sand. For its authors, *Mercury Project* was the first interactive artwork on the Internet to combine this potent communications media with telerobotics.

4 - Pierre Lévy, *Cyberculture* (translated from the French by Robert Bononno) (Minneapolis, MN: University of Minnesota Press, 2001); pp. 67-73.

5 - See "Telegarden: Frequently Asked Questions," 1996. A useful current URL is <http://www.telegarden.org/tg/>.

6 - That unfailingly have been experienced already from the first months of going online: flooding caused by excessive watering, destruction of plants due to the intentional incorrect use of the robotic arm... disadvantages to be expected from the moment that restrictions were not applied. The future of the garden has deliberately been left in suspense, at the mercy of the gardeners of the web.

From another perspective, Steven Gentner values this question and maintains that *Telegarden* has implicit rules, generated by adherence to the community: "The *Telegarden* tries to establish that you are not the only user in the garden and that your actions have repercussions on other users of the system. For example, planting on top of another's plant is not the best way to start a friendship with your neighbor. People are held accountable for their actions in the *Telegarden*. Most often in virtual settings people get bored quickly because of the lack of restrictions or challenges. This happens because they can do or say anything without any negative results. Without rules any game becomes trivial to solve and thus uninteresting. The negative web personality is created by the lack of response-interaction that so many users desire.

Once you give people the possibility of really causing harm or destruction they acquire a sense of responsibility and belongings.” “Interview with Steve Gentner, Tele-Garden,” in *Diogenesis*, 1995.

7 - S. Ditlea, N. Stedman, “Thriving Community is Seeded by TeleGardening on the Web,” in *New York Times* (Section: Cybertimes), August 2, 1996.

8 - See “Introduction: Why a Garden?”

9 - Pierre Lévy, *Collective Intelligence: Mankind's Emerging World in Cyberspace* (translated from the French by Robert Bononno) (foreword by Eugene F. Provenzo, Jr.) (Cambridge, MA: Perseus Books, 1997); p. 6.

10 - “Planting Seeds of Doubt,” in *California Alumni Association*, November 2000,
http://www.alumni.berkeley.edu/Alumni/Cal_Monthly/November_2000/Planting_seeds_of_doubt.asp.

11 - “Interview with Steven Gentner, Tele-Garden,” op. cit.

12 - The activity of each member is constantly controlled and checked for actuality – any account that remains inactive for more than a week is cancelled. An appropriate page relative to the statistics of *Telegarden* reports all the data; each user can verify his own situation through the chat area or by making a special request. To each member is allocated only three seeds to be planted; during the planting season, the users who demonstrate themselves to be the most faithful can proceed to the action:

Planting - There are no restrictions on where one can plant but, out of respect for the communitarian spirit, it is advised to search for a free area, facilitated by a map which subdivides the terrain into sectors of 64 square centimeters. Once the user's place has been found, he commands the robot to plant: the operative unit placed at the end of the arm, put in motion electrically by the robot's controller, is equipped with every instrument suitable for the operation. Above all, the robot forms a small hole introducing into the terrain the cylindrical pivot with which it is equipped; then it extracts a special pneumatic suction device, a sort of proboscis, directs it for a few

seconds above the seed-carrying basin situated on the perimeter of the garden, sucks in a seed and at the end lets it fall, blowing it away, in the previously realized orifice.

Watering - After having positioned the video camera and thus the robotic arm onto the area to splash, the user presses the 'Water' button and the robot releases a small dose of it equal to about two tablespoons.

13 - On this subject, Goldberg recalls an episode that highlights how often one forgets that vegetables are not machines and that, even if placed into relationship with them, what prevails is their organic character: “Initially, we had the grow lamps turned on 24 hours a day just like the computers, but the plants reacted and kept dying. After a few weeks, someone kindly informed us that plants need a night cycle just like humans.” “The Tele-Garden, Pixel interviews Ken Goldberg,” in *Pixel*, March 1999.

14 - D. Pescovitz, “Be There Now: Telepresence Art Online,” Op. cit.

15 - Ibid.

16 - Examples of this are the installations *Shadow Server* of 1997 and *Dislocation of Intimacy* of 1998. The book cited is K. Goldberg, ed., *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet* (Cambridge, MA: The MIT Press, 2000). See the reviews in *Leonardo Digital Reviews* by Y. Spielmann, February 14, 2001, http://www.leonardo.info/reviews/feb2001/bk_BOTGARD_spielmann.html and E. Thacker, October 17, 2000, http://www.leonardo.info/reviews/oct2000/bk_BOTGARD_thack.html.

17 - “The Tele-Garden, Pixel interviews Ken Goldberg,” Op. cit.