# The Design of Horacle: Inducing Serendipity on the Web

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**Abstract:** Is Serendipity designable? Are we able to induce it or do we end up destroying it in the attempt? Horacle, a prototype hypothesis of a serendipitous system, is an exploration on digital serendipity accomplished through the facilitation of access to new and uncommon content, presented in a way that allows for the occurrence of processes that can be associated with serendipitous discovery. It is our objective, through this system and the analysis of the concept, to help recover the limitless of the Web by breaking through content bubbles and to assist the creation and discovery of insight through access to meaningful information.
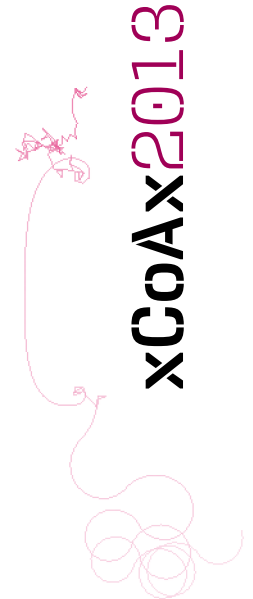
# 1. Introduction

The seemingly infinite amount of content that is accessible on the Web has created the necessity for tools that help to discover relevant and meaningful information. Tools such as search and recommendation engines or social networks attempt to aid the discovery and access to content to the user, and are constantly evolving. This is done through personalization (Montgomery and Smith 2009): learning increasingly more about its users' patterns and habits in an attempt to deliver ever more accurate results that relate with the users interests and tastes.

This personalization of these tools may, however, end up limiting the possibilities of the user, becoming a restrictive enclosure, an echo chamber of perpetuating tastes and content. What Eli Pariser named a "Filter Bubble" (Pariser 2011), which restricts and limits the diversity of content that the users have access to and their capacity to discover new, uncommon and unexpected information from them. In other words: a decrease in the potential for serendipity.

It is with this premise that we have created the *Horacle* prototype: a system that, through the analysis of how serendipity may occur on the web, and its inherent characteristics, may help to induce serendipitous discoveries by allowing access to new and diverse information, in an permissive context.

## 1.1. Understanding Serendipity

Horace Walpole coined the term *Serendipity* in 1754 (cit), but the process it describes is one that is common through the history of human invention, from Archimedes's famous anecdote to the fortuitous discovery of penicillin by Fleming. It can be described as the accidental discovery of meaningful information, made possible due to the *sagacity* of the observer. This combination between accidental and sagacity is key to any attempt to induce serendipity.

Studies of serendipity can be found associated to various areas of study, but for this study we will focus on those regarding user interaction and information seeking, such as those of Elaine Toms (2000) who observed how users approached a digital newspaper, with hopes of finding serendipitous patterns or methods to trigger serendipity. Users were asked to "find an answer to a set of questions" or to read or browse the newspaper for 20 minutes. Toms then observed that "when the interaction was not guided by an objective, user decisions seemed less definitive and less predictable", however, there is no mention of any serendipitous discoveries.

A small study conducted by André et al. (2009), in an attempt to gather some new insight on the frequency of serendipitous encounters, asked a selection of individuals who considered themselves "serendipitous" to review their search history and report any clicked results not directly related to a task and that lead to any specific discovery. Of the eight participants, only two reported encountering something unexpected and none of them gathered any particular new insight.

This is, of course, an example of the elusive nature of serendipity. Most efforts attempting to observe it in a controlled fashion have been for naught. Only by applying methods that could record the natural occurrence of serendipitous discoveries had a degree of success, such as those of Foster and Ford (2003), who asked users to record

serendipitous experiences on a mobile diary, with positive results.

In an explicit attempt to induce serendipity, Max, a software engine developed by José Campos and António Dias de Figueiredo (2001) used information retrieval techniques and heuristic search in order to discover information that is "useful, and not sought for". To do this, Max is informed of websites that are of the users' interest and then submits queries to a search engine as well as randomly chosen words, e-mailing the results to the user. In a two-month evaluation, 100 messages were sent, of which 7 were considered of interest. Its 7% success rate, while seemingly low, it is an encouraging number when considering the fleeting nature of serendipitous experiences.

## 1.2. Inherent characteristics of Serendipity

In an attempt to discover exactly what can be acted upon when attempting to induce serendipity, we identified four broad characteristics that are intrinsic to the process.

### Nature (accidental)
The *accidental* nature of it. For something to be considered as a serendipitous experience, it has to happen in a random and unexpected way. This was one of the defining characteristics since the creation of the term and is key to the whole process. It is also what we may call an *actionable* characteristic, meaning that it can be acted-on in the attempts to design for serendipity.

