

Lecture: From Browsing to ZigZag: a theoretical study of Theodor Nelson's ZigZag project

By [Cicero Silva*](#) @ UCSD, Communication Department, 2007

Firstly, I want to thanks Noah Wardrip-Fruin for his friendly reception and his support of my work. I also want to thanks Dan Hallin for his kind welcome in the Communication Department. And finally I would like to thank Ted Nelson for been supervising the development of this project and CAPES for the support with the Fellowship.

I.

To present ZigZag project: intentions, concepts etc.

The ZigZag project, idealized by Theodor Nelson, is in my point of view, a philosophical way to deal with the hierarquical structures of computers, since it was created with the intention of deconstructing, term used by Nelson, the idea of reference, i.e. names, dependency and structures. In 1965, in an article called *A file structure for the complex, the changing and the indeterminate*, a proceeding of the 20th national ACM meeting, Ted Nelson presented for the first time a theoretical way to rethink structures in the computer science field. It was not yet called ZigZag, which appeared under this name in his book *Literary Machines*.

The intention of the ZigZag project, since it was developed, has been to think in a new direction about computers, computer science and the way that computers are internally organized and work. Since they deal with binary processing, they work with structures of data and processes that permit a sort of activities, like the projection of an image on the screen starting from a mathematical process.

Even though the way in which computers in general went was the “metaphorical” graphical prototype, also called GUI (Graphic User Interface), which is capable of showing images related to the operational system creating a “form” for the FILES, like the word FILE itself is represented as the image of a FILE etc. The way proposed by Nelson for computers was without data structures and without references. It means a conceptual “tour de force” on the way that computers are organized because we usually think about it using “references”, “structures” and “contexts” and Nelson wanted to propose a different way of organization.

- *no names as reference
- *no hierarchy
- *no structure

and according to Nelson: “

- nothing corresponds to paper, except very indirectly.
- violates everything in the modern interface (introduced to the public in 1984 -- what most people call misleadingly the Graphical User Interface or GUI, but we call the PARC User Interface or PUI).
- it is not WYSIWYG (what would "get" mean?)
- it offers a different programming model (small programs, encapsulated in zcells, which accept zcells as input and generate zcells as output)
- there are no "applications", meaning separable programs for separate purposes.” (From the Xanadu project website)

2.

Demonstrate how Ted’s ideas are still impossible due to the existent digital systems in computer science. ZigZag is strongly based on Vannevar Bush Memex ideas. By the way, they are considered almost impossible to achieve: no names in the files, no hierarchical structures of access to files or data, no reference (type of file, actions etc. in the system).

The ZigZag

“I propose to go back to the beginning and branch in another direction. Let's go back to 1945, say, when anything seemed possible, and when conventional wisdom could be challenged more easily because it had only been made up a few months before, perhaps by another 20-year-old in the same lab.

The evolving conventions of those days involved lump files with short names, hierarchical directories for storing them, programs as long strings, databases as tables stored in files. (These would later be packaged into "folders" and "applications".)

But now imagine that a few guys had snuck off to another lab and created a whole new system of conventions, completely different, for everything. Such an imaginary team, unfettered by years of courses, journal articles, meetings, ads and handouts, just might have come up with the following ideas.” (Nelson, Theodor. *A Cosmology for a Different Computer Universe: Data Model, Mechanisms, Virtual Machine and Visualization Infrastructure*).

The concepts behind ZigZag are related to, as I said before, philosophical problems, like “reference”, “context” and “metaphor”.

Nelson’s approach to computers began in a period of time in which nothing was built and everything was being made from scratch. So, for Nelson it was simple, like he said, to think of computers as something simple to give us tools to develop our own way to deal with information, graphics, storage, databases etc.

But what we saw is completely different from what was Nelson’s first idea about computers systems, based on the Vannevar Bush concept of MEMEX, but not entirely focused on his machine, but in fact in the way that Bush described his vision of human behavior dealing with information when recovering some fact, analyzing a story or even archiving a picture or experience.

Basically Bush said that we archive facts in our memory relating images to sounds, texts, places, faces and then we put all of them together in order to organize, but this organization is personal, not structural, nor traceable by someone else. It is private and based on experience.

If we now think of computers, or maybe the human way to archive memories, we will see that most of our memories follow a structure, a method in order to be reliable to the “real” facts of life or reproduce the experience, being most of the time far from the human experience, following Bush’s and latter Nelson’s proposals.

Ted Nelson’s concept of ZigZag is a attempt to use Bush’s theory about archive and experience in practice. But, as Nelson said, we choose to follow the traditional path and to create the same ways to deal with the archive.

