Personal souvenirs as Ambient Intelligent objects

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Abstract

Recollecting memories is an important everyday activity, which can be supported in an Ambient Intelligent environment. For optimal support cues are needed that make people reconstruct their memories. The cue category that is most suitable for an Ambient Intelligent environment concerns physical objects, more specifically souvenirs. This paper shows that personal souvenirs are suitable for usage in an Ambient Intelligent recollecting application.

1. Introduction

1.1. Tangible Ambient Intelligence

Ambient Intelligence originates from Mark Weiser's concept of Ubiquitous Computing [1], which foresees that in the future many networked devices will be integrated in the environment. The characteristics of Ambient Intelligence [2] show an increasing digitization of everyday objects, which offer the possibility to couple the physical world to the digital world. One way of integrating these physical objects into an Ambient Intelligent environment is by means of a Tangible User Interface. The term was first coined by Ishii and Ullmer and described as follows: "TUIs couple physical representations (e.g., spatially manipulable physical objects) with digital representations (e.g., graphics and audio), yielding user interfaces that are computationally mediated but not generally identifiable as 'computers' per se" [3, p. 916].
Recently an addition was proposed to the most accepted TUI framework [3]. This framework extension [4] makes a distinction between generic and personal objects as tangibles and adds personal objects. The reason for that is that several existing TUI systems could not be placed in the original framework, such as Rosebud [5], POEMs [6] and the Living Memory Box [7], because they used personal objects.

A benefit of using personal objects, as opposed to generic objects, is that in the first instance users already have mental models related to these personal objects.

Another advantage of using personal objects as a Tangible User Interface is that it can support existing media systems (such as a digital photo collection), instead of designing new physical objects and systems that have to be learned by users.
In addition these associative TUIs can support "overloading", which is the capability to have more than one link to digital media per tangible object.

1.2. Memory cuing

The field of application of the work in this paper concerns recollecting or remembering in an Ambient Intelligent environment. After studying the psychological theories on Autobiographical Memory ("memory for the events of one's life" [8, p. 217] it appeared that in order to remember, people need cues to make them reconstruct their memories. A cue could for example be a photo, sound, smell or souvenir.

Souvenirs seemed useful as physical objects providing links to digital memory cues, such as photos, sounds or videos. Therefore a study was set up to find out whether, in everyday life, souvenirs are suitable as part of a Tangible User Interface of an augmented memory system in an Ambient Intelligent environment. This study consists of two parts, a focus group and a questionnaire study. The focus group was done to inform the questionnaires.

2. Souvenir study

2.1. Souvenir definition

The word souvenir originates from Middle French from (se) souvenir (de) meaning "to remember", which again comes from the Latin word subvenire meaning "to come up, come to mind". The definition of the word souvenir differs across dictionaries, as can be seen from the following examples:

- something that serves as a reminder [9],
- something you buy, give or receive to help you remember a visit or an event [10],
- the material counterpart of travels, events, relationships and memories of all kinds [11, p. xii] and a souvenir's "function is to store or stimulate memories".

Since many definitions of the word souvenir exist and this might confuse the people who participated in the questionnaire study described later in this paper, it was decided to choose one single definition based on the results of the focus group.

2.2. Related work

The souvenir questionnaire study will focus on evaluating whether it is realistic to use souvenirs as part of a Tangible UI. First, practical questions about the everyday use of souvenirs are investigated, such as: how many souvenirs do people have in their homes, are they available for use in a TUI and do people have memory-related media-types associated with those souvenirs, such as photos, soundtracks, video recordings or perhaps even smells. According to Bationo et al. [12, 13] physical contact with objects gathered during travels (which can be souvenirs) is more important for story telling travelers than visual presentations, such as photos. This might indicate that people prefer to recollect memories by using souvenirs rather than using photos. On the other hand, a study by Sherman [14] investigating which objects were used by elderly for reminiscing, showed that the object most often mentioned (42% of the cases) as "stirring recollections" was the photograph. From these two studies, one might conclude that a combination of souvenirs and (digital) photos seems a particularly powerful combination for recollecting memories.
The second topic of interest in the context of the current study is whether souvenirs can serve as external memory (in the real world compared to inside memory, which remains in the head

of the user). If this is possible these souvenirs could help people to recall memories and support storytelling. In this way, aside from their role in a TUI, souvenirs could obtain a second function as a physical handle to digital information.
There are some indications that souvenirs might serve as external memory, the first being the definition of Hitchcock and Teague [11] saying that a souvenir's function is "to store or stimulate memories". Another strong indication comes from Stevens (personal communication) who studied how people store their memories [7] and her estimate is that 90% of the physical volume is caused by physical artefacts (e.g., souvenirs), 8% by printed photos and 2% by other media, such as video tapes. When instead of the physical volume the number of items is estimated then printed photos take up 60% of the number of memory-items, 25% are physical artefacts and 15% are other media, such as videotapes. These results show that people do associate "souvenirs" with memories (without giving the participants a definition of a souvenir), a conclusion supported by the results from a Memory Workshop [15]. Perhaps people use those souvenirs as external memory, consciously or unconsciously. Another indication comes from an interesting and large-scale study by Czickscentmihalyi and Rochberg-Halton [16] who investigated what people thought was their most cherished object in the home. The three categories of objects which were most cherished were furniture (36% of the participants mentioned at least one piece of furniture), visual art (26%) and photographs (23%). For all three categories the number one reason why these objects were most cherished was because of "memories".

Later Czickscentmihalyi and Rochberg-Halton did the opposite of giving meanings to objects, they tried to categorize the mentioned objects according to their object type. The category Memories consisted of five sub-categories, namely: memento (general memories), recollection (memories of occasions), heirloom (inherited object), souvenir (memories of a place) and "had it for a long time". Within this Memory category the most often mentioned type of object was furniture (66%), sculpture (44%) and visual art (40%). Apparently, furniture can be special to people, because of the memories associated with it and most cherished objects are cherished because of associated memories. Since this study asked participants "what is your most cherished object in the home", and the objects were later classified according to their meaning (one of them being "souvenir"), it is not known which objects would be chosen when asked directly for the "souvenir" meaning. Therefore this