Breadcrumbs: Location and Context Aware Mobile Platform for Story Sharing

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ABSTRACT

With the current proliferation of sensor equipped mobile devices such as smartphones and tablets, location aware services are expanding beyond the mere efficiency and work related needs of users, evolving in order to incorporate fun, culture and the social life of users.

Today people on the move have more and more connectivity and are expected to be able to communicate with their usual and familiar social networks. That means communications not only with their peers and colleagues, friends and family but also with unknown people that might share their interests, curiosities or happen to use the same social network.

Through social networks, location aware blogging, cultural mobile applications relevant information is now available at specific geographical locations and open to feedback and conversations among friends as well as strangers. In fact, nowadays smartphone technologies aloud users to post and retrieve content while on the move, often relating to specific physical landmarks or locations, engaging and being engaged in conversations with strangers as much as their own social network. The use of such technologies and applications while on the move can often lead people to serendipitous discoveries and interactions. Throughout our thesis we are engaging on a two folded investigation: how can we foster and support serendipitous discoveries and what are the best interfaces for it?

In fact, to read and write content while on the move is a cognitively intensive task. While the map serves the function of orienting the user, it also absorbs most of the user's concentration. In order to address this kind of cognitive overload issue with Breadcrumbs we propose a 360 degrees interface that enables the user to find content around them by means of scanning the surrounding space with the mobile device.

By using a loose metaphor of a periscope, harnessing the power of the smartphone sensors we designed an interactive interface capable of detecting content around the users and display it in the form of 2 dimensional bubbles which diameter depends on their distance from the users. Users will navigate the space in relation to the content that they are curious about, rather than in relation to the traditional geographical map. Through this model we envisage alleviating a certain cognitive overload generated by having to continuously confront a two dimensional map with the real three dimensional space surrounding the user, but also use the content as a navigational

filter. Furthermore this alternative mean of navigating space might bring serendipitous discovery about places that user where not aware of or intending to reach. We hence conclude our thesis with the evaluation of the Breadcrumbs application and the comparison of the 360 degrees interface with a traditional 2 dimensional map displayed on the devise screen. Results from the evaluation are compiled in findings and insights for future use in designing and developing context aware mobile applications.

KEYWORDS

- Narratives
- Storytelling
- Stories
- Breadcrumbs
- Local-aware
- Serendipity

RESUMO

Com a atual proliferação de dispositivos móveis equipados com sensores, tais como *smartphones* e *tablets*, os serviços cientes da sua localização estão a expandir-se para além da mera eficiência e das necessidades relacionadas com o trabalho, evoluindo de maneira a incorporar o divertimento, a cultura e a vida social dos utilizadores.

As pessoas hoje em dia, sempre em movimento, estão cada vez mais conectadas e esperam ser sempre capazes de comunicar com os seus amigos e aceder as suas redes habituais. Isto significa a comunicação não só com os seus parceiros, amigos e família mas também com pessoas desconhecidas, que podem vir a partilhar os mesmos interesses, curiosidades ou somente utilizar a mesma rede social.

Através das redes sociais, blogues cientes da sua localização e aplicações móveis de âmbito cultural, as informações relevantes estão agora disponível nos lugares geograficamente específicos e abertos a criticas e conversas entre amigos ou estranhos.

Hoje em dia, as tecnologias *smartphone* habilitam os utilizadores a partilharem e receberem conteúdos enquanto estão em movimento, conteúdo esse muitas vezes relacionado com uma referência física ou local, envolvendo-se ou sendo envolvido em conversas com estranhos ou numa rede social. A utilização destas tecnologias e aplicações, enquanto em movimento, pode levar as pessoas a encontrar interações e descobertas acidentais.

Ao longo desta tese estamos a desenvolver duas investigações: Como podemos criar e melhorar descobertas acidentais (*Serendipity Discoveries*) e qual a melhor interface para tal?

De facto, ler e escrever qualquer conteúdo enquanto em movimento é uma tarefa com um esforço cognitivo intensivo. Enquanto um mapa tem como função de orientar o utilizador, pode também, absorver grande parte da sua concentração. De forma a verificar este tipo de subcarga cognitiva, na aplicação Breadcrumbs propusemos uma interface em 360 graus que habilita os utilizadores encontrarem conteúdos à sua volta, percorrendo o espaço circundante com o seu dispositivo móvel. Utilizando uma espécie de conceito em periscópio, aproveitamos assim o poder dos sensores do *smarphone*s e desenvolvemos uma interface capaz de detetar conteúdos à volta do utilizador, apresentando em forma de círculos de duas dimensões, em que o diâmetro desses

círculos depende da distância que este conteúdo está do utilizador. Os utilizadores poderão navegar através do espaço circundante em relação ao conteúdo que estão curiosos em ver, em vez dos tradicionais mapas. Através deste modelo prevemos avaliar a subcarga cognitiva gerada, confrontando o tradicional mapa em duas dimensões com o ambiente em três dimensões que rodeia o utilizador, pretendendo também, utilizar este conteúdo como um filtro de navegação. Esta alternativa de navegar no espaço pode vir a trazer descobertas ao acaso (*Serendipity discoveries*) sobre lugares que os utilizadores não estão cientes que existam ou, até mesmo, lugares que não intencionavam em ir.

Concluímos esta tese com a avaliação da aplicação Breadcrumbs e a comparação do conceito de interface de 360 graus com o tradicional mapa em duas dimensões. Os resultados da avaliação são compilados em informação relevante para o futuro desenvolvimento de aplicações cientes do contexto.

PALAVRAS-CHAVE

- Narrativas
- Contador de Histórias
- Histórias
- Breadcrumbs
- Sistemas cientes do local
- Serendipity

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I. INTRODUCTION

I.1. PROJECT CONTEXT

With the current proliferation of sensor equipped mobile devices such as smartphones and tablets, location aware services are expanding beyond the mere work and efficiency related needs, evolving in order to incorporate fun, culture and the social life of users. Today people on the move communicate not only with their peers and colleagues, friends and family, but also with unknown people, that might share their interests, curiosities or happen to use the same social network. Through social networks, location aware blogging, cultural mobile applications relevant information is now available at specific geographical locations and open to feedback and conversations among friends as well as strangers. In fact nowadays smartphone technologies aloud users to post and retrieve content while on the move, often relating to specific physical landmarks or locations, engaging and being engaged in conversations with strangers as much as their own social network. The use of such technologies and applications while on the move can often lead people to serendipitous discoveries and interactions. Throughout our thesis we are engaging on a two folded investigation: how can we foster and support serendipitous discoveries and what are the best interfaces for it? Other important aspect, that needs to be taken into account, is the cognitive overload that this types of information system can produce to users. Is important to present a solution that provide users with an intuitive interface so that tasks are completed more efficiently with less cognitive work load and stress.

I.2. MOTIVATION

Finding and leaving content through a mobile device while roaming the streets of an unknown city, traversing a street, is often done through the help of a digital map, which occupies the screen of the device. While the map serves the function of orienting the user, it also absorbs most of the user's concentration. Furthermore constantly looking and checking a map while navigating real 3D space can be dangerous or distracting from real features of the space such as cars, streets crossings or monuments. For example, while testing story delivery applications, researchers discovered that users suffered a certain disorientation due to cognitive overload [1][2]. In these situations, the content becomes almost secondary to the navigation act, diminishing the pleasure and the immersion of the user in it, impeding the users to fully relax and enjoy the advantages of serendipitous discoveries and encounters.

In order to address cognitive overload issues and foster pleasurable experiences and serendipitous discoveries we decided to explore alternative options for navigational interfaces. In this thesis we describe Breadcrumbs, a 360 degrees interface that exploits the metaphor of a periscope, enabling the user to find content around them by means of scanning the surrounding space with the mobile device. By using a loose metaphor of a periscope, harnessing the power of the smartphone sensors we designed an interactive interface capable of detecting content around the users and display it in the form of 2 dimensional bubbles which diameter depends on their distance from the users. Users will navigate the space in relation to the content that they are curious about, rather than in relation to the traditional geographical map. By getting closer to the bubble (the content left at that location by another users), the content comes into focus in the form of a picture, text and some audio. Similarly if the users wish to leave their own content at a specific geographical location, they can or upload pictures add text and voice over and geo tag it to the location. Later in time, other people using Breadcrumbs, will be able to retrieve it and add comments to it.

Through Breadcrumbs we are aiming to reduce cognitive load of the users in navigating the space, while preserving the engagement with the content and the immersion in the surrounding environment, supporting the enjoyment of serendipitous discoveries done while engaging with the system. Through this model we envisage not only bypassing a certain cognitive overload generated by having to continuously confront a two dimensional map with the real tree

dimensional space surrounding the user, but also use the content as a navigational filter. The users will direct themselves where there is content they are interested in or drawn to; instead of orientating themselves in the physical space, they orient themselves in the content space. We hypothesised that this alternative mean of navigating space might bring serendipitous discovery about places, discovering locations that the user where not aware of or intending to reach or making contact with people or information they would have not intentionally searched for. In fact, serendipity is by definition "The occurrence and development of events by chance in a happy or beneficial way" [3]. Serendipity as defined above, is a transversal theme, it can occur in several areas from science to photography where relevant discoveries or event occurred accidently. Such theme be further analysed and explained in relation to our application during the unfolding of the thesis.

I.3. OBJECTIVES

The main objective of this project is to investigate how local-aware mobile applications can provide pleasurable experiences through location specific content and foster serendipitous moments when used to explore real places. We believe that serendipity can improve users experiences during exploration as long as the interface and the application itself does not overload the users cognitive effort. To fulfil our goal we designed and developed Breadcrumbs: a mobile location-aware application that makes use of stories and short narrative in order to foster serendipity towards user's exploration of urban spaces. The application allows users to explore stories left by locals or tourists in certain places, as well as sharing their one content while on the move. An evaluation study was conducted to assess our goals. In this thesis we will describe the design development and study of such application and its goals. All finding will be discussed, and conclusions drawn, including possible future steps and improvements.

I.4. THESIS STRUCTURE

The thesis is structured in five main chapters:

- **1º Chapter** – This chapter is the "Introduction" chapter where the thesis context, motivation and objectives are described.
- **2º Chapter** – This chapter is the "Related Work" chapter that is divided in two main sections. Firstly the "Literature Review" section where terms and area of research, such as "Context-Aware Ubiquitous Computing", "Locative Media" and "Serendipity" are defined. Secondly we have the "State of the Art" section where several relater works in the area of context aware and locative media are reviewed.
- **3º Chapter** – This chapter is dedicated to the implementation of the Breadcrumbs application, describing the main requirements needed to produce the application prototype. This chapter describes the architecture of the breadcrumbs system, the rationale behind the two different navigation models and in the end a description of the different interfaces of each navigation concept.
- **4º Chapter** – This chapter is where the evaluation study is described. The evaluation of Breadcrumbs was first designed and conducted. Then the content was analysed and discussed.
- **5º Chapter** – This chapter is dedicated to describe the general conclusion of this thesis and possible future improvements and ideas to the actual thesis solution.

II. RELATED WORK

This chapter is divided into two main sections. Firstly a literature review where I firstly define the terms and areas of research that are relevant to understand the project and position Breadcrumbs in the correct area of study. Secondly a state of the art section, where I review relevant work that has been developed in the area of context aware mobile storytelling and locative media.

II.1. LITERATURE REVIEW

This section covers terms and areas of research relevant for the project development, such as "Context-Aware Ubiquitous Computing", "Locative Media", Narratives and Storytelling" and "Serendipity" are defined.

II.1.1.Context-Aware Ubiquitous Computing

Portable devices such as laptops, tablets or cell phones that are easily carried in a bag or even in the palm of your hand are getting smaller, lighter and far more powerful. If people are going to interact with these personal devices small enough to always be with them, then these devices should be aware of what is happening around them [4].

B. Schilit in his article defines that one of the challenges of mobile distributed computing is to be able to explore the changing environment using context-aware applications able to detect the context in which they run. Systems such as these can examine and adapt to their environment.[5]

In the article "A Survey of Context-Aware Mobile Computing Research" the authors define context as a "set of environmental states and settings that either determine an application's behaviour or in which an application event occurs and is interesting to the user." Many researchers attempted to define such contexts by analysing them as Computing context (networks, communications cost, communication bandwidth, nearby resources, displays and workstations), User context (location, people nearby, social situation), Physical context (light, noise level, traffic, temperature) or even time context (day, week, moth, season of the year)[6].

In another definition of context from the article "Towards a Better Understanding of Context and Context-Awareness" the authors define context as "…any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves".

In the latest definition the authors define location, identity, time and activity as the primary context types to characterize an entity being able to answer the questions who, what, when and

where, and act as a source of contextual information indices. This context characterisation can help designers to choose and structure the context and search for more relevant contexts. [7]

Systems with this capabilities can examine and react to changes to the environment not only user locations but other important things such noise levels, light, communications cost, social situation, network connections and others. B. Schilit categorize context-aware applications in four categories [5] :

- Proximate selection: user interface technique that emphasize or make easier to user a nearby located-object.[5]
- Automatic Contextual reconfiguration: process removing, altering or adding connections between components duo to context changes.[5]
- Contextual information and commands: according to context produces different results. [5]
- Context-triggered: rules that specify how Context-aware systems should adapt. [5]

From G. Chen and D. Kotz perspective mobile applications can take advantage of context in two ways: [6]:

Active Context – An application automatically changing its behaviour adapting itself to new discovered contexts [6].

Passive Context – The application presents the new or updated context to users or save it future retrieval [6].

The Breadcrumbs application can be defined has as a context-aware application using the context as an active context, as defined by D. Kotz, due to its ability to automatically adapt the information presented to users according the device GPS positon. Moreover, when referring the B. Schilit categories we can associate mainly the Breadcrumbs application to the third category as the application produces different results if used in different contexts.

II.1.2.Importance of Narratives and Storytelling

According to Henrik Schärfe narratives has been one of the favourite tools of man to exchange experiences and viewpoints, for thousands of years. He refers to narratives as "Drawing on essential human cognitive faculties, narration is common to all mankind, in all cultures, at all times, and continues to be explored through every media we have at our disposal and for every communicative aim we can think of" [8].

In the modern days, storytelling tools have gone through huge changes. With the intervention of new mobile context aware technologies, introducing multimedia elements such audio, video, animations and graphics, stories diversified themselves in terms of tools for making and delivering. Although the tools were changing rapidly, stories never lost their purpose. [9]

Today we still rely on stories to make and maintain friendship, share knowledge, curiosity and emotions. Stories are important in our application because they allowed people to discover a place and who traversed it, as well as making and maintaining new friends, as well as leaving a trace and informing people. We believe that the sharing of stories through Breadcrumbs still maintains the story original purpose, but also extends it through the use of mobile context aware technologies and makes stories available to users while on the move, and connects storytellers and readers through its social networks.

II.1.3.Locative Media

Locative media can be defined as a set of technologies and info-communicational processes in which content is associated to specific places. This group of technologies and process are characterized for emitting digital information from a place or object. This locative information can be processed by wireless artefacts, such as, GPS enable mobile devices including phones and laptops.[10]

The "Locative Media" term was used for the first time in an international workshop of artists and researchers by Kalnins and Tuters in 2003. Now the term is a synonym to particular mobile experiences that mix the physical and the virtual world, including mobile media that arguments people experiences in real places.[11]

A workshop at CHI 2007 classified relevant locative media in four categories[11]:

1. Facilitate navigation and way finding[11];
2. Mobile augmented reality applications[11];
3. Application to create information attached to physical places or objects[11].
4. Application to access information attached to physical places or objects[11].

The Breadcrumbs application in relation to this four locative media categories, will easily be related with the third and the fourth category, due its ability to access and attach stories to a specific place.

II.1.4.Serendipity

On the 28th of January 1754 Horace Wallpole in one of his eighteen hundred letters to Horace Mann coined the word "Serendipity" [12], describing it as a particular kind of discovery [13] giving such name to an accidental sagacity involved in many scientific discoveries[14]. He illustrated the serendipity concept by referring to a Persian folk tale named The Travel and Adventures of three Princes of Serendip [13].