We create FILES, lists, database and applications, binary systems and all of them use the same philosophical approach: structure.

The method of Nelson’s idea, at that time, was to use in a computer system the information, without “programs” running. What we have today are the separate files executing functions. For Nelson, the system could be only one program running in different times, what he called “dimensions”, an “operational system” that could work with many sets of the same information in various places at the same time.

Differently from the OS that we have today, in ZigZag (the original version) you could have N-dimensions with variables that could have the same name and be changed in N+4 places without changing the other dimensions. It means that in ZigZag you could have more than one content for the same name (variable) at the same time running in your system. Bringing back Bush’s idea, it was as if you had a picture of a place and you wanted to relate to that picture some descriptions in order to “store” it and then you wrote something like “The Cat in the Hat”.

So, for you this image has to do with the description, it’s personal. Today we have this possibility, but instead of putting a “label”, with a written name and storing it in a position in a fake FILE, with Nelson’s proposal you could use an image instead of a “name”, or if you want, you could use a video as a reference to store a picture and so on.

That means that all has to do with all and that there is no hierarchical distribution of the content in the system. The user creates every data, all

the content is an attribution of the user and all the content can be moved of place or representation whenever the user wants, with no pre-determined ways to represent anything. No FILE images for the FILES (names and Icons), no Videos images for the Videos place and so on. You can configure and set up the images, their functions, the ways in which they will work and their function.

3.

To present a gap between the hypertext and hypermedia (here considered or compared to the Internet) and the web based systems.

ZigZag is not a system based on the Internet yet. It was developed as a system to be used as an OS, i.e. to create a kind of system in which the user could have its own system, without the file directories and all the sort of files inside his machine running before he could do something by himself.

As Nelson stated, the computer science walked that way and the Internet was invented and distributed to our computers by a system that allows us to connect and share information. The ZigZag is not a hypertext or hypermedia system. It can be used like that, but the original idea is to create a system in which each user can publish, organize, read and distribute the information in the way that he wants, not using “visualization” systems nor tags or readable files compiled by private owned plug-ins.

There is a gap between the Internet and the original idea about “hypertext”, when coined by Nelson in the 60s. To Nelson, the connection (also known as “link”) was not unidirectional and it was separated from the original content. The links should stay in a “library” of links, differently from the web (html, xml) where the links are in the FILE. In Nelson’s hypertext concept the link could be in each part of the content created by the user and consequently be different if the user looked at it from another dimension or “place” in the text. The original idea of the Hypertext was developed for a multidimensional

representation of the content, not for a flat and framed visualization of it.

Nowadays, the ZigZag system can be used as a tool to develop the original concept of Hypertext and Hypermedia. I will show you a prototype developed by Tuomas Lukka in Finland at University of Jyväskylä. There are some projects, like the Fenfire at fenfire.org that are also dealing with the problem of representation of the database on the computer field. The ZigZag system right now is under a patent and is a trademark registered to Nelson's company. This is only a model, because the new version will come with 3D models and layers.

4.

To present a proposal of a [“Metabrowser”](#), that will allow users to publish, to read, to change, to print and to create relations among documents online and offline and also will permit users to publish their own data inside the system using their own method and concepts.