### Context
The context of the user in the time it happens: there are peculiar physical and mental circumstances that are common to serendipitous discoveries to happen. This is also an *actionable* characteristic of serendipity, as we can identify and reproduce the context or processes that are associated with serendipitous discoveries.

### Mind
The third characteristic is the capacity to recognize the discovery and its inherent value, what Walpole originally described as sagacity. As this is specific to — and depending of — the one experiencing *serendipity*, it is not an *actionable* characteristic.

### Value
If an event isn't in someway valuable to the user, then it's not serendipity. While the value is subjective to the user, we can attempt to increase the odds of a valuable outcome occur, by increasing the relevant content that is made available to the user. The value itself is largely depending of the experiencing user, so it is not *actionable* as well.

## 2. Theoretical Framework

### Not a mere coincidence
Serendipity may be mistaken for coincidence, and it can, indeed, occur due to it, however it does not depend on the (im)probability of an event to happen for it to exist, if we resort to Margaret Boden's definition of coincidence as a "co-ocurrence of events having independent casual histories, where one or more of the events is improbable and their (even less probable) co-occurrence leads directly or indirectly to some other, significant, event" (Boden 2004, 235). It was not only probable, but inevitable that the water level would rise on Archimedes's bath, as such we cannot describe the process to happen as a result of a

coincidence, but of the capacity of the user to understand that seemingly unrelated event as an *apropos*, serendipitous one.

## Randomness as a creativity tool

Both serendipity and coincidence, however, have inherently a certain degree of randomness. As we have seen, randomness is a prerequisite for serendipity, as per its *accidental* nature. This assumes randomness in the event itself: unsought and uncontrolled. Randomness is a tool well documented on creative practices through history: a method used to overcome creative barriers or to provoke the unexpected, such as Mozart's *Musikalisches Würfelspiel im C K516f*[1], Iannis Xenakis development of his 'stochastic music' or the cut-up techniques employed by dadaist Tristan Tzara.

## The value of Idle time

One particular aspect associated to serendipitous experiences is the recurring act of changing context. This could be referred as a necessity to wander or, as in many examples, to simply "go for a walk". These common recurring activities, such as, e.g.: gardening, washing dishes or taking a bath, when associated with a creative breakthrough, describe a period of incubation, when active research is halted and the researcher focuses on a completely different activity, normally mechanical in nature. One interesting example of this is of the physicist Hermann von Helmholtz, as reported by Graham Wallas (1926), who said that ideas came to him unexpectedly and without effort and that rather than occurring at his "working table (...) they came particularly readily during the slow ascent of wooden hills on a sunny day".

This concept was explored by Csíkszentmihályi and Sawyer (1995), who interviewed nine individuals, 60 years or older and actively involved in creative work. All of them mentioned the importance of a certain kind of "idle time", crucial to creative insights. Some of their interviewees actually scheduled "a period of solitary idle time" in order to be creative, following a period of hard work.

## Serendipitous browsing

Search has dominated our interactions with information seeking on the web. We no longer 'surf the Web', but rather ferry across it, towards our goal and without detours.

To 'surf' the web denoted an underlined exploratory state: to surf is not to dictate our will upon the ocean, but to ride it, let it takes us in its currents, with minimal control on direction, going, wave-like, from website to website.

While we are now much more precise when finding information (click through rates plummet after the first page of Google[2]) there are still services that promote this wandering state. The most prominent are social networks such as Facebook or Twitter, which facilitate an aimless wandering through its content, with easy visualized images and videos. Another example is StumbleUpon, a discovery engine that combines machine learning with human opinions, allowing its users to 'stumble upon' web pages that relate to their previously indicated interests. The user is unaware of what page is going to be shown, although it can fine-tune the possible results by 'thumbing' up or down each page.

As per Elaine Toms' (2000) distinctive methods of approaching an online newspaper, this type of wandering browsing opposes the goal-driven conscious browsing one might engage when searching for a particular item. This distinction between purposive and non-purposive browsing reflects the findings of Oscar De Brujin and Robert Spence (2008) of a "serendipitous browsing".

1. Written in 1787 and published in 1793.

2. http://searchenginewatch.com/article/2049695/Top-Google--Result-Gets-36.4-of-Clicks-Study

De Bruijn and Spence define "serendipitous browsing" as one which occurs when browsing is done without a particular goal in mind, which may happen in two ways: "Opportunistic Browsing", where the user intentionally looks for content but without a clear notion of what, in a state of seeing "what's there", and an "Involuntary Browsing", goal-less as well but unintentional, when the user's gaze moves naturally from "a series of fixations", and naturally focusing on a specific information item that might lead to a specific, fortuitous insight or the answer to a "longstanding query"(De Brujin and Spence 2008).