> "This discovery indeed is almost what we can call serendipity, a very expressive word, which as I have nothing better to tell you, I shall endeavour to explain to you: you will understand in better by the derivation than by the definition. I once read a silly fairy tale, called The Tree Princes of Serendip: as their highnesses travelled, they were always making discoveries, by accidents & sagacity, of things which they were not in quest of: for instance, one of them discovered that a blind mule in the right eye had travelled the same road lately, because the grass was eaten only on the left side, where it was worse than on the right – now do you understand serendipity?..."[12].

Moreover the Cambridge dictionary defines serendipity as "The lucky tendency to find interesting or valuable things just by chance"[15], other similar definitions of serendipity are proposed in various related study works:

- "The gift of finding valuable or agreeable things not sought for"[16].
- "The faculty of making fortunate and unexpected discoveries by accident" [17].
- "The art of finding what we are not looking for by looking for what we are not finding" [18].
- "Serendipity is an experience when people find something that they weren't expecting to find"[19].

In the last 60 years this notion of accidental and happy discovery has gone from being an arcane word and concept, to being part of the common language [13]. The term serendipity is scattered over many different domains as medical discoveries, corporate settings, creativity and thinking

having all discussed accidentals and serendipitous findings[14]. Even so A. Dias de Figueiredo and Jóse Campos in their "The Serendipity Equations" article refers to serendipity as "one of the less researched concepts in the realm of creativity. One reason that may, to some extent, account for this is that it tends to be regarded as a mere manifestation of conventional creativity, a view that makes its distinctive nature"[16].

In "A Discussion on Serendipity in Creative Systems "[13] the authors presents some examples that shows how serendipity can influence, in this case, scientific discoveries:

> "In 1928, while researching influenza, Fleming noticed an unusual clear patch in a petri dish of bacteria cultures. Subsequent examination revealed that the lid of the petri dish had fallen off (thus invalidating the experiment) and mould had fallen into the dish, killing the bacteria – resulting in the discovery of penicillin"[13].
>
> "In 1948, on returning home from a walk, de Mestral found cockleburs attached to his jacket. While trying to pick them off, he became interested in what made them stick so tightly, and started to think about uses for a system designed on similar principles – resulting in the discovery of Velcro"[13].
>
> "In 1974, Fry was struggling to use pieces of paper to mark pages in his choir book, when he recalled of a colleague's failed attempts to develop superglue. The colleague had accidentally made a glue so weak that two glued pieces of paper could be pulled apart – this resulted in the discovery of Post-it notes"[13].

The same above mentioned authors categories serendipity accidents in three different types, according to three different dimensions of it: Chance, Sagacity and Value:

- **Chance**: "The serendipity trigger is unlikely, unexpected, unsought, accidental, random, surprising, coincidental, arises independently of, and before, the result". [13]
- **Sagacity**: "This dimension describes the attribute, or skill, on the part of the discovery. (The bridge between the trigger and the result). In many of these examples others had been in the same position and not make the discovery. This skill involves an open mind (an ability to take advantage of the unpredictable); ability to focus-shift; appropriate reasoning techniques; and ability to recognize value in the discovery". [13]
- **Value**: "The result must be happy, useful (evaluated externally). [13]

Reflecting on the Breadcrumbs applications we can infer that the serendipity that arises from the use of the application can have elements of all three dimensions. The stories revealed by the app or the trails the users are suggested to walk can lead to random, surprising or coincidental events, like meeting a friend, discovering a special shop or bar that eventually can become a favourite.

Sagacity is an important link between the chance and the Value, users to recognize value from an unexpected, random or coincidental moment need to be connected to it, such as, past experiences or personal preferences. Is very probable that two persons, having the same unexpected event, behave to it differently, due to that, this dimensions is decisive to create Serendipity moments. Value dimension can be considered as the final goal to create Serendipitous moments, were the results have to be useful or happy.

II.2. RELATED WORK

In this section will be reporting on several projects related to the area of context aware and locative media.

II.2.1. InStory: A System for Mobile Information Access, Storytelling and Gaming Activities in Physical Spaces

InStory is a platform for mobile storytelling, information access and gaming activities. Its goal is to define an architecture and implement a system to support interactive cinematographic narratives, offering as well entertaining activities with mobile devices. They address four fundamental problems in this type of systems:

1. Definition of a flexible computational architecture that integrates heterogeneous devices, different media formats and different narratives modes.
2. Information presentation and interaction in heterogeneous devices, when navigating in the real world.
3. Systems support for networks and group management (namely ad-hoc networks and groups that are formed to participate in a given activity).
4. Development of appropriate mechanisms for personalization and collaboration for this new channel of communication.

Figure i - In Story Client Interface

The system is divided between client and server, considering an architecture with several clients and one server. The client has the responsibility to provide the user experience through the use of PDA technology. In other hand the server maintains all the information about users and items in

the system. He allows users to contribute with new data to the story threads, permitting the upload of different types of data, including text or images. They consider three main application scenarios divided in three layers (information, special storytelling, spatial games) attempting to provide a compelling experience to users and test the different aspects of the built computation framework.[20]

From the In Story project some suggestions related to the technical part of the breadcrumbs application can be gathered. Especially we were inspired by how the authors resolved the technical issues related to the client and server side. Similarly in the Breadcrumbs application we built a client side, which is responsible to provide the Breadcrumbs experience to users, while the server work as an information repository. Moreover, in The In Story project they intent to create an spatial game like an treasure hunt, this spatial game component can be of interest to add to the Breadcrumb future development, working in parallel with the storytelling to engage users to explore more.

II.2.2. Location-bases Storytelling in the Urban Environment.

In this article the authors present the research for the design and user experience of a mobile location-based story where users physical surrounding function as a backdrop for fictional storytelling. In order to explore this idea the authors build a prototype system called "Who Killed Hanne Holmgaard?" applied to the city of Aalborg. The project presents its content through a mix of old and new surroundings, making it appropriated for this type of location-based storytelling systems.

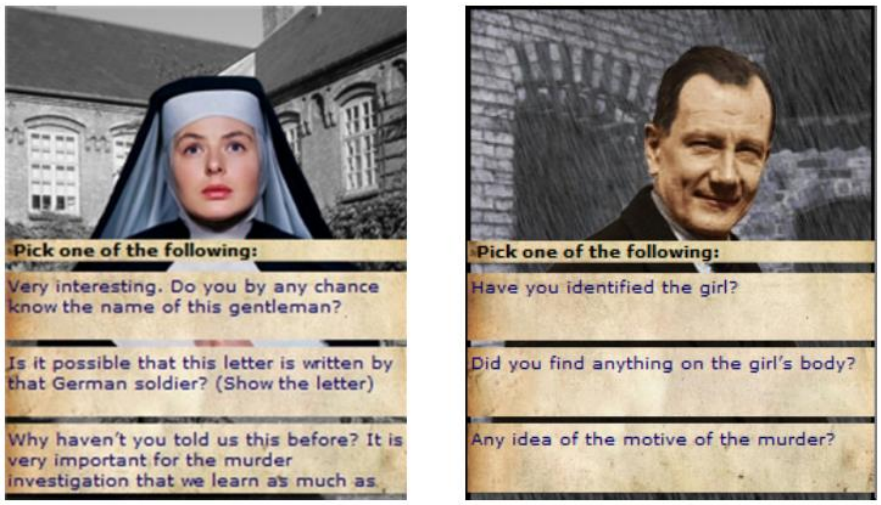

Figure ii - Interactive story element example

To test the user experience the authors gave to users working in pairs a PDA, a headset and a physcal map of the area. Each one of the users plays a different character in the story, unravelling simultaneously the mystery while on the move. The system presents the story through text, image and audio. Users interact with it basically by selecting choices on the screen (see Fig. 1) and moving physically through the city of Aalborg. After the user experience evaluation they proceeded with field trials, this time with five pairs of participants. In the end of the field trials they concluded by interviewing the users . All participants found the storyline interesting expressing high motivation to reach the end, and the use of elements of the physical surrounding linked with the storyline was well received.

The participants encountered some concentration difficulties regarding the quantity of dialogue presented mixed with the noisy environment of the city, making them prefer to focus on the pieces of text displayed. Most participants expected that would have liked to investigate more their surroundings, facilitating face-to-face interactions with partners. [21]

What we valued from this work is the warning about the fact that participant might reported some kind of cognitive overload when trying to concentrate in the stories dialogues in the middle of the city environment. This kind of problem has to be taken in consideration when producing the Breadcrumbs application, since if not taken into consideration, it may also result in a problem for our users.

II.2.3.Evaluating automatically generated Location-based Stories for Tourists.

Using the WikEar System the authors offer tourists who wish to learn about places a sort of tourist guide to explain the surroundings, using narratives. They accomplish this by using cell phone cameras where users are able to interact with a real map creating routes that trigger auto-generated narratives contents. The content of these narratives are mined from georeferenced Wikipedia articles that are presented in audio form through text-to-speech software.[22]

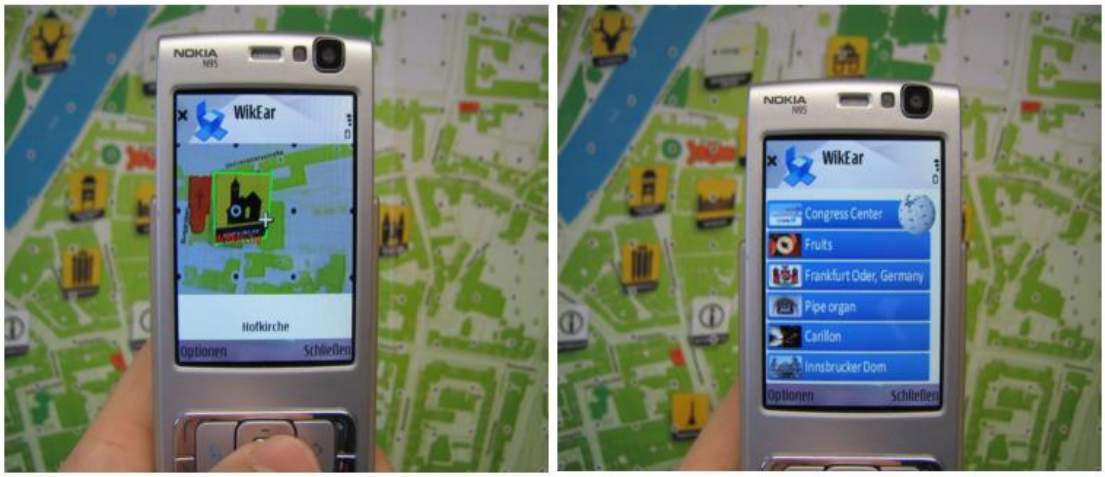

Figure iii - Wikear User Interface [19]

The main aim of this article is to describe a first evaluation of these narratives and also the WikEar interface. They conduct a semi-formal evaluation of the quality of the generated stories and the interaction metaphor with a group of 21 UbiComp conference attendees, answering at the end eight questions ranked with a six-point system. Analyzing the result from the questioners they drawn promising, but not, conclusive results. Nevertheless they found some encouraging positive results indicating some success in their survey methodology.[22]

In this article they describe their challenge to create good quality stories through auto generated content mined from Wikipedia. Similar difficulties may be encountered in the Breadcrumbs application, people will not always create good quality stories, hence it is important to somehow monitor or filter user generated content (Using for example the number of likes or an repost system) to provide to users a better experience unveiling only the most interesting and liked stories to the users.

II.2.4.The iLand of Madeira Location Aware Multimedia Stories

The iLand paper describes Location aware multimedia story project that captures and explore the rich oral culture and traditions of Madeira Island. They take advantage of this tangible heritage to develop a high quality content to be used in a Location aware story delivery platform, to bring a new level of engagement of the audience with the city, and its traditional stories. After deciding to use the city as the project playground they defined what type of experience to build, expanding on the concept of the Location Aware Multimedia Stories (LAMS). They started collecting stories from people, like friends and familiars who are part from the same social network, selecting eight stories for production based on the potential drama.

Figure iv - iLand - Story video frame

After the story production, a pilot study was conducted, helping to find out eventual issues. The pilot was focused in five young adults, where they were asked to try the iLand experience. During the pretest the participants were left to explore the stories on their one, being observed during the way. At the end of the experience it was conducted a semi-structured interview to better understand how users generally felt about the experience.[1]

This article was a useful example on how to collect and value local folk story content, by searching among friends and familiars. Moreover, we looked at the evaluation of the prototype in order to draw a structure of how to evaluate the Breadcrumbs application.

II.2.5.Urban Tapestries: Public Authoring, Place and Mobility

Urban Tapestries is a system build in upon twenty first century networks communications that explores the mobile technologies with geographic information systems from the point of view of peoples everyday lives. To understand this everyday interaction between people they developed and adapted a set of research methods such as experimental ethnography and body storming experiences, enabling them to observe the behaviour emerged from the process of mapping and sharing local knowledge and experiences. With this method they were able to retrieve information about people's relationships to place, context, time and mobility.

Figure v - Urban Tapestries

Based in this gathered information they build a prototype using a variety of technologies, such as, Mesh Wifi, GPRS, PDAs, mobile phones and spatial annotation systems. The system were tested in the Central London, enabling to observe the kind of content people want to share. They detected a strong desire by users to share knowledge tempered by questions such as, who this knowledge wold be used by and Importance of the knowledge context. They conclude that the research indicates a need for particular communities to explore knowledge shared in and between communities.[23]

This study can be directly related with the Breadcrumbs metaphor, where users will share their knowledge attached in a specific spatial context. Some concern detected by them, can be addressed also in our thesis, regarding the users tempered behaviour to share information, concerned with who the information will be used. Their assumption where there is a need to communities to share knowledge can help us to understand who users will receive the breadcrumbs system concept.

III. BREADCRUMBS SYSTEM

III.1. BREADCRUMBS SYSTEM REQUIREMENTS

To support the breadcrumbs system we conducted a functional and non-functional requirements analysis. The production of this requirements followed the needs to produce an application capable of supporting all the tasks required to conduct the study.

This is an important development phase, acting as a foundation for any software. This requirements are the pillar to all the application production granting that in the end all is prepared to realize the necessary tasks.

Duo to the existence of two different navigation models some requirements needed to be differentiated because of the specific functionalities of a certain type of interface perspective. Below we list all the requirements common in both navigation models and, in the end, a table specifying the association of the requirements with the navigation models perspectives from the breadcrumb application.

III.1.1. Functional Requirements

Functional requirements gather the set of functionalities that the application supports and offers to the user [24] In table 1 we list all the functional requirements for the breadcrumbs application:

Requirement Id	Description
FR1	Authentication is required by users via identification and a password to access the system.
FR2	Users create new content to the system by introducing the story title, story narrative and capture the needed photo.
FR3	Users select a story.
FR4	Users visualize a selected story image, story title, story narrative and comments.
FR5	Users identify if they like a specific story.
FR6	Users visualize a story preview.
FR7	Users navigate thought the map.
FR8	Users zoom in and out through the map.
FR9	Users cancel a story visualization.

FR10	User visualizes his geographical position in the map.
FR11	Users comment a story.
FR12	Users visualize the stories geographical position in the map.
FR13	Users access the 200m closer stories around them using the mobile phone compass.
FR14	Users access the preview information the 200m closer stories around them using the mobile phone compass.
FR15	Users randomly select one of the accessible 200m closer stories around them.
FR16	Users receive directions to the story location.

Table i - Functional Requirements

III.1.2.Functional Requirements & navigation model

The next table presents the requirements associated with their specific navigation model:

Requirement Id	Map Navigation Model	Landscape Navigation Model
FR1	X	X
FR2	X	X
FR3	X	X
FR4	X	X
FR5	X	X
FR6	X	X
FR7	X	
FR8	X	
FR9	X	X
FR10	X	
FR11	X	X
FR12	X	
FR13		X
FR14		X
FR15		X
FR16		X

Table ii - Functional Requirements & Navigation Models

Checking the table II can be observed that 75% of the requirements are common in bought navigation models. These requirements are more related to authentications and information requirements. The other 25% that are dedicated to each navigation model are focused on how the stories must be presented to users until they see their content.