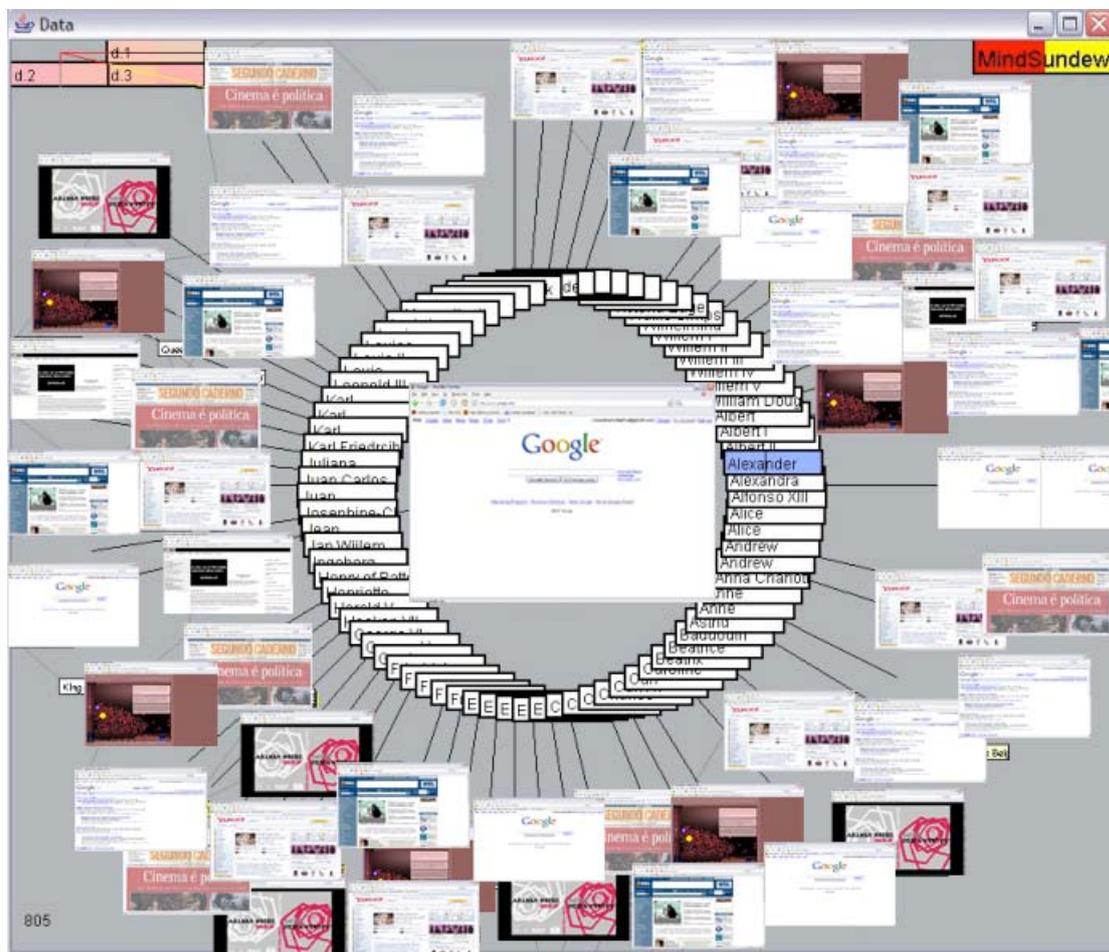
I think that before talking about the project that I am working on, I can just talk about some functions of the original ZigZag project and then insert my comments on the [“Metabrowser”](#) project when it differs from Nelson's concepts. To do this, I will follow one of Tuomas Lukka's articles about the ZigZag called A Gentle Introduction to Ted Nelson's ZigZag Structure:

- Comparing ZigZag with existing computer structures.

According to Lukka: “Among other things, ZigZag guarantees that there are no dangling pointers: all links are two-directional. You can always find which cells refer to a given cell”

(SHOW the ZigZag and Comments on the “two-directional” functions that the [“Metabrowser”](#) will allow the user: a) create his own online content; b) relate this content to another published content (note: it will

read all the existent web browsers systems (XML, Html, plug-ins etc.) using the drag and drop functions; c) save these relations between cells (viewers) online or offline.