This "serendipitous browsing" resulting in a breakthrough denotes a kind of ideation as a result of a question in a state of incubation, akin to the breakthroughs described in the value of idle time. This is in a way reminiscent of the psychoanalytical technique of Free Association, developed by Sigmund Freud. In this technique, patients are encouraged to verbalize their thoughts and feelings, without restriction or fear of embarrass. This was done in the hopes of helping surface repressed thoughts, making the patient aware of them as, then, being able to act upon them.

By considering these various concepts: Randomness, Idle Time and Serendipitous Browsing, we begin to form a pattern of necessities that create a permeable state for serendipity to occur. It is by attempting to reproduce a process that happens during an opportunistic or involuntary browsing, occurring during a period of idle time, and being confronted with new, uncommon and unexpected information, that one might be confronted with a new item that, in turn, could lead to a breakthrough or insight. If we can achieve this we have, indeed, induced serendipity.

## 3. Designing Horacle

It is our intention to develop *Horacle* as an ever-evolving hypothesis of our study. It reflects our concerns on the increased personalization of the web, and how it limits our access to new information, as well as its purpose and as a method of creativity and discovery.

Being developed concurrently to this ongoing research, it is a reflection of our thoughts and discoveries on the matter and, as such, is constantly evolving. An evolution that will continue as new insights on the matter occur.

### 3.1. Traits for serendipity

Our analysis of the available literature on Serendipity, as well as an observation of a series of online systems that, intentionally or unintentionally help serendipitous discoveries (Melo and Carvalhais, 2012), have allowed for identifying a series of common traits that are recurrent on serendipitous systems. It is the implementation of these traits that direct the course of the design of a serendipitous system.

**Purposelessness**

Purposelessness describes an interaction that is deprived of objective, as per De Brujin and Spence's "Serendipitous Browsing". The system should allow for a casual 'wandering' of content, without a defined goal, providing thusly a context that is receptive to the creation of unexpected relationships between data. By allowing a 'wander'-like browsing and exploration of content, we encourage the mind and gaze of the user to freely drift, following a whim. This could lead to the discovery of something unexpected or allow

the user to disengage from an active thought on a problem and enter a state of idea incubation. The system, in this case, would serve as the change of context referred by Csíkszentmihályi and Sawyer (1995), and could allow for the uncovering of connections by forming patterns between the sub-conscious processes and the confrontation of these with the visualization of new content.

**Immediateness**

In order to maintain a state of wandering, purposelessness browsing, the system should necessitate minimum interaction by part of the user. If an user is required to actively interact with content, it engages the mind and removes it from an observing content to one of active interaction.

**Diversity**

Increasing the diversity of the information available can increase the probability of a discovery or connection between said information being made.

It is, as well, through access to a rich variety of content that we can hope to break through the "filter bubble" and allow the user access to information that can help to broaden their horizons and be truly surprised.

**Curiosity and Playfulness**

The user needs to be enticed to use a system in order to achieve a state of necessary engagement for a purposeless, unconscious and serendipitous browsing to occur. And since playfulness is recurrently associated to curiosity, creativity and ideation, by applying these principals we encourage the mind to enter a state that is conductive for discovery.

**Randomness**

We have previously established the accidental nature of serendipity. It is one of the defining characteristics of it. As such, we believe that by introducing a certain degree of randomness into an interactive system, we can increase the probabilities of unexpected and fortuitous events. The advantages of the introduction of randomness have been documented by Leong, Vetere & Howard (2008), on their analysis of the shuffle functionality of music players, noting a more relaxed experience of music by the users, when freed from the "burden" of choice.

**Designing decisions**

The design of *Horacle* was guided by the attempt of implement the five different traits for serendipity, with the clear intention of providing access to diverse and possibly relevant information that could be accessed in an *overview* state: during idle time, in a state of contemplation or wandering, on a goal-less, non purposive way, all in a playful interface that would entice its users for a continued experience, allowing access to content with minimum direct action by the user. For this, the system should present content fully, when possible, with the capacity to allow for a specific focus on a particular item.

As such, and after other experimentations with other layouts, we decided upon on a fluid, orbital-like layout, that represented three different types of content, as it relates to the user: (1) Content that the user has marked as relevant; (2) Content that is recommended to the user according to their demonstrated interests and (3) Random information for the Web. The first two categories would be representations of the users' tastes and interests while the third would introduce that needed level of randomness for serendipity.