III.1.3.Non-functional Requirements

Non-Functional Requirements are related to the quality service of the functions offered by the system. This qualities characteristics are related to safety, portability, accuracy, reliability, robustness, constraints and others.[24]

Requirement Id	Requirement Type	Description
NFR1	Usability	All text sizes in the application must be readable.
NFR2	Usability	The interface presents must be user friendly, user must be able to learn to perform any interface model in less than 5 minutes
NFR3	Friability	The system must be robust and avoid error
NFR4	Performance	Usage of global positioning system using GPS or IP thought Wi-Fi connection or GPRS
NFR5	Security	The system maintains data integrity
NFR6	Availability	The system is always available (uptime is >95%)
NFR7	Integrity	The system handles error from server data requests
NFR8	Adaptability	The system support the iPhone 3G/3GS, IPhone4/4S using the ios6 operating system

Table iii - Non-functional Requirements.

III.2. BREADCRUMBS ARCHITECTURE

The Breadcrumbs application architecture consists mainly of a Client-Server Model applying a Representational State Transfer (REST) style where each instance communicates with the server through an Internet connection. The client side is implemented in the IOS 6 operating system and the server consists of a PHP server, provided with MySQL database.

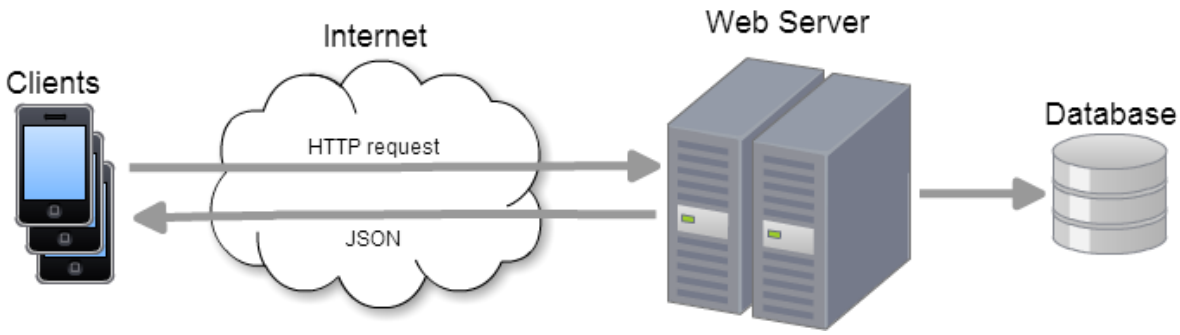

Figure vi - Breadcrumbs Application General Architecture

To implement the Rest style [25] we used two different frameworks, one for the Client and another for the server. Each framework supports the exchange of resources between the client and the server. In the Client side we used the Objective-C framework named RestKit, making it easier to perform requests/responses actions and also providing an effective object mapping. For the server side we used a PHP web application framework prepared for Restful implementations. This framework follows the Model-view-controller (MVC) framework which is responsible for all the interactions (Insert, Get, Delete and Update) with the MySQL database as well as the responsibility to process all the clients information requests.

The choice for a restful style implementation is primarily due to its practicability in terms of lightweight and easier implementation related to SOAP for example. One of the main counterparts for this style is the security. Measuring the level of security needed for the breadcrumbs system, related primarily to the objectives of the thesis, didn't give security an important weight.

The client side the Breadcrumbs system is divided in three logical layers, each layer takes a particular responsibility in how the application works.

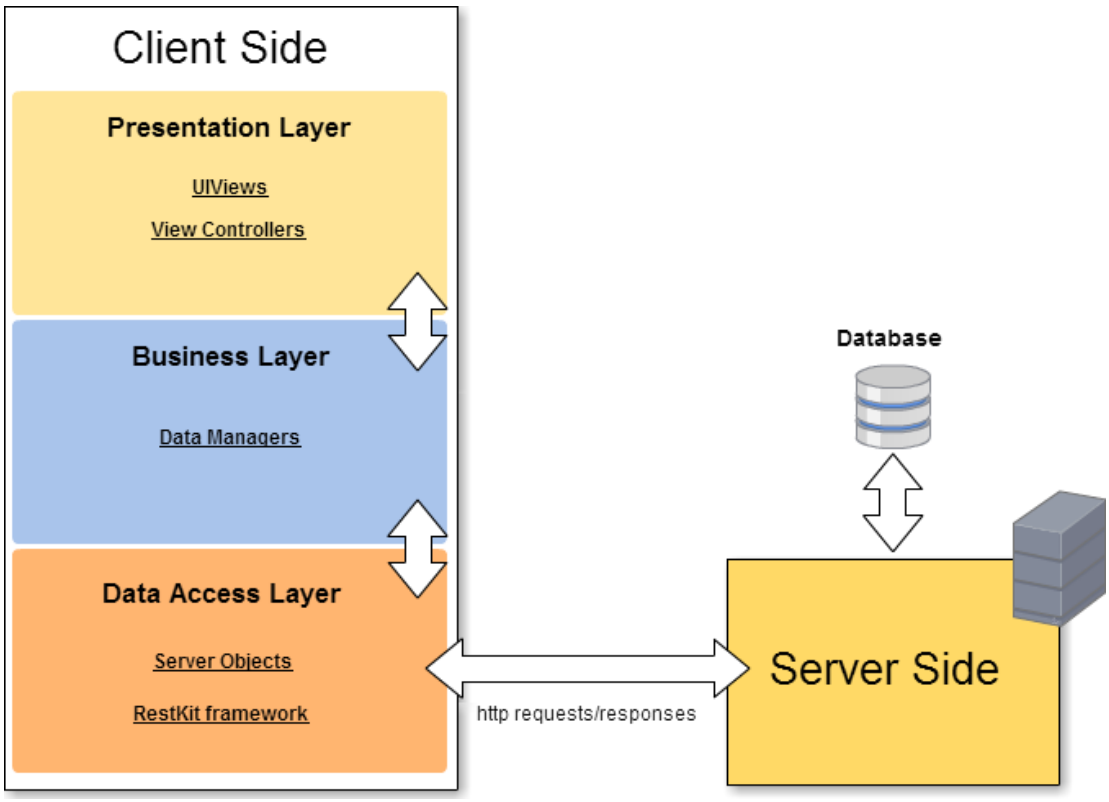

Figure vii - Breadcrumbs Application Client Architecture

Presentation Layer: This layer consists of Views and View controllers, in the one side the views are responsible for showing information on screen and receiving user inputs, on the other side the view controllers are responsible for the screen flow and processing the input received from the UIView objects.

Business Layer: This layer is responsible for managing information and executing complex calculations. This layer works as an intermediary between the presentation and the data layers processing, calculating and managing their information flow.

Data Access Layer: This layer is responsible for all the data access functionalities.

III.3. DATABASE MODELING

In this section we present all the models describing the structure of the MySQL database supporting the breadcrumbs system. The database is responsible for storing all the breadcrumbs system information's as user's data. The story contents represented here as breadcrumbs and other relevant information to complement the social side of the application. This model facilitates the comprehension of the database structure, and if needed, alterations to this structure.

III.3.1.Entity-Relationship Model

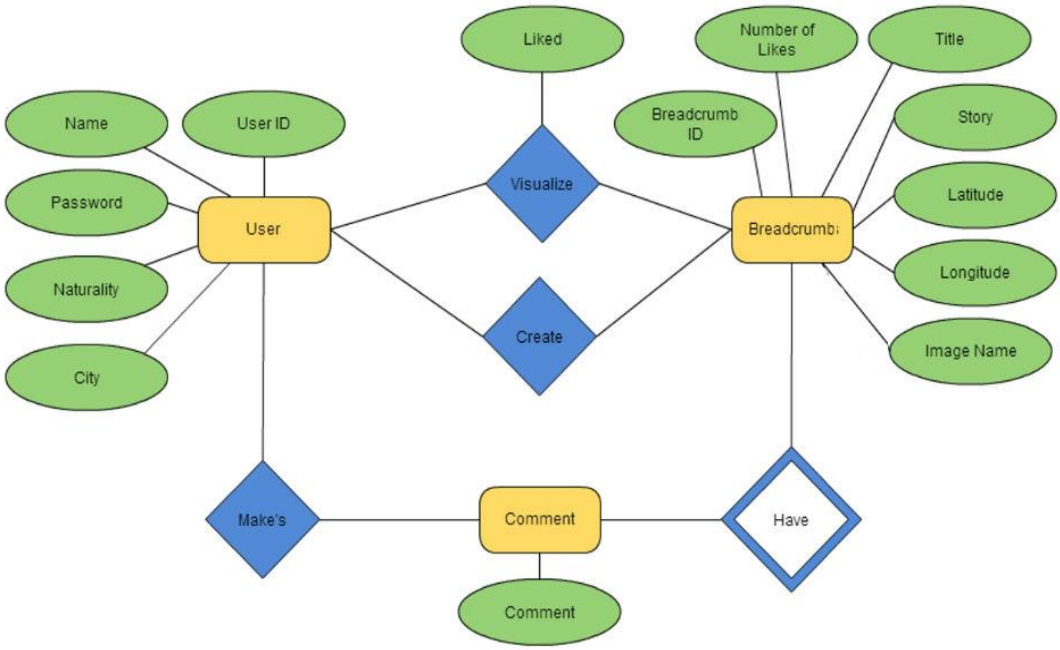

Figure viii - Entity-Relationship Model

The ER model represents an abstract view of the actual database, presenting all the entities of the system and their relations with each other. Here in this model the entities are represented with yellow squares and their relationships with blue diamonds, and finally the attributes with the green circles. The relationships with a double diamond define a dependency where the comment entity depends on the existence of a breadcrumb (Story contents). Some characteristic related to redundancy were taken into account, focusing in the attributes Number of Likes in

the Breadcrumbs entity which stores the total of likes that a specific breadcrumb gathers and the attribute liked in the visualize relation storing if a user liked an certain breadcrumb. In this case we can notice some redundancy in the two attributes duo to the fact that the total number of likes can be measured counting the number of users that liked the breadcrumb, but this procedure spends a considerable processing resource from the server related to the weight of storing this redundant data.

III.3.2.Relational Model

The image below represents the Breadcrumbs system database relational model. Even if the structure is simple, it complements the necessary requirements for a correct operation of the system. The Relational Model is a Logical Model, describing the database on an abstract level very close to the physical one implemented in the server. The contrasts the ER model (Figure 1) that represents a more conceptual model of the database. This Model consists in a group of relations represented by tables containing a set of attributes and keys that identify the associations between relations. The Database Relation Model (Figure 2) was created with MySQL Workbench and exported to the server thought the PhpMyAdmin platform.

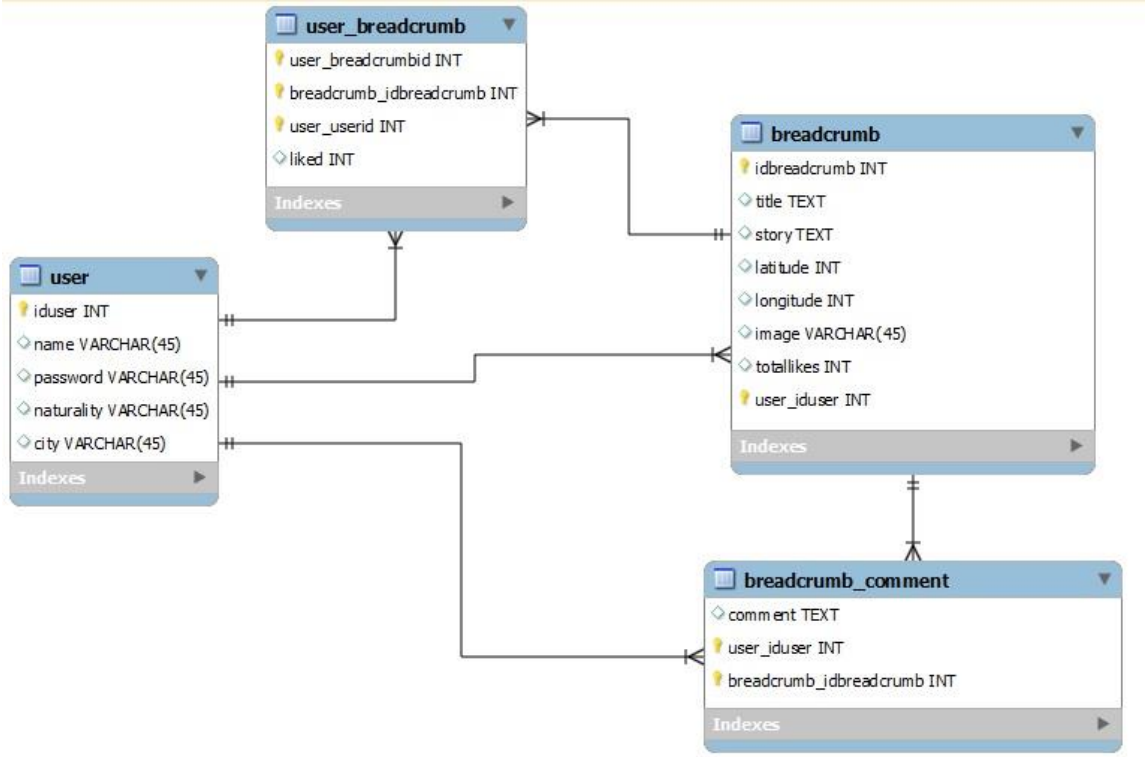

Figure ix - Relation Model.

All the Tables and their purpose are described below:

- **user:** responsible for storing all the needed information related to users.
- **user_breadcrumb**: Responsible for storing if a user view and if liked a breadcrumb.
- **breadcrumbs**: Responsible for storing all the story content, positions and image names.
- **breadcrumb_comment**: Responsible for storing store the comments on the breadcrumbs made by users.

III.4. BREADCRUMBS APPLICATION

The breadcrumbs applications consist of a social networking application where the users have the possibility of sharing stories (Breadcrumbs) in the form of images and text. These shared stories can then be explored by other users using the same application where contents can be commented and evaluated.

The breadcrumbs application is divided in two different navigation models, The first approach is a conventional map-guided application and the second presents the breadcrumbs in a 360 degree landscape view, giving the user a distinct approach in order to explore the geographically spread stories.

III.4.1.Map-guided Navigation Model

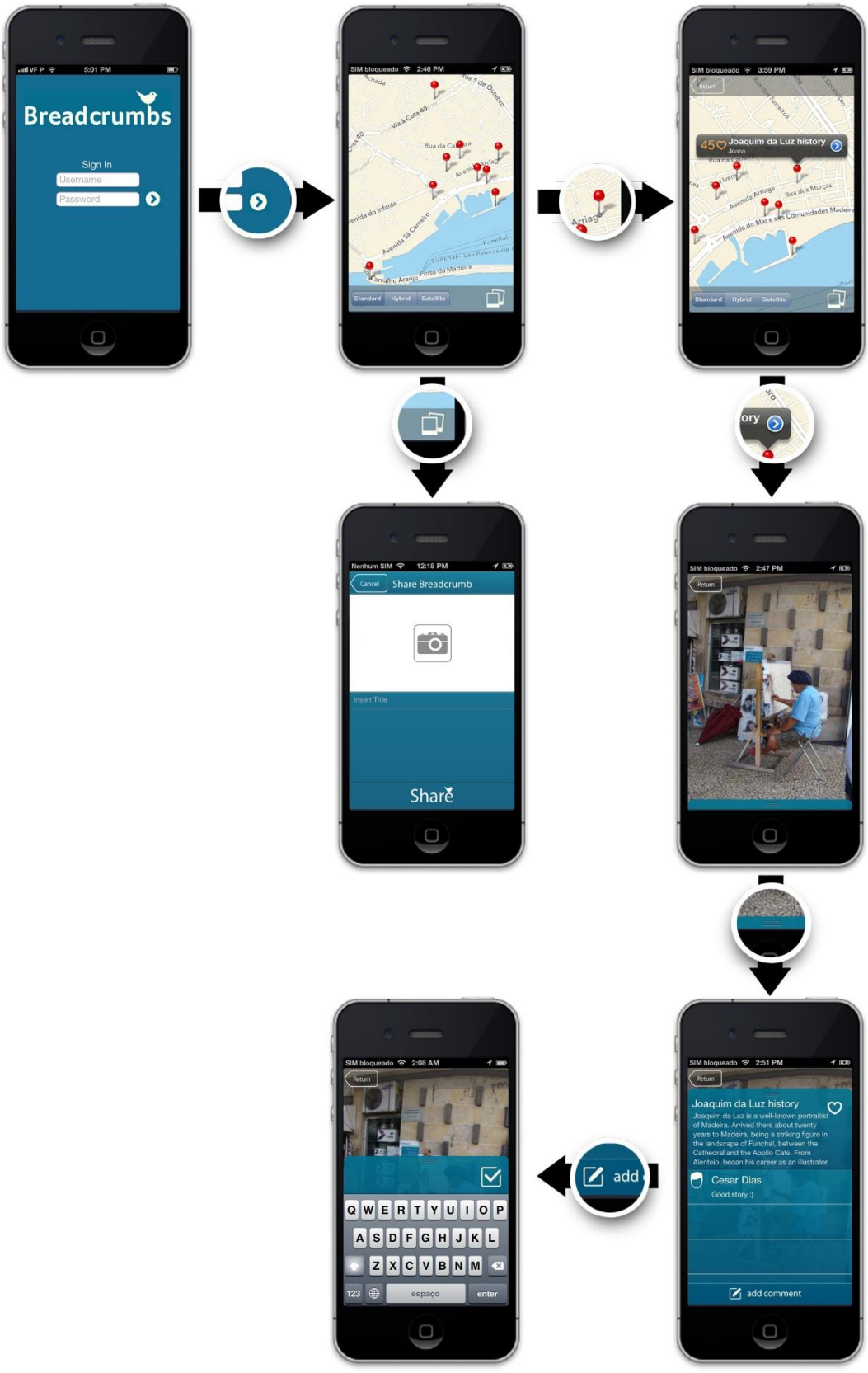

Figure x - Map-guided Navigation Model.

The map-guided Navigation Model presents the various stories adding red pins in a map, identifying where the geographic position of each story is. The users can access the story contents by clicking the pins spread in the map without needing to present the same geographical context of the story.

All the screens presented in Figure 5 demonstrates the navigation flow thought the breadcrumbs map-guided Navigation Model. We describe these screens below in detail:

Login screen - This screen behaves as a normal login screen very common in similar applications. The user inputs a username and password in the respective textboxes and clicks the forward arrow. An activity animation appears while the system validates the inserted user credentials. If everything is correct the application automatically presents the next screen with the stories, if not the user is taken back to the login screen with an error message.

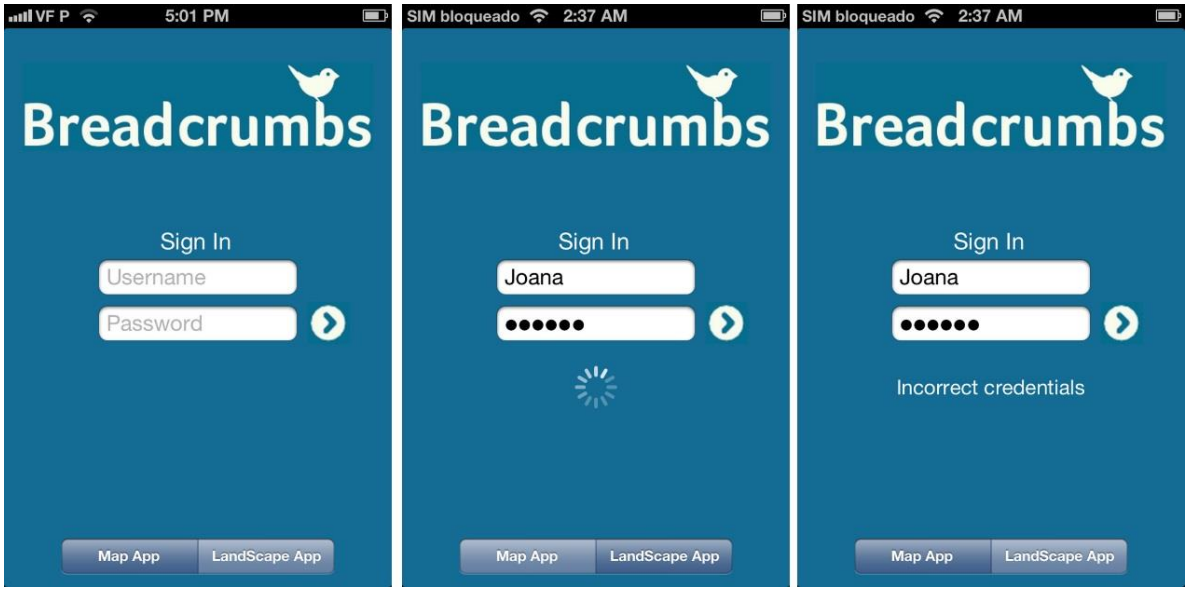

Figure xi - Login Screen.

Map Navigation Screen - Here the user is presented with a map with all breadcrumbs scattered in their respective geographical position. Each breadcrumb is represented by a clickable red pin. In the bottom left of the screen a group of buttons is placed to control the map visualization type (Map, Satellite and Hybrid) and at the left the button to create new breadcrumbs.

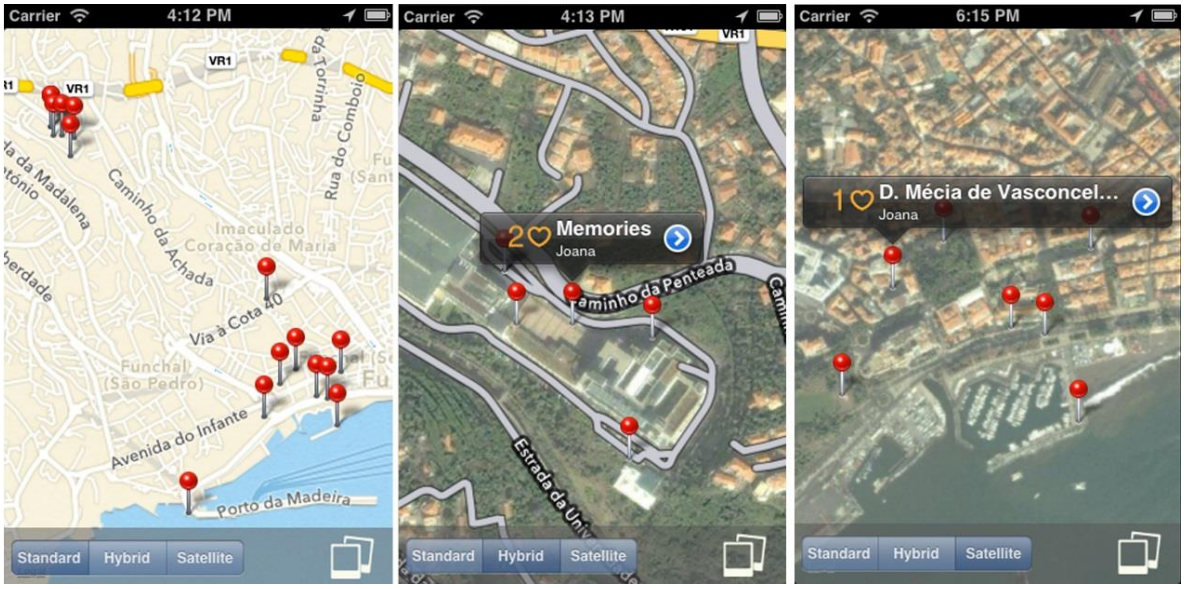

Figure xii - Map Navigation Screens.

Breadcrumb visualization screen – This screen is responsible for presenting the story contents, first in this particular map-guided navigation model. The user is presented with the image associated with the story, in the bottom of the screen is located a slide bar which when open presents the narrative and the user comments from the story. The heart symbol located right to the narrative indicates if the user likes (in orange) or not (in white) the story, to make like in the breadcrumbs is only needed to click over the hart icon.

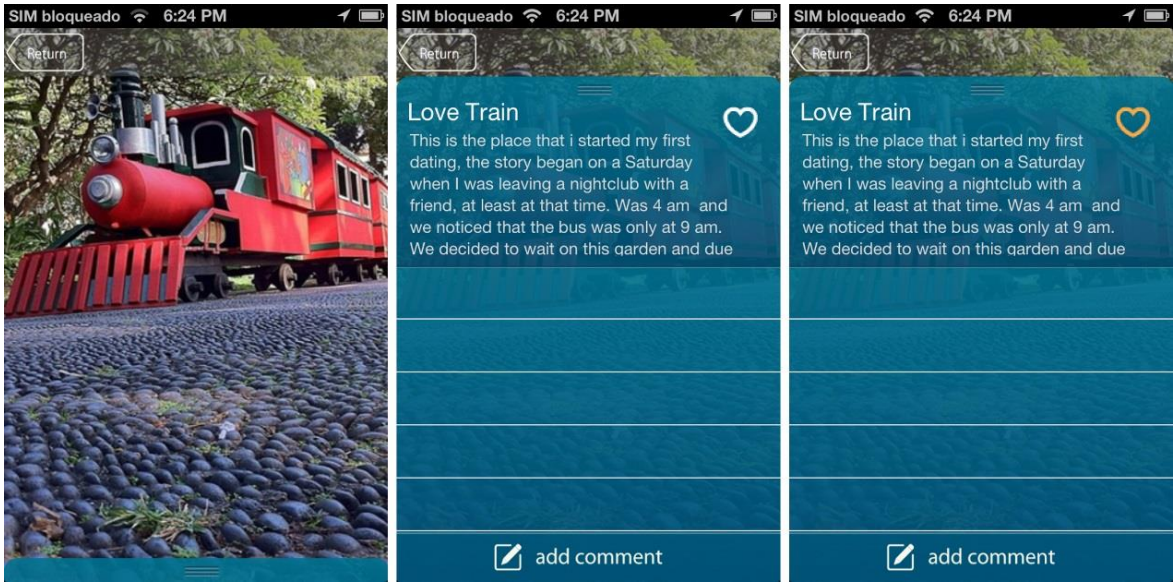

Figure xiii - Breadcrumbs Visualization Screens.

When the slide is open in the bottom the user is presents with add comment button. When clicked the screen presents an interface with a textbox and a keyboard to insert it. When ready the user only need to click in the confirm icon, and the screen return automatically to the previews screen state.

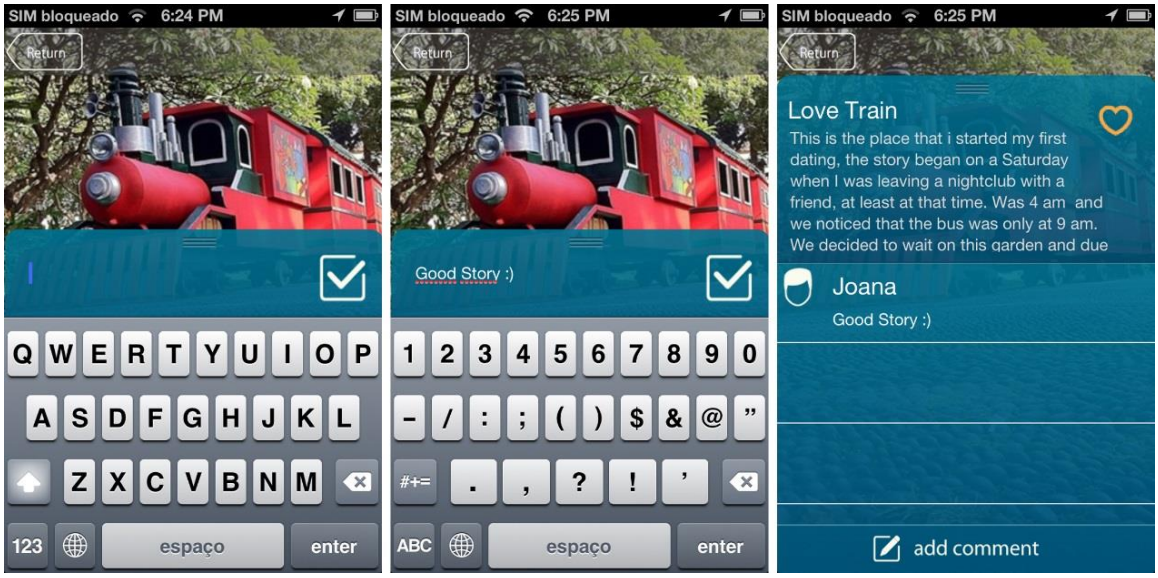

Figure xiv - Add Comment Screens.

Breadcrumbs creation Screen - This screen shows the interface responsible for creating the various story contents. Clicking the photo machine representation icon the user accesses the standard camera interface from the iPhone where she can take a photo and use it. After that the photo machine representation icon will be replaced by the photographed image.

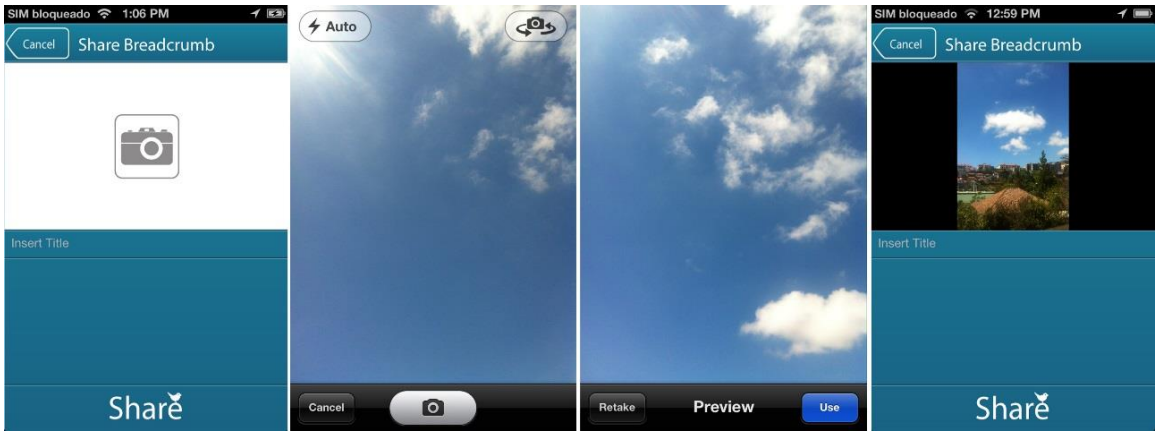

Figure xv - Taking Breadcrumbs Picture Screens.

Below there are two textboxes to insert the story title and the respective story content. Selecting this textboxes will make the digital iPhone keyboard appear and the screen will adjust enabling the user to wright content, to restore to normal after writing only is needed to click in the check symbol. To finalize all the story creation process only need to click in the share button.

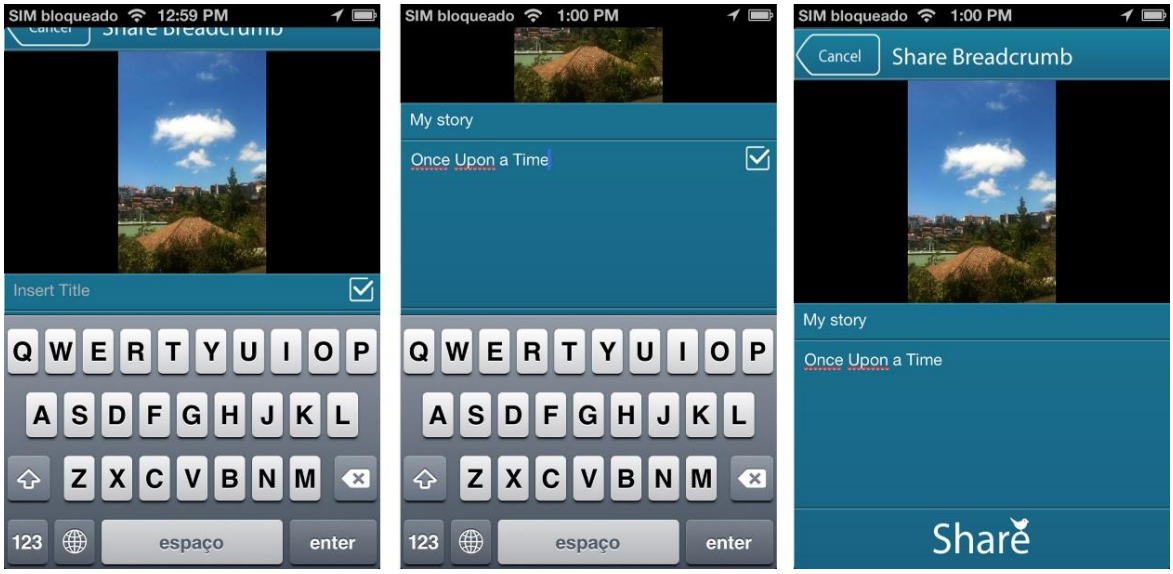

Figure xvi - Insert Story Screens.

After clicking in Share button the system will dim appearing an activity animations meaning that you shared data is being send to the server. If some error occurs the system will present a message box asking the user to try again.

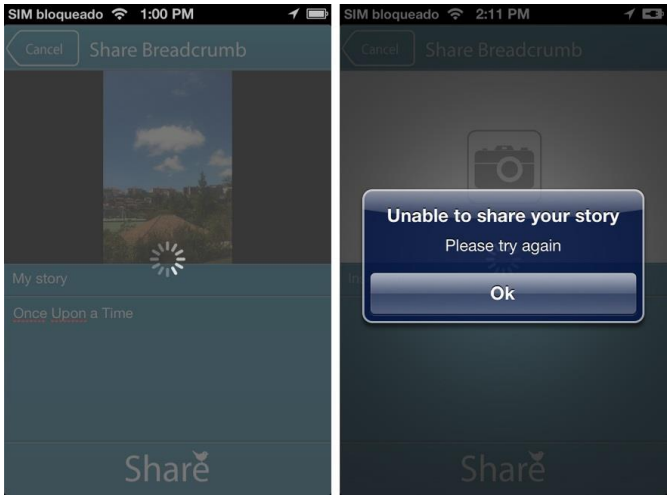

Figure xvii - Loading and error message box screen.

III.4.2. 360º Landscape navigation model

In this section we present the second navigation model of the breadcrumbs application. In this particular model users have a 360º Landscape interface where content is floating around the user.

Figure xviii - 360º Landscape Navigation Model

Using the compass of the mobile device the users can navigate through the stories around and then chose one to follow. When following a breadcrumb the application shows directions leading the use to the physic context of the story. When the place is reached the user visualizes the stories content. Some interfaces are similar in booth the navigation models such as Login Screen, Breadcrumb visualization screen and at last the Breadcrumbs creation Screen. Above we explain the detailed screens for this navigation model:

Landscape screen – This view appears after users perform the login, here the stories around the user are represented by white circles. User can interact and visualize the stories using mobile phone compass navigating thought the content like a periscope.

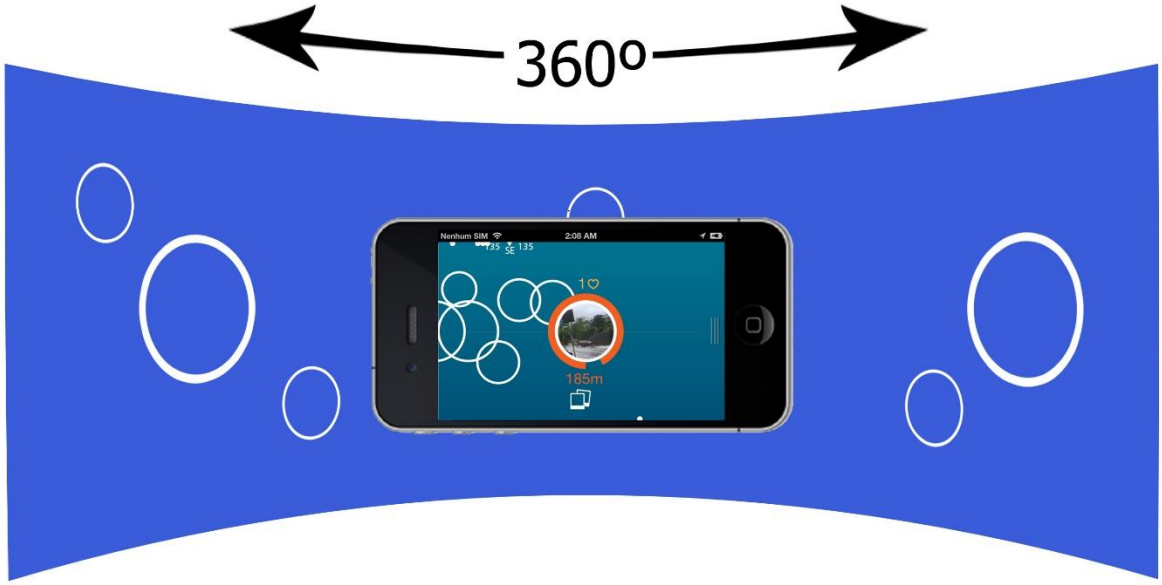

Figure xix - Landscape screen example.

There are several circle sizes, this different sizes as well the circle position in the screen represent the distance of the stories from the device geographic position. The circle reaches the maximum size when a breadcrumb is located less than 200 meter from the user position, enabling the users to preview and interact with the breadcrumb.

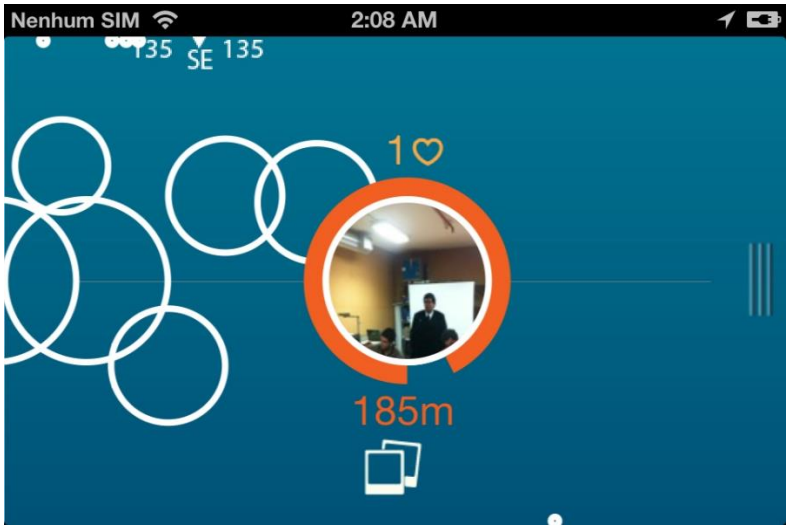

Figure xx - Landscape screen example 2.

To interact with the story it is only necessary to center the desire circle in the center of the screen appearing automatically as a small preview of the image inside of the circle as well the distance in matters and the number of likes.

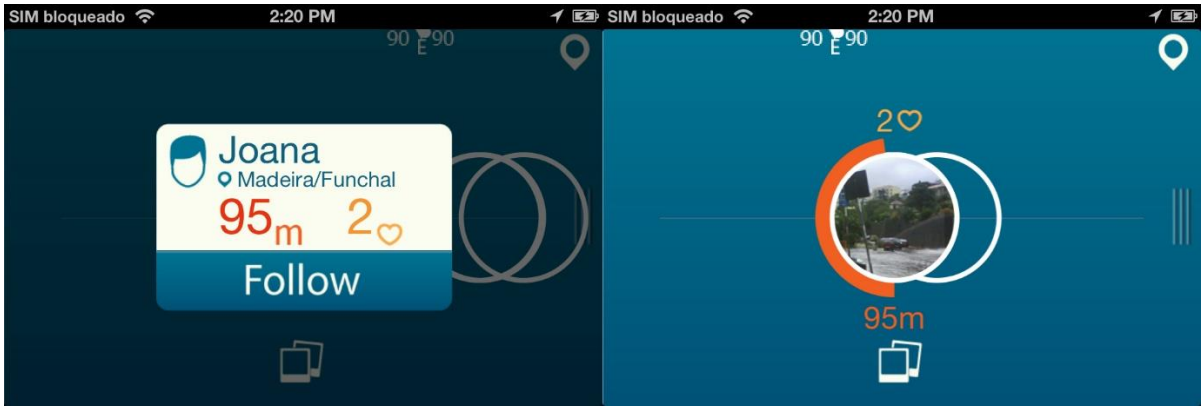

Figure xxi - Landscape screen example 3.

To see more about the story the user can click the circle appearing like a pop up window with some information about the story author, distance and number of likes. There is also the possibility of choosing a random story by shaking the mobile phone appearing automatically as a pop up window. If the users decide that want to follow the story to its place he or she needs to click in the follow button directed for the next view that will give directions to users to reach the story place.

Fallow screen – This screen is responsible for leading users to the same geographical position of the story. It intends to do so by presenting to users a group of clues in form of direction such us arrows and directional lines and image bluer level.

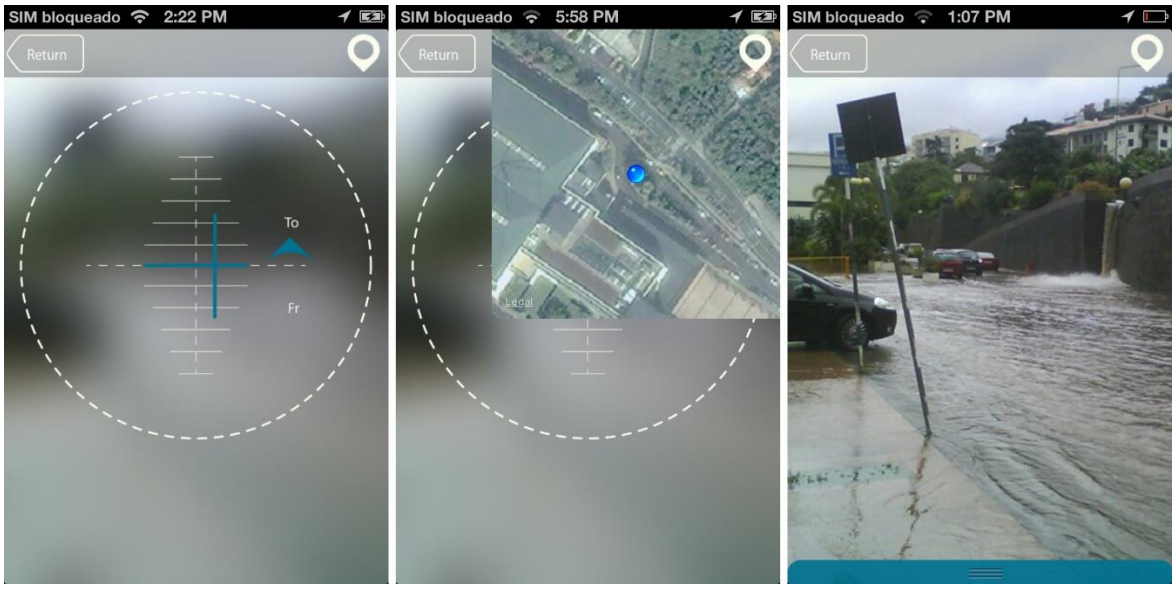

Figure xxii - Fallow Screen.

To help users work around obstacles the button in the top right-hand corner shows a mini map that presents only a satellite image from the device GPS position. When users arrive to the story place the system automatically presents the story content with a similar screen to "Breadcrumb visualization screen.

IV. Study

IV.1. STUDY INTRODUCTION

In this chapter we will describe the evaluation that we designed and carried out in order to test the Breadcrumb application. Through such evaluation we wanted to understand how our application can foster a pleasurable and eventually a serendipitous experience of exploring a space, alleviating the cognitive overload of navigating real space through a map. In order to understand the benefits of a map based interface versus the 360 scanning metaphor we adopted an A/B study where users are tested with two kinds of prototypes and then results are compared. The A model uses the conventional map-guided navigation approach and in the B model a 360º Landscape navigation model approach is utilised.

The study consists mainly in a field study where users are invited to explore the story content that surrounds them through one of the two different navigations models, each user only use one of the models so the results won't be influenced. Users are asked to find at least three stories and share one new story, being shadowed along the way. During this phase, relevant qualitative information in taken in form of observation notes. After roughly 30 minutes of observations the user is presented with a questionnaire where he/she is asked about the experience.

IV.2. STUDY PREPARATION

We prepared the evaluation by defining a protocol made of a loose script of tasks for the users to perform, observations that had to be taken by the researcher, and final survey for the participants to fill out. In order to start testing our protocol we first needed to first introduce some initial content in the system, in the form of short stories or anecdotes. Such story content had to be created and collected and positioned in the respective GPS location. In order to populate the application with content, fifteen stories had been created, some containing real facts and others more fictionalised.

After having manufacture the content content, we proceeded with the pilot test with the tree participants. The pilot test took place in the Penteada University Campus where participants here were asked to use the 360 Navigation model to find at least tree Breadcrumbs and read their content. Then they had to use the Breadcrumbs application to share, if they wanted, a personal story about that place. All the tree tests lasted between fifteen to twenty five minutes, varying according to the time that the participants take to perform all the steps.

In the end all participants filled a survey. This survey, which is presented in the appendix, was divided in five different questions with the intention of probing participants to express themselves about their experience exploring and unveiling the stories.

After the pilot, some minor improvements and bug fixing had to be made to the Breadcrumbs system in order to provide a fluid user experience using the application. Improvements such:

- Improve server communication.
- Improve GPS precision.
- Addiction to the interface of missing loading and uploading animations, giving feedback of hidden application activities.
- Minor bug fixes, improving system stability.

Analysing the pilot results it resulted that users performed with pleasure all the proposed tasks, so there was no need to change the main study procedures, maintaining them as they were.

IV.2.1.Participants

In order to perform the main study of the application we recruited ten users to test each navigation model type (A: with a two dimensional map and B: with the 360 degrees navigation interface), for a total of twenty participants to perform the whole study. The group was composed of users with ages ranging from eighteen to fifty years old, most of them being familiar with the location where the study was taking place, as they were student or workers from Madeira's University, around which campus the evaluation took place.

Name	Age	Nationality	Sex	Occupation	Study
User 1	23	Portuguese	Male	Student	A
User 2	25	Portuguese	Male	Student	A
User 3	22	Portuguese	Male	Student	A
User 4	21	Portuguese	Male	Student	A
User 5	25	Portuguese	Male	Student	A
User 6	27	Portuguese	Female	Student	A
User 7	23	Swedish	Male	Student	A
User 8	24	Portuguese	Female	Student	A
User 9	23	Portuguese	Male	Student	A
User 10	24	Portuguese	Male	Student	A
User 11	38	Portuguese	Female	Worker	B
User 12	22	Portuguese	Male	Student	B
User 13	23	Portuguese	Female	Student	B
User 14	25	Portuguese	Male	Student	B
User 15	26	Portuguese	Male	Worker	B
User 16	25	Portuguese	Male	Student	B
User 17	23	Portuguese	Male	Student	B
User 18	22	Portuguese	Male	Student	B
User 19	24	Portuguese	Male	Student	B
User 20	20	Portuguese	Male	Student	B

Table iv - Participants List

IV.3. FINDINGS

IV.3.1. Field Study Observations

For the study users where invited to use the Breadcrumb application to find and read at least three stories, leaving in the end, if they wanted, a new story through the Breadcrumbs application.

We shadowed each user during in field in order to observe some behaviour patterns that could indicate some serendipitous feelings (surprise, sudden fear or unexpected reactions) Taking notes of such serendipitous cues or other interesting reactions occurring during the experience.

IV.3.1.1.Map Guided Navigation Models Observations

With the classic navigation map model (A) all of the ten users easily understood the Breadcrumbs concept and the navigation paradigm. This result was somehow expected since map navigation models are the most frequently encountered in Location based services, from google maps to restaurant findings.

Figure xxiii - User using the Map Navigation Model.