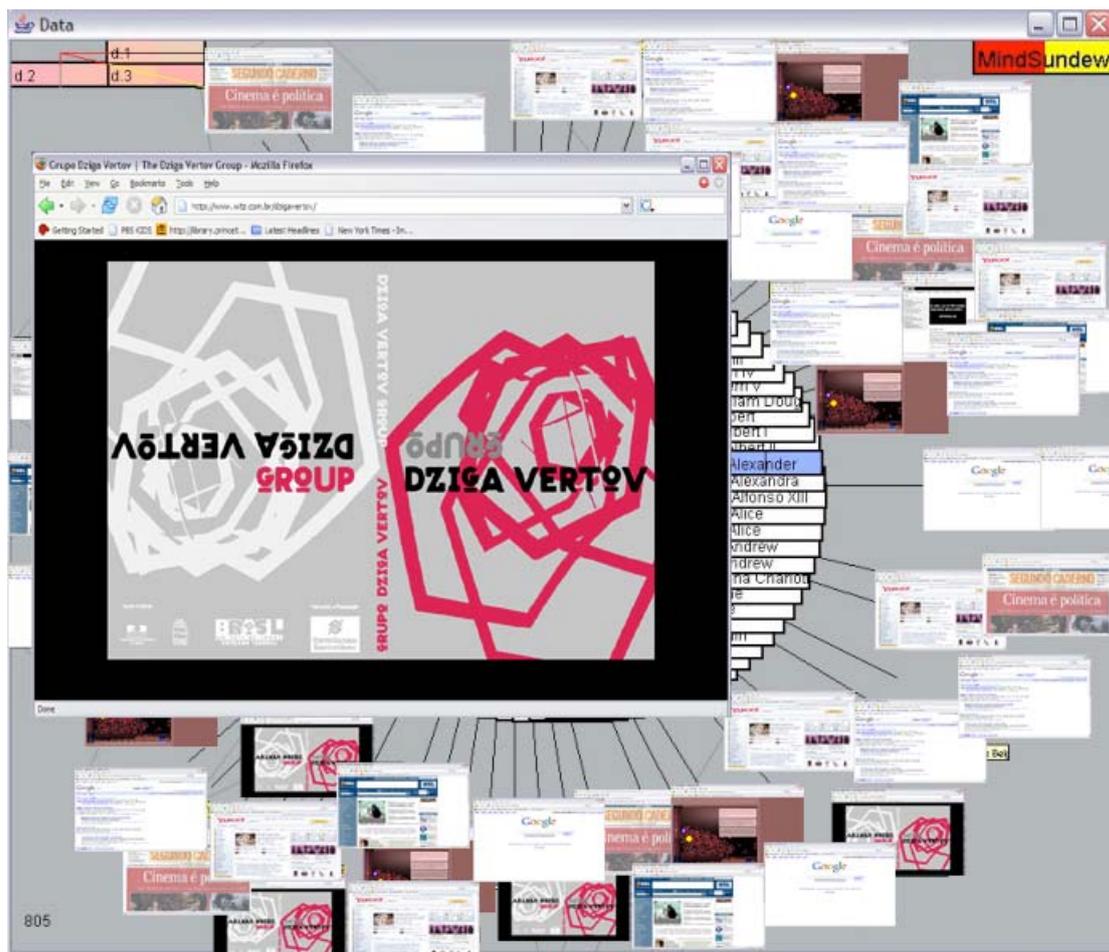


- **Applitudes:** term coined by Nelson that means the system doesn't need "applications" anymore but only one system doing all the tasks.

Nelson's proposal was to create a system in which everything was connected, without separate programs running at the same time and doing different things. For Nelson, the ZigZag could be a system in which all the content could be easily changed and the tasks could be running in only one place. An applitude is the task inside ZigZag (a word processor, an animation software, an email client or a browser viewer).

(COMMENT: in the "[Metabrowser](#)" project the idea is to use together 4 applitudes (word processor, webmail, calendar and web viewer) and allow connections between elements (such as videos, pictures) of the content produced or viewed by the user, like for example if the user

was reading in an cell an article from the JSTOR and was interested in quoting some part of the article, the user could simply apply a “pointer” function to that exact place from his “word processor”, which would be open in the other cell, and at the same time, the user could drag this pointer to another cell which would be open with comments on the same article by a different author in another website that the user was reading and at the same time he could save all these relations and show them in only one cell or even all the relations created in a 3D or 2D view).



- Dimensions:

ZigZag works with the concept of dimension, which is the “place” where the cells work. Nelson describes the cell as “...the principal unit of the system. We may visualize it as a box, sphere, or any other simple object. The zcell is a first-class object, meaning it is independently addressable and has a persistent name, in principal referentially available from anywhere. This means each cell has a unique identifier, which is a way of permanently and reliably addressing the cell and/or its contents.” (Nelson, Ted. A cosmology).

(COMMENT: with the concept of dimension, the [Metabrowser](#) will allow the user to have the number of cells that he wants and change the content whenever he wants, to save or to create new relations between the content in the level (dimension) in which the user will be working on. It's not possible yet to work among the dimensions (it will be explained below). It could be online or offline. If the user is in one dimension and creates 4 relations among cells, plus 2 links in each cell in the Dimension S, the system will save the content in a specific "dimension" creating a special partition on the server. This part of the project is demanding a lot of effort because we need to work with a big amount of online memory and disks at the same time. In some tests that I have done, it's consumed an enormous amount of the band. For example: 10 users using 2 dimensions each at the same time. For this example, the server creates for each user a "dimension", for now it looks like a "folder" and allowed the user the commands "change", "save", "link" and "create dimension". In this case, the users created more than 20 actions each at the same time, shooting down the system for 3 or 5 seconds each time somebody changed the dimensions. When the user is offline, the system usually works well, but still has problems with memory....a lot by the way....)