With these three levels of content, we are able to provide the necessary context for the possibility of interesting juxtapositions of information to occur, in an attempt to create unforeseen relationships between them.
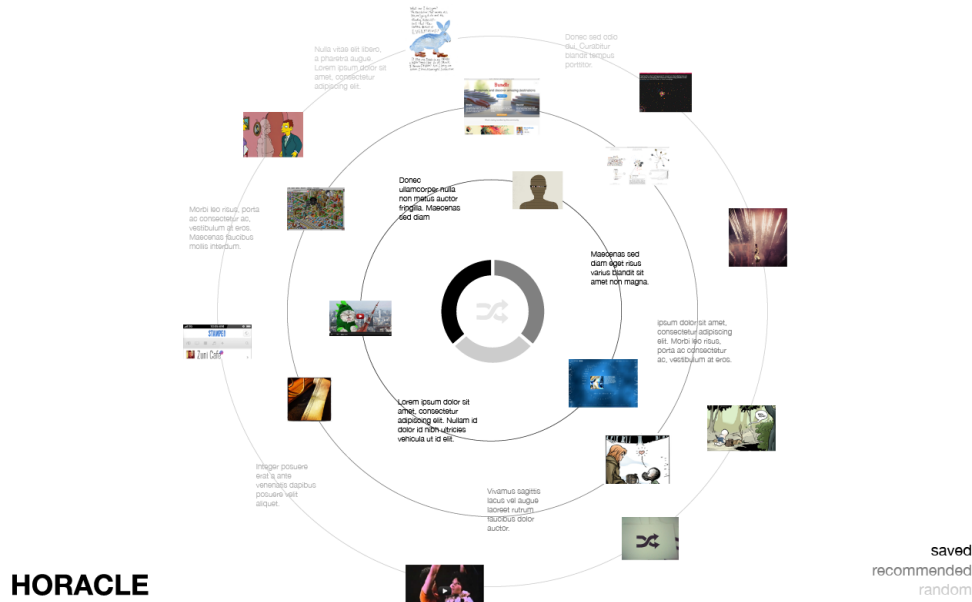


Fig. 1. *Horacle* wireframe with equal distribution of content.

These levels spread from the center, or it's nucleus, in correspondingly degrees of direct relationship to the user: closer to the center we find the saved content and farther out the random content, with recommended in the middle. These levels are also visually distinct from each other, through a color coding.

Initially, the system divides the content, and it's respective levels, into equal amounts, however the user is able to control this, by choosing to increase one particular category (and respectively decreasing the other two). This allows the user to choose between viewing an equal amount of variation, to more of one and less of the other two, as well as being totally dedicated to one of the three variables.
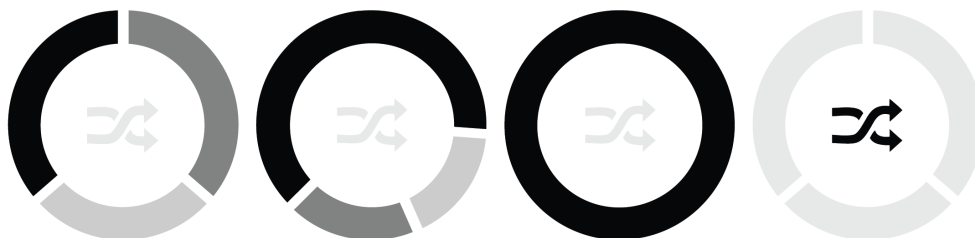


Fig. 2. *Horacle* controller: 1/3, 2/3 and 3/3s, as well as the unstructered mode.

This is done through a controller found in the nucleus of the system, which also incorporates a "shuffle" mode that removes visual indications of types of content as well as randomizing the value for each. This shuffle mode would be an useful method to remove preconceived notions from the user towards the content.

## 3.2. Conclusion and Future Work

The concept of serendipity and its implications on the web have been subject of a gradually increasing concern as creators of online services and platforms realize its value and implication on information seeking and access to content. Google's executive chairman Eric Schmidt, at the 2010 TechCrunch Disrupt conference, said that their company hoped to "one day tell people things they may want to know as they are walking down the street, without having to type in any search queries" (Krotoski 2011). Schmidt called this a "Serendipity Engine".

The capacity of the web to provide true serendipitous experiences have also been the subject of diverging opinions (Darlin 2009), (Johnson 2011), but regardless of the *current* limitations of the web regarding serendipity, it is our focus to understand how the process of serendipity occurs and how this can inform us in in our design decisions, in order to create better and deeper tools.

Through the review of existing literature on the subject, and particularly on its implications on the web or in digital interactions, we have been able to define a series of identifiable processes and traits that guided our choices for the design of *Horacle* (and other possible serendipitous systems).

*Horacle* is a work-in-progress in continuing development. Its development mirrors our developments regarding the subject of designing towards serendipity and, as such, its characteristics are in permanent mutation. In this current hypothesis we have attempted to accommodate our five defined traits for serendipity, allowing for constraints of the medium and implementation.

On future work, we will continue the development of *Horacle* as a working hypothesis of a serendipitous system to a fully functional state, as well as conduct some initial user-testing in order to evaluate its true capacity for discovery. We will, as well, continue the examination of the serendipitous process and its implications on the web, information discoverability and creativity.

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