During the test participants focused mostly on stories close to their geographical position. Only two out of ten participant explored the map looking for stories located in the Funchal City

downtown, even if, in the Map Navigation Model users easily could navigate through more distant stories.

Figure xxiv - User using the Map Navigation Model.

At the end of reading a story, two users felt compelled to share orally with the researcher their own experiences, related to the story and its location. One of the participants (Figure xxiv) referred to the researcher that he passed near the so called "Soul chapel", one of the stories presented, several times a week and never noticed its existence.

In the end all users were given the opportunity to create their own story content, but not all of them took up the challenge. Only 3 users out of 10 performed this task. It was noted that the users during all the Model A test procedures resist moving from their initial location. This was also true for the story creation task, since to create and share a story it was necessary to move to the place where the event happened, due to this fact few users, 3 out of 10, intended to create their own content in breadcrumbs system.

Map Guided Observations Conclusion

The lack of interest shown by users to move to a different location to find and view the stories can in a certain way compromise the user's sagacity level and in such way, diminish the ability to recognize value in the discoveries. Looking at the article "A Discussion on Serendipity in Creative Systems"[13] the ability to recognize value in the discovery is a feature of one of the serendipity levels. Users with some connection to the place or to the story, from past experiences, reflect less curiosity to move to the story place (Figure xxiii), staying basically in the study initial location.

IV.3.1.2. 360º Landscape Navigation Model Observations

Generally, from the users general comments we can deduct that Users received well and enjoyed the "Periscope Metaphor" model with the 360 degrees scanning of the surrounding landscape (model B). Compared to previous map model, users required more time to understand and familiarize themselves with the interface since it has more complex interaction paradigm and it is a less familiar interface compared to the simple map, but in the end had more fun with it.

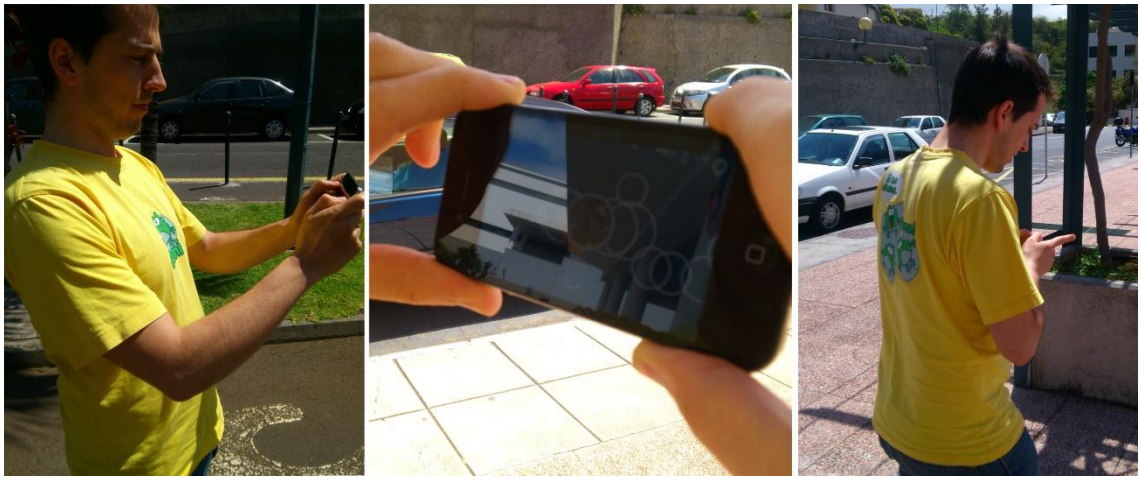

Figure xxv - User using the 360º Landscape Model

With this particular navigation model, participants are forced to move to the specific story location to be able to visualize the content, otherwise the content would not be available to them. Users then, preferred to search around the vicinity for the closest stories, preferring vicinity criteria to others, such story ranking in terms of preferences, preview image or story direction.

While walking towards the story location, participants were constantly looking to the mobile phone's screen. This kind of action does interfere with the user being able to look around and take in the environment. It can result in cognitive overload where user are constantly looking around and at the screen for directions. It is a feature that must be avoided and the interface must be improved in future versions. When reaching the story place users tried to correlate the place with the image that the interface would show them, commenting that at that moment they were expecting to read the story on the screen.

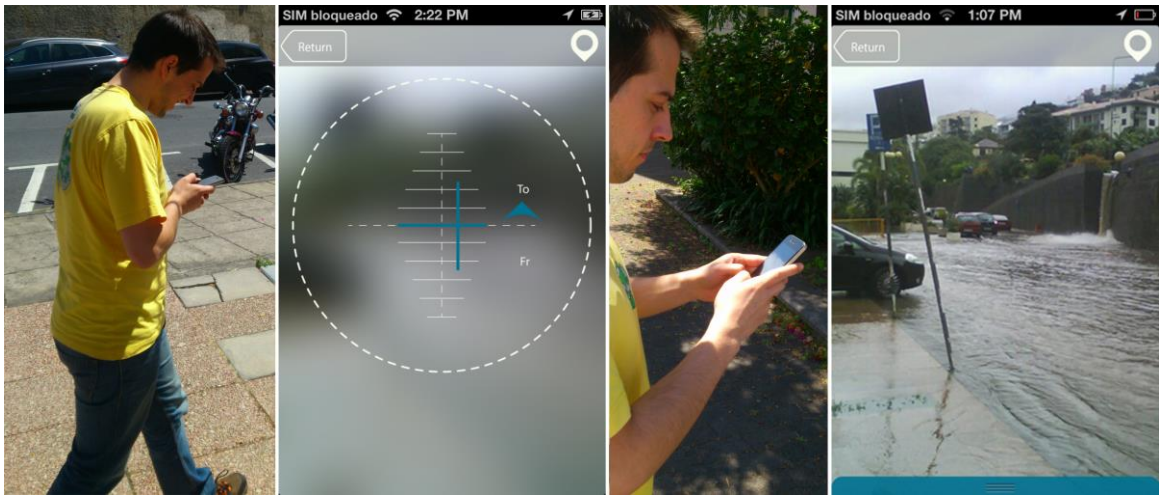

Figure xxvi - User using the 360º Landscape Model

Similarly to the previous study with the navigation model (A) not all users took up the challenge to share their own stories. Only 3 users out of 10 took up the challenge of creating their own story to post through the Breadcrumbs app.

Nevertheless, participants were more engaged during the various study stages of this navigation model (B), by exploring and experimenting more often the Breadcrumbs application functionalities.

360º Landscape Navigation Model Observations Conclusion

When users moved to the story location context in order to experience a story proved to be a story enhancer and users tried to correlate their sounding with the given story. By moving around a place to find and view stories can help users with no attachment or prior knowledge to the place to get acquainted with the context story triggering curiosity and interest to explore more, this was seen when participants shared information about the story, correlating the story to the place, and engaged to see do next one. Moving around to collect stories, offer users, unlike the map guided model, a better level of sagacity and more probability of generating serendipitous moments.

When users reached to the same place of the story, tended to guess what they will read, and what story is attached there. This creates a new level of serendipity trigger, lending to unexpected, surprising or coincidental moments their guesses are confronted with the story content.

IV.3.1.3.Field Study Conclusion

Concluding from the overall analysis of the observations, we found that both models of navigation, A and B, offer some potential to generate pleasurable experiences and foster serendipity. Still, participants using the map navigation model (A) moved much less than the other group and did not exploring their surrounding as much as the 360 navigation model. This lack of movement elicit less discovery and diminishes the pleasure gathered from finding and viewing the stories.

The map navigation model has the potential to offer users a bigger quantity of stories at once, since the stories are all displayed on the map and available for viewing at any given moment, instead of having to walk around the surrounding scanning the environment to find them. Content is easier to access, since users do not have to physically go to the location to scan and find stories about that place. Furthermore, through the A model, we noticed that users engage into a story only when they already have some knowledge about the place or somehow feel connected to the narrative due to past experiences or by knowing the user that shared the story. Users naturally explore stories of places that they know, or stories they are familiar with, instead of walking around and finding new content or new locations that they did not know of. From this point of view Model A does not foster conditions in which serendipity could usually occur.

With the 360 navigation model (B) users go through a quite different experience. They are guided to the story location and to view the stories in their place of occurrence. Compared with the map navigation model (A), model B is less powerful in relation to the number of stories accessible to the user at any given time and the ease of access to the stories, but it has the advantage of offering a richer experience by forcing the users to walk around to find the stories in this way, introducing the place into the story, and pushing the participants to discover new places and with them new story content at every step.

With the B model, participants with no pre knowledge to the physical place or context can become acquainted with it and through the potential novelties that can be encountered during the discovery of stories that serendipity is more likely to take place. In this way location-awareness have proved to be essential in creating moments of unexpected discovery with participants, and such characteristic has a big influence in providing moments capable of offering serendipity.

IV.3.2. Findings Survey Analysis

The survey administrated to the users is divided in five main questions where users report their opinion about the Breadcrumbs experience. In this chapter we present the findings gathered from the surveys analysis. Each survey questions was evaluated separately, for both the different navigation models.

IV.3.2.1. User Expectations

"What do you expect to find?" is the first question in the survey with the main intention to gather the expectations from users in relations to the story content. This question is also intended to put users in the frame of mind of the study, creating in their minds an initial idea about what they hope to find.

IV.3.2.2. Map Guided user expectation

Generally participants in the map navigation model (A) expected to find stories narrating important moments from other people's lives. These assumptions came from users reporting that they expect to find:

- "True life Stories".
- "Stories related with parties, relationships, adventures".
- "Stories of people who have had good times".
- "Stories about moments in life of person that happened in that specific location".
- "Stories about college parties"

The Map Navigation Model present thought a map all the available stories, and this was reflected in what the participant expected to find in the application. Participants, 8 out of 10, expressed to find a more widespread expectations, not so focused in the location where the study is taking place.

Participants also revealed to expect not only personal stories, but also historical information:

- "Historical and personal stories, something that no one ever heard about that particular place".
- "Historical knowledge".

IV.3.2.3. 360º Landscape Navigation Model User Expectations

User in this navigation mode were expecting more stories related to the space where they were situated. Quoting some users:

- "*Stories about people around me, in this case the university*"
- "*because I was finding myself in the university area, I expected to find stories that student posted*"
- *"Given the site I hope to find stories about the history of the university*"

This was expected since this navigation model has a lower story radius, as explained in the technical chapter of the 360º Landscape navigation model (VII.4.2)**.** In the majority users expected stories related to the university and their students. Especially:

- "*Stories and memories lived here in university*"
- "*Stories about college students*"
- "*Freshman reception and academic experiences*"
- "*University musical groups, freshman reception, students and workers*".

The next two users feedback expressed an more widespread expectations, no so focused in the study place:

- "*Interesting stories about many places*"
- "*Funny stories related with the place*".

IV.3.2.4. User expectation Conclusion

Analyzing both results, from the A and the B navigation model, it can be noticed that in each one of the navigation models the expectations are different. On one side we have a more open application letting users reach a bigger number of stories with an easier access. On the other side we have the landscape interface that leads users to a specific place to unveil its story, here user's expectations are more focused in the life stories about the university place (University of Madeira Penteada Campus), with expectations in college stories and freshmen stories. This differences between the navigation models reflected different types of expectation among participants.

IV.3.2.5. Users Findings result

The second question in the survey, "*Did you find value and interesting experiences?*" is intended to identify if participants found value in the experience and if they found the experience interesting or agreeable. This question, inspired by the definition of serendipity as "the gift of finding valuable or agreeable things not sought for" [12], is important to help define the users level of sagacity (ability to recognize value in the discovery) and value (if the result is happy, useful)[13].

IV.3.2.6.Map Guided user Findings Result

Participants found the overall experience interesting reminding them about passed events of their lives, as some of them said:

- "*Stories reminded me from past events on that place*".
- "*One of the stories was funny and reminded me of a similar experience that I had in that same place. It was good remembering that experience*".

Users encountered different kinds of stories as they used the application, and this variety of content is seen by users as a positive factor, making them find:

- "*About other people stories, about random stuff and knowing that at that place someone´s life or experience had shifted enough to share it with everyone*".
- "*See the difference from the stories at the exact same spot of the story in reality*".

One of the users mentioned that "*I was only expecting true life stories, I got amazed when I saw some interesting historical data*". Such comment gave us an idea about the relation between expectations and the final findings, when something unexpected is found, it can foster a more interesting and valuable experience for the users.

Not all users find value and interest in the Breadcrumbs experience, one user for example said: "*I think not, I did not explore the stories with curiosity about what had happened at the place*". It is important that users feel inclined and willing to explore and use the application and gladly receive the stories and the information they carry, in order to have a true and meaningful experiences form the stories and eventually find them interesting and valuable.

IV.3.2.7. 360º Landscape navigation model User Findings Result

Some of the answers gathered in this survey question, revealed that participants found unexpected moments and recognized value in the stories.

- "*I particularly liked the story with the Madeira flooding in February 2010, I also saw the pictures from when it happened. I never thought it was so bad*"
- "*The experience of the flood, told from the experience of someone who lost their home on February 20th*"
- "*I liked the baptism and also the story about the 20th of February, I found them quite interesting*"

Two participants also indicated that they were interested by Breadcrumbs experiences, reporting that they find "*in a certain way new and interesting experiences in different places*" being a "*free book of memories from all people that want to share their stories*".

IV.3.2.8. User finding conclusion

Results from the survey reveal that users with the both navigation models (A and B) encountered valuable and interesting experiences. Being notorious that in the 360 landscape navigation model (B) gathered more consistent results comparing to the map navigation model (A), where users reflected a more consistent qualitative data.

As seen in the in the tree serendipity levels, listed in the literature review section, is important to users recognize the stories as valuable and bee connected with them. This ability to recognize value in the discovery (Sagacity dimension) and consider it as valuable or happy, is a halfway to create serendipity moments.

IV.3.2.9. User revelation Moment

"How many surprises did you find in the experience?" Is the third question of the surveys, by this question it is intended to capture if users felt some surprising moment about their experience reading the stories.

IV.3.2.10. Map Guided User Revelation Moment

A minority of users, tree out of ten, were able to find some surprising disclosure during their story exploration. Those who encountered such type of feelings revealed different motives behind the surprise, one user revealed to have encountered moments that make him remember past experiences as this user said:

- "*One of the stories happen with me in a very similar way*".

Others have been surprised by finding who is telling the story and how the story helps the users to re live the moment in which the story was told:

- "University *College students telling their stories*"

- "*To be able to get to the image location, and see the time-lapse of it. By reading the story, you can get the feeling that the writer had at that time that the story really happened*".

A surprising moment for one of the user's occurred when he-she found at story related to the floods of the 20th of February. An example is this user that mentioned that encountered "*the account of those who suffered on February 20th, that is was very intense and was marked in the history of Portugal*", he not only revealed that the story is interesting but also mentioned to be surprised by it, even if it transmitted a sad experience is nevertheless a surprising one.

Other users revealed being surprised from the Breadcrumbs application concept:

- "*I'm surprised about this application, is interesting from the touristic level, which can evolve into a larger app and become an important*"

- "*One of the stories that I found was a first time experience of this kind of technology support. It was interesting knowing that people can write stories and share them*".

Four out of ten users admitted not finding any kind of surprising moments, but they revealed two important details about the application, facts that may in some way influence the user experience to reach serendipitous moments.

One user feedback is about the number of stories prepared to carry out this test, "*I did not find many surprises, because there wasn't enough content, but I believe with many users there will be loads of surprises and experiences to find out about*", with more content available greater the possibilities to users to find a story that they found valuable enough to them to consider surprising.

Other participant referred that he didn't find any surprises due to its initial expectations, "*I didn't find any. Since I was in the university I was expecting to find some story about something that happened in that context.*" It can be seen clearly that this participant didn't find anything different about his expectations and had difficulties to encounter surprising feelings.

IV.3.2.11. 360º Landscape Navigation Model Revelation Moment

Eight out of ten users in this navigation model (B) found surprising, coincidental, or interesting moments, as they referred:

- "*The stories about the freshman baptism, because I already have been in their place*"
- "*I saw a photograph of a defining moment for all of us*"
- *The picture with flooding was really surprising. Also, the story with freshman was interesting*

One particular user revealed that he "*found one surprise in one story. I didn't know that my friend Joana almost lost her house due to a strong storm. It was a really ugly and sad day for Joana and her family"*. Here we can notice the importance of the social component in storytelling, where users reading the story felt related not only to message but with the person who told the story. This social component introduces a new element that foster the possibilities do find surprising and potential serendipities feelings.

Other users expressed "I *tried to imagine the place presented in the image and relate the image with the story that we will read*". As mentioned in the field study, users after starting reading the story, tended to speculate about what they will read. This can give to users a suspense feeling, similar to a child opening a wrapped gift on Christmas.

Equally to the map navigating model (A) user expressed surprised and interested by the technologies presented in the 360 navigation model (B), stating:

- "*When we start to find a story, everything is burred, and then when I reach then place it showed the image of the story, and then I was like 'I wasn't expecting this'*".
- "*I think it is an app very well achieved in concept level*".
- "*The content of the stories was varied and the content being unexpected makes experience interesting".*
- *"The amount of stories and the presentation of them (near and distant)".*

From the user feedback then, it can be concluded that the way users are guided towards the stories, presenting small clues, direction, and the revelation of the blurred image (Figure xxvii), turned to be fundamental to enhance the probability to create suitable moments of serendipity.

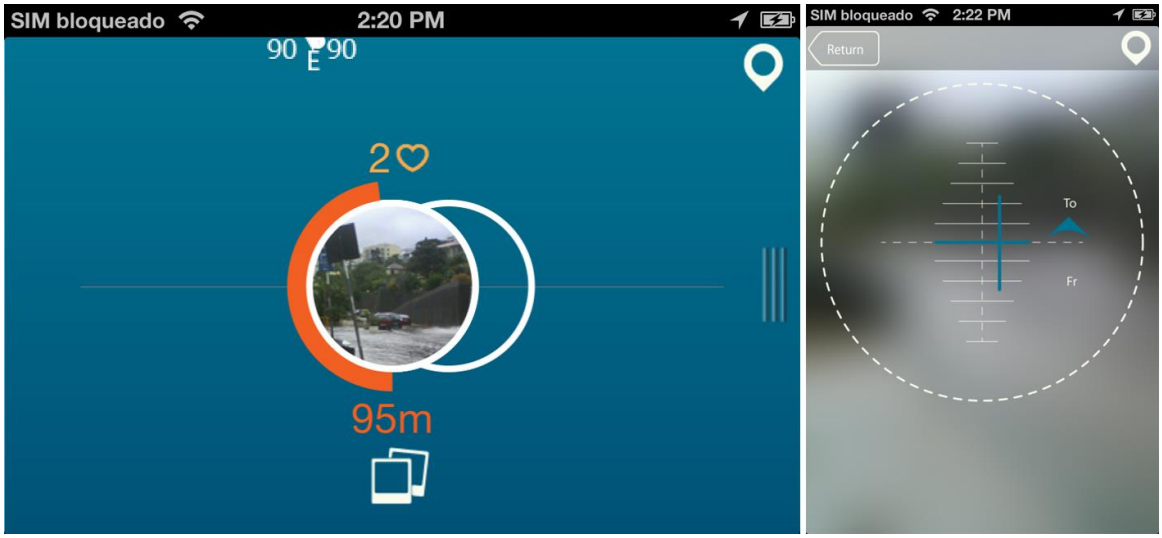

Figure xxvii - Breadcrumbs applications clues and direction example.

IV.3.2.12. Revelation Moment conclusion

Surprising moments were encountered by users in both navigation models due a variety of motives. Motives such as coincidence moments where users encountered familiar stories to some past experience and unexpected moments where users find something that they are not expecting to find.

The 360 navigation model, with clues that lead users to the story place, proved to successfully enhance the user experience while using the application, improving the chance to generate serendipitous moments among participants.

IV.3.2.13. Expectations verses Findings

The fourth question "*Did you find anything that you are not looking for?*" tent to discover if users found, during their stories exploration, unexpected moments. May seem a repeated question, related to the past ones, but we wanted to insure that users did reflect and report any event that would relate the experience with the occurrence of serendipitous moments.

IV.3.2.14. Expectation versus Findings in Map Navigation Model

Eight out of ten users said that they did encounter exactly what they were expecting. Two users on the other hand, reported the opposed, finding actually something unexpected, as they mentioned in the survey:

- *"I was looking to only find true life stories that happened to certain people, but by my amazement I found some interesting history information, things that I didn't know."*

- "*I saw that the second story indicates something historical about a chapel in Funchal*"

Some of the stories inserted in the breadcrumbs application have content related to historical events, even if the application refers to sharing personal stories, people in the same way share their historical knowledge about a specific place.

IV.3.2.15. Expectation versus Findings in 360º Navigation Model

Users initially expected stories related to the Madera's University, and when they found a story about the 20th of February that was something that they did not expect and referred to this story as an unexpected one:

- "*A story that was not directly related to the university. But about February 20th*"
- "*Yes and no, one of the I expected to be related to the university, but the other it happened in the university and in all Madeira*"
- "*The story about the flooding was a misleading bauble picture. When I reached the place I was surprised with what appeared*".

IV.3.2.16. Expectation versus Findings Conclusion

In both navigation models the majority of users reported to encounter what they initially expected to find, still some users encountered unexpected moments during their story exploration.

This unexpected moments where more evident in the 360 navigation model (B) with tree out of ten participants. This navigation model approach, with baubles presenting an image story preview (Figure xxi), revealed to be successful to create misleading expectations, enchasing the probability of unexpected moments.

This unexpected discoveries are present in several serendipity definitions and in examples given by the authors of "*A Discussion on Serendipity in Creative Systems*" [13], revealing that this variable is important to foster moments of serendipity.

IV.3.2.17. User Story Creation

User where proposed to share one of their stories in the end. The question "*Did you post a story? Explain*" intents to detect why users shared, or not, one story through the Breadcrumbs application.

IV.3.2.18. User Story Creation in the Map Navigation Model

Only three users from the ten participants using the map navigation model shared a story. The main reason, reported by users, behind why did they shared a story was mainly to experiment with the application features, as reported in the survey:

- "*I tried to post a story to experiment the app worked. But I think that I would probably share something in the future*".
- "*Yes, I wanted to post a little story about my experience and post my mark on the breadcrumbs*",
- "*Yes, I wanted to test the application and see how it worked*".

Nevertheless it was important to understand why users shared their. Pushing users to share their stories was not an easy task, most users don't remember many stories or did not have stories to share about the location when they were asked to share something:

- "*No, I did not post a story because where I was at the moment, it did not remind me of anything in particular to post.*"
- "*No, I was not in a place that wanted to publish", I didn't because I couldn't remember and the moment but I would*".

IV.3.2.19. User Story Creation in the 360 Landscape Navigation Model

User here where not only engaged in experimenting the application but really in posting some significant story to the system, justifying in the survey what type of content they shared:

- "*Yes, I did post a story about moments I spent with my friends in certain places in the university*".
- "*Yes, when I forced all freshman from engineering to "exercise" close to Tecnopolo, with a megaphone in my hand*".

- "*I have posted a story in a place that means something to me. It was in 2009, I and my colleagues from the university took a photo to remember the freshman month. All my best friends are in that photo and it was a good year*".

User that did not share any story, revealed that they were not in the right story place or did not remember any story at that moment, similarly to what was said by the users of the map navigation model.

- "*No, I don't have any story appropriate to the place where I was and did not want to move me to another point of the university*"

- "*No. It was hard to remember a good story to post on the application*".

IV.3.2.20. User Story Creation Conclusion

In each navigation model, both A and B, we have only three participants that engaged in story sharing, but the explanation of why they did it, it was different. In the map navigation model users were only experimenting the application functionalities, while, in the 360 landscape navigation model users revealed a real intention to create new content.

The experience given by the 360 landscape navigation model metaphor seems to help users to feel encouraged to share their personal stories with others. In relations to those who did not share any content the justification was similar in either navigation model, they did not remember stories, or did not have stories related to the location in question.

IV.4. STUDY CONCLUSION

Through the filed study and the user's surveys answers significant data about the user's exploration of the application were collected.

The general opinion of the users testing the Breadcrumbs was positive, in both navigation models. With both A and B models, the users received well the overall breadcrumbs concept.

This collected data proved that, during the unveiling of the stories, users connect themselves with the narratives and the places where the narrative was located, revealing sometimes having experienced similar past moments. This phenomenon occurred somehow in the bought navigation models, but the 360 interface fostered more moments of sagacity and hence hading more potential to generate serendipitous encounters and events.

Even if they study was limited to 20 participants overall, the data collected reveals that users experienced a substantial number of moments that can prove fostering of serendipitous moments through the Breadcrumbs exploration modalities. The application offered a mean, to users, to confront their expectation with the encountered stories, revealing unexpected or coincidental moments, which are essential to trigger serendipity moments.

V. CONCLUSION

V.1. PROJECT CONCLUSION

The main goal of this thesis was to investigate how local-aware mobile applications could provide serendipitous moments when used to explore places, and how that serendipity improves users experiences during their exploration.

One of the main tasks faced during the initial phases of development of the project, was to study the underlying concepts of local-awareness and context awareness coupled with storytelling and serendipity. Investigating such concepts and the state of the art of mobile applications that have been developed in this areas helped during different phases of the project, such as supporting the study and its final evaluation, as well as the implementation of the presented navigation models.

During the implementation of the Breadcrumbs application, various challengers had to be overcome - one of the biggest was the implementation of the 360 degrees landscape interface, which was needed to guide users to the correct story place and direction without overwhelming them with the simultaneous use of a map.

New personal knowledge was acquired during the implementation of the Breadcrumbs application, and synthesised in the findings and insights reported in the evaluation chapter of the thesis.

Several interesting results were collected from our study and prototype evaluation proving the potential for this kind of local-aware storytelling application to provide serendipitous moments among users. Some users, especially while utilizing the 360º landscape navigation model, encountered unexpected and coincidental moments, leading towards a better experience while unveiling stories.

We can finally conclude that the Breadcrums application, especially in its 360 degree landscape navigation mode, can be an interesting avenue to further explore in order to investigate novel way of getting acquainted with spaces and memories left but passers by and dwellers of such places. Some serendipitous event were detected among the users of the Breadcrumb. and support our initial intent to foster serendipity while exploring places.

V.2. FUTURE WORK

V.2.1.The breadcrumbs application

With the goal of improving the quality and amount of information offered to the end users, future versions of the breadcrumbs application should adopt new types of media, such as sound and video or integrate the use of simultaneous forms of media. In order to be implemented, these improvements require a reasonable number of changes to the actual state of the application, introducing several new features, such as new interfaces to support the new types of media, and implementation of ways to store them.

Creating these media types anytime and anywhere would be and advantageous improvement to boost the creation of new contents and would give users more time to create to personalize these stories. This could be done by integrating this in the same breadcrumbs application or in an independent platform prepared to support the upload of various contents.

Based on the insights gathered from the study some improvements have to be made to the applications interface, such as: improving the usability and consequently offering a better user experience when used. One example is the implementation of different ways to lead users to stories with less visually invasive techniques. This would lead the user to focus less on the application and focus more in the physical surrounding space.

The introduction of the breadcrumbs concept into indoor spaces will bring a high amount of new opportunities to explore. This would demand a complete restructure of the breadcrumbs system to make it capable of detecting the mobile phone position inside spaces that GPS technology is not able to reach.

V.2.2.Breadcrumbs as a serendipity trigger

Integrating social networks in the breadcrumbs system such as Facebook or twitter can improve the social component of the stories and increase users interest by sharing their own stories. Integrating social networks could additionally help users to find stories based on personal interest. This can be accomplished by using the network data to work as story filters, presenting more suitable stories to a specific user. It is important to remember that this social network should not be used as story data repository, risking to reveal stories outside the breadcrumbs system.

V.2.3.Future studies

Much remains to be explored relatively to the Breadcrumb applications. Long-term studies with a higher number of participants will give us a larger amount of relevant data capable to reach new boundaries in understanding the capabilities of this kind of storytelling activity to provide real and useful serendipitous moments. Different approaches of storytelling can be integrated in the breadcrumbs system, some of them described in the related work topic on this thesis, studies upon those approaches can provide different perspective how we conceive serendipity and how people respond to it.

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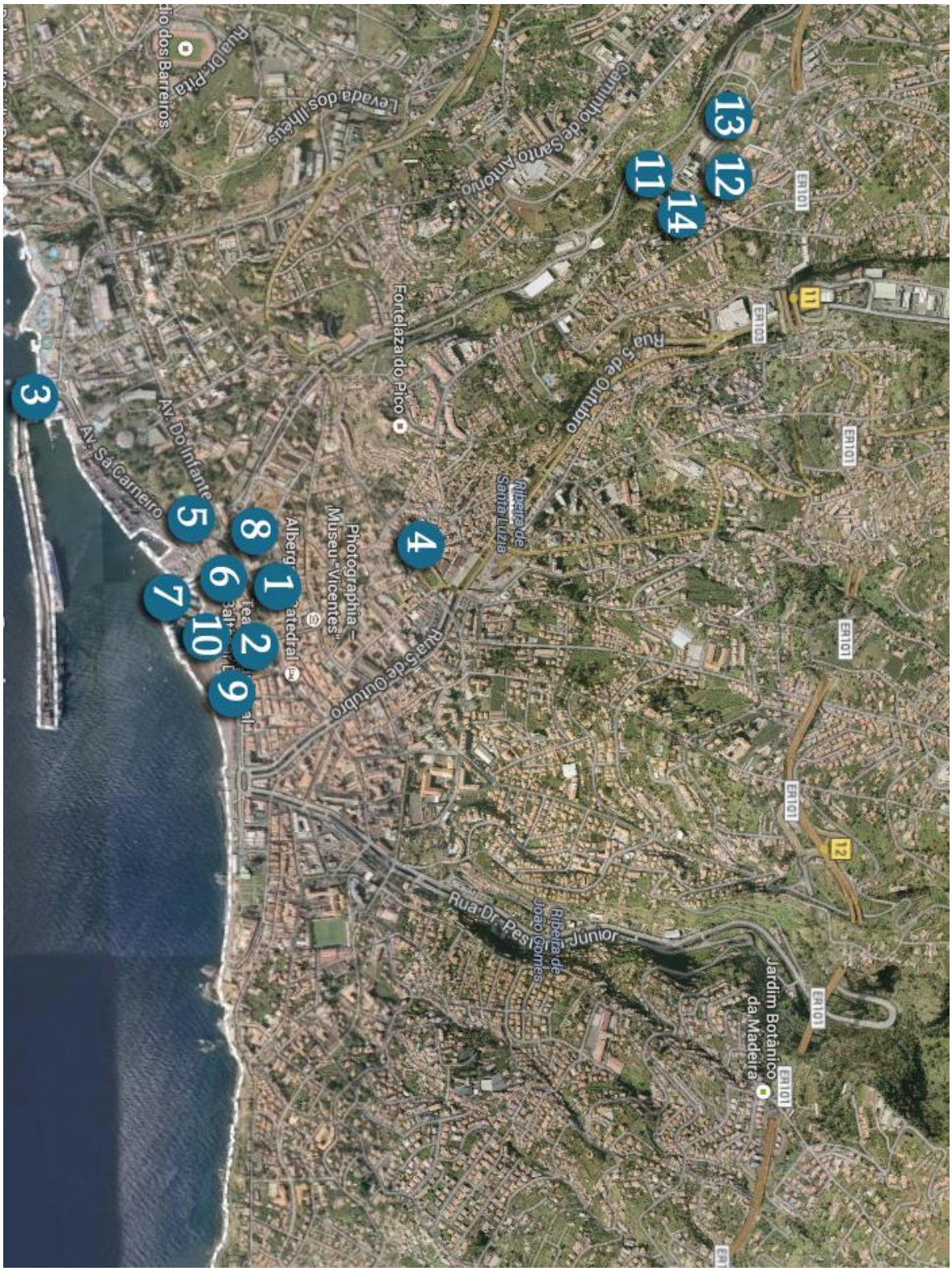
VII. ATTACHMENTS

VII.1. LIST OF STORIES



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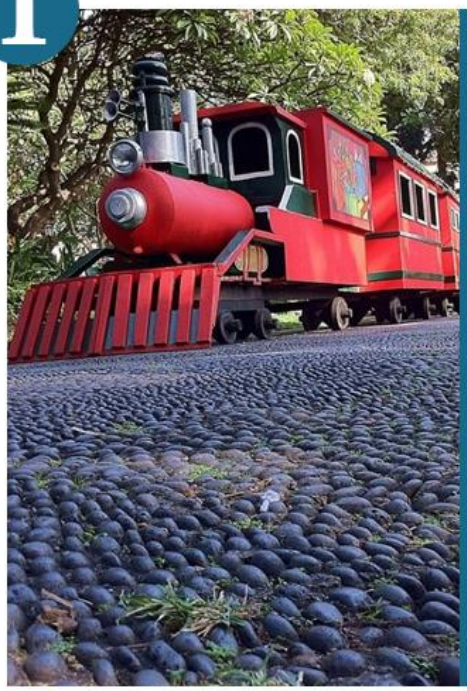


LOVE TRAIN

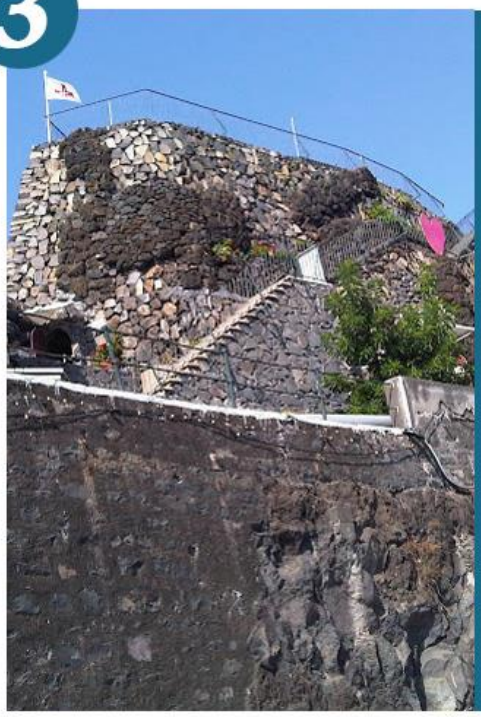
THIS IS THE PLACE THAT I STARTED MY FIRST DATING, THE STORY BEGAN ON A SATURDAY WHEN I WAS LEAVING A NIGHTCLUB WITH A FRIEND, AT LEAST AT THAT TIME. WAS 4 AM AND WE NOTICED THAT THE BUS WAS ONLY AT 9 AM. WE DECIDED TO WAIT ON THIS GARDEN AND DUE TO POOR PRECIPITATION WHICH OCCURRED AT THE TIME WE ENTER THE CHRISTMAS TRAIN. IN THE DARK INSIDE THE TRAIN BEGAN TO EMERGE THE NOVEL, WE FELL ASLEEP HOLDING EACH OTHER FOR HOURS AND HOURS,SO WE WAKE UP WHEN THE CITY WAS FULLY ACTIVE AT 11 HOURS LOLOL, THE MOST ROMANTIC DAY OF MY LIFE :).

2

JOAQUIM DA LUZ HISTORY

JOAQUIM DA LUZ IS A WELL-KNOWN PORTRAITIST OF MADEIRA. ARRIVED THERE ABOUT TWENTY YEARS TO MADEIRA, BEING A STRIKING FIGURE IN THE LANDSCAPE OF FUNCHAL, BETWEEN THE CATHEDRAL AND THE APOLLO CAFÉ. FROM ALENTEJO, BEGAN HIS CAREER AS AN ILLUSTRATOR OF BERTRAND, MAKING LATER THE STREETS HIS STUDIO, WHERE HE PAINTES AND DREW. DIED IN 2013, WITH SUDDEN DEATH.
FOR SOME TIME YOU CAN STILL SEE THEIR UTENSILS ON LEASE WHERE I WORKED, IF YOU SEE THEM SHARE A COMMENT.

3



PRINCIPALITY

THIS ISLET HAS A FUNNY STORY ABOUT IT, THE PORTUGUESE KING IN 1903 SOLD THIS SMALL ISLAND CONNECTED NOW BY THE DOCK INFRASTRUCTURE, NOW THE OWNER IS DEMANDING THE INDEPENDENCE OF THE ISLET. TURNING THE ISLET THE SMALLER PRINCIPALITY IN THE WORLD. THIS ISLAND HAD A GREAT IMPORTANCE IN THE FIFTEENTH CENTURY WITH THE EXPORT OF SUGAR, CALLED "WHITE GOLD" OF MADEIRA, AND THEN IN THE EIGHTEENTH CENTURY WITH THE WINE. SINCE FUNCHAL IS THE FIRST CITY IN THE ATLANTIC, THE ISLET IS THE FIRST ATLANTIC DOCK.

4

CHAPEL OF ALMAS POBRES

THIS CHAPEL WAS BUILT IN 1781 ON THE ORDERS OF A PERSON WHO ESCAPED AN ATTEMPTED MURDER IN THIS SITE.

5

SANTA CATARINA CHAPEL

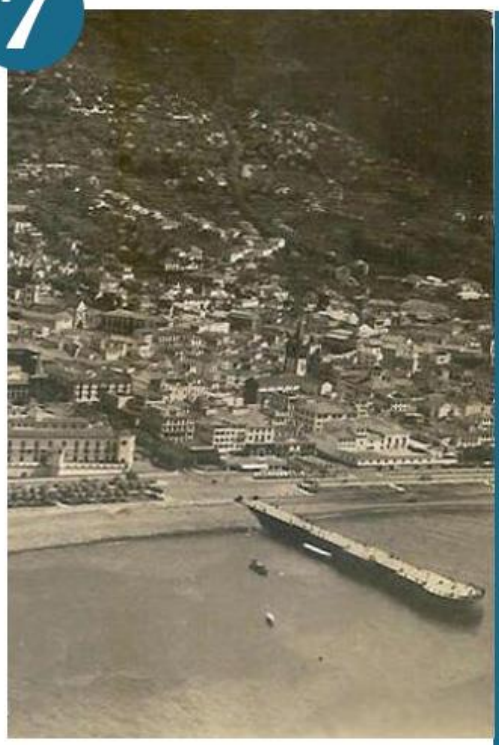
SANTA CATARINA CHAPEL WAS FOUNDED IN 1425, IN THE EARLY SETTLEMENT OF THE ISLAND, AT THE BEHEST OF D. CONSTANÇA, WIFE OF JOÃO GONÇALVES ZARCO, 1ST CAPTAIN OF FUNCHAL. THIS CHAPEL, WHICH WAS THE FIRST RELIGIOUS TEMPLE ERECTED IN MADEIRA, ONE CAN FIND PRECIOUS VESTIGES OF THE MANUELINE ARCHITECTURE, NAMELY THE CROSS OF CHRIST AND THE ASHLAR STONE HOLY WATER FONT, AND A BELL TOWER. AT THE END OF THE 17TH CENTURY, THE CHAPEL UNDERWENT THROUGH A TRANSFORMATION AND THE MANNERIST PORCH WAS INTRODUCED. LATER ON, AT THE END OF THE 18TH CENTURY, THE ALTARPIECE OF THE CHAPEL WAS BUILT IN A NEOCLASSICAL STYLE, WHEN OF THE REFURBISHMENT OF ITS INTERIOR.

6

PALACE OF S. LAWRENCE

IN 1566 IT WAS STORMED BY PIRATES, THE NORTH, WHERE THE WALL STOOD JUST 12 FEET HIGH, TAKING HOLD OF A HOUSE MONTLUC BORDER, SENT AWAY THE BUZZING CUBELO AND MOST OCCUPANTS OF THE FORT, FORCING THE STRONGHOLD DOOR. AROUND 250 INDIVIDUALS, BETWEEN SUPPORTERS AND PEOPLE WHO WERE THERE REFUGEES WERE THREATENED BY SWORD.

7



THE PIER

THE INTENTION TO BUILD A PIER, TOOK SHAPE ON APRIL 23, 1843, AN INITIATIVE OF THE MUNICIPALITY OF FUNCHAL. HOWEVER, THE WORKS WERE UNSUCCESSFUL AND BEFORE IT IS COMPLETED, THE SEA DESTROYED WHAT HAD BEEN BUILT, LEADING TO ABANDONMENT OF THE WORK. IN 1889 BEGAN THE CONSTRUCTION OF THE CURRENT PIER, DONE IN TWO PHASES. THE INAUGURATION OF THE CURRENT VERSION OF THE FUNCHAL PIER HAPPENED IN MAY 28, 1933. THE PIER PROJECT WAS PRESENTED BY THE CAPTAIN LIMA CANHA, AND THE ENGINEER JOSÉ BERNARDO DE ANDRADE LOPES MADE A FEW CHANGES. THE FIRST PHASE WAS COMMISSIONED AND BUILT BY FRENCH ENGINEERS COMBEMALE, MICHELON AND MAURIE AND FINAL EXTENSION, AS IT IS TODAY, WAS CONDUCTED BY THE COMPANY NEDERLANDSCHE MAATSCHAPPIJ VOOR HAVENWERKEN.

8

D. MÉCIA DE VASCONCELOS

THIS HOUSE IS FOREVER LINKED TO A MISFORTUNE THAT BEFELL ONE OF ITS OWNERS, D. MÉCIA DE VASCONCELOS, THE WIDOW OF MANUEL DRUMOND. THE LADY WAS AT THE WINDOW OF HER HOUSE ON 7 MARCH 1695, WHEN SHE WAS STRUCK BY SHOT FIRED BY A FRANCISCAN MONK ON THE GROUND OF THE ADJOINING CONVENT. THE FRIAR WAS TRYING TO SHOOT A KESTREL SITTING IN ONE OF THE TREES OF THE CONVENT, BUT THE SHOT HIT D. MÉCIA IN THE FOREHEAD, AND SHE DIED INSTANTLY.

9

BANGER PILLAR

FOR ABOUT 40 YEARS THE CITY OF FUNCHAL, WAS KNOWN, PICTURED, PAINTED AND DESCRIBED AS A PLACE WHERE THERE WAS A HUGE STONE COLUMN ABOUT 30 METERS AND HEIGHT AND 3 METERS IN DIAMETER, THIS COLUMN WAS CALLED BANGER PILLAR IN HONOR OF THE MAN WHO HAD IT BUILT, JOHN LIGHT BANGER, A COMERCINTE ENGLISH. THE HUGE PILLAR WAS BUILT WITH STONE TAKEN FROM THE QUARRY CAPE GIRÃO AND WAS COMPLETED IN 1798, WITH THE FIRST UTILITY TRANSPORT GOODS BETWEEN SHIPS AND LAND, USING CRANES AND PLACED IT AS A PLACE OF SENTINEL VESSELS AGAINST PIRATES AND WAS LATER USED BY BLANDY, AS POST SIGNS FOR NAVIGATION. BUT BEHOLD, IN 1939, SOMEONE HAD THE UNFORTUNATE IDEA TO DESTROY IN ORDER TO BUILD THE CURRENT AVENUE OF THE SEA.

10

UNPLEASANT POLICE STOP

GOING HOME BY MOTORBIKE AFTER A DAY OF WORK, CROSSING THIS AVENUE, A POLICEMAN ON A MOTORCYCLE THAT WAS IN FRONT OF ME TO MAKE ME SIGN TO OVERTAKE EM. IMMEDIATELY AFTER I OVERTAKE THE POLICE HE SUDDENLY SPEEDS UP AND PUTS THE BIKE IN FRONT OF ME, NEARLY CAUSING A ACCIDENT, I STOPPED SUDDENLY AND STOOD LOOKING AT HIM SPEECHLESS. HE LEFT THE BIKE AND TOLD ME THAT I HAVE THE LICENCE PLATE MISPLACED AND THAT DOES NOT SEEM TO BE ORIGINAL. YES, THE COP WAS RIGHT, BUT THE WAY HE MADE ME STOP WAS'T APPROPRIATED ENDANGERING MY LIFE, AND A ABUSE OF POWER ON HIS PART.

11

BYE UMA

CRAZYYYYYYY, TODAY IS MY LAST PARTY IN UNIVERSITY, BIG MOMENTS LIVED HERE, I WILL MISS THEM ALL... IF YOU ARE READING THIS YOU COULD BE A STUDENT FROM UMA, AND ONE DAY YOU WILL BE IN MY PLACE, FINISHING THE COURSE AND PROBABLY IF YOU'RE NOT FROM MADEIRA LIKE ME, HAVING FUN FOR THE LAST TIME WITH YOU BEST FRIEND :*(... THE LIFE IS ONLY STARTING AND I HAVE MANY THING TO DO YET, BYE UMA :).

12

MEMORIES

THE MADEIRA ISLAND AFTER FEBRUARY 20 WAS NEVER THE SAME. AT THE TIME I ALMOST LOST MY HOME, AND IT WAS AN UNFORGETTABLY SCARY NIGHT. TODAY ALMOST RELIVED ALL THESE MEMORIES, WHEN SUDDENLY WHEN I WAS IN THE CLASSROOM I WAS TOLD THAT THE UNIVERSITY WAS FLOODING DUE TO RAIN, I IMMEDIATELY RAN OUT OF THE CLASSROOM TO CALL MY PARENTS, WHO ONLY WORRIED ABOUT THEM. I REACHED THE STREET AND CAME UPON IMMENSE WATER COMING FROM THE ROAD, AND MY MOM FINALLY ANSWERED ME. IN THE END SHE TOLD ME THAT SHE WAS FINE. A HUGE RELIEF LIFTED MY CHEST BUT STILL I CRIED, MANY MEMORIES AND LOTS OF FEAR.

13

FRESHMAN ADVENTURE

HAHAHA, TODAY IS THE TRAVESTY DAY FOR FRESHMAN THAT RECENTLY JOINED THE UNIVERSITY. THIS MAKES ME REMEMBER MY FRESHMAN TIMES LOLOL, I SPENT ALL DAY DRESSED AS A WOMAN THROUGH THE CORRIDORS OF THE UNIVERSITY. AT THE END OF THE DAY WE RUN A CONTEST WITH EACH UNIVERSITY COURSE WHERE THE WOMEN DRESSED AS MEN AND MEN DRESSED AS WOMEN. AT THE TIME THAT WAS THE FIRST DAY AT UNIVERSITY. ALL STARTED ON THE FIRST DAY OF CLASS. A GROUP OF VETERANS "INVITED US" TO PARTICIPATE IN THE INTEGRATION OF FRESHMEN. SOME WOMEN'S CLOTHES SUDDENLY APPEARED FOR ME LOLOL BUT WHAT A SHAME :/ . BUT IN THE END IT WAS FUN. EVERYONE IN THE CLASS WERE DRESSED UP AND WE LAUGHED OF EACH OTHER'S LOLOL.

14

THE FINAL STEP

THANK GOD, TODAY IS THE LAST DAY FOR THE FRESHMEN'S HERE AT THE UNIVERSITY, THEY WILL BE BAPTIZED FINALIZING THE INTEGRATION WITHIN THE ACADEMY.
I''M A VETERAN NOW, AND NEVER IMAGINED IT WOULD BE SO TIRING TO CONTROL SO MANY FRESHMEN, SPENDING ALL DAY STANDING, SCREAMING AT THEM LOLOL.
TODAY I KNOW THAT IT IS MORE EXHAUSTING TO COMMAND INSTEAD OF BEING COMMANDED.
TODAY THEY MAKE THE OATH, AND WE WALK DOWN TO FUNCHAL FOR THE BAPTISM.
BELIEVE OR NOT TO MISS BEING A FRESHMAN :).

VII.2. SURVEY USED IN THE STUDY

Name:

Age:

Nationality:

Sex:

1: What do you expect to find?

2: Did you find value and interesting experiences?

3: how many surprises did you find in the experience? Explain.

4: Did you find anything that you are not looking for?

5: Did you post a story? Explain

VII.3. BREADCRUMBS POSTER