- Hierarchies:

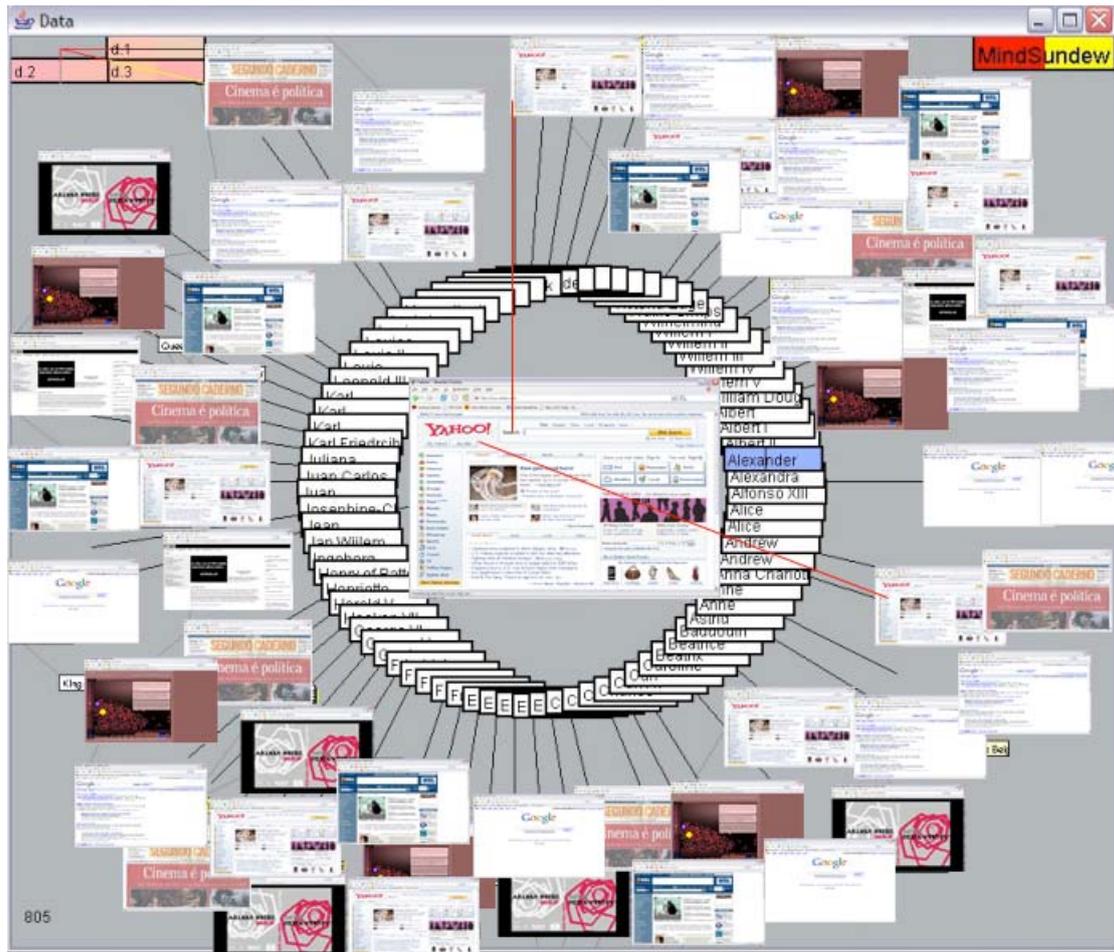
As I have described before, ZigZag doesn't work with hierarchies. Instead of using "file names" it uses cells and the content of the cells is referred to as pure data.

Lukka advised that "It is good to remember that the same cells can be in several different trees using different dimensions." This means that we can't connect (link) cells from different dimensions, but we can have the cells appearing in all dimensions and we can also have, if we want, one dimension with the cells that we want to work with and in the other dimensions the links or changing that we will do to them without changing them in their original dimension. (Mirror function). Another problem that can be solved using this system instead of a hierarchical one has been known as "the cousin problem". According to Lukka "...in the human representation of concepts, there is no hierarchy between mother, father, son, daughter and cousin. There is no good way to pick just one way to represent the information since the idea "B is A's cousin" is perfectly valid, even without knowing whether it is on the mother's or father's side."

(SHOW the ZigZag with the Kings cousins....)

- Paradoxes and advantages of the system:

Usually, the OS that we have nowadays are based exactly on the models that Nelson has been criticizing for decades and this system ([Metabrowser](#)) is a theoretical and still abstract proposal that tries to change the way that we can work with and on the Internet. It is not exactly what Nelson is working on (the ZigZag), but introduces some of his ideas to an Internet Culture besides putting together some solutions for problems that the Internet still has, such as the unidirectional links, the name of the files with their extensions that closes the user's action (I mean to link), or insert the links in the same FILE, which causes the losing of the path to the original content) among other problems. The Internet is a common place to learn, to get access to information and to create social relations, but in my point of view, it still lacks more freedom of action to the user and is still based on the same protocols (if I can say that or call the act of reading like that) of the printed book. The idea of deconstructing the models of reading online is to practice and to test Bush's and Nelson's concepts, which seem to be logically close to the way that we think.



Thanks for you attention!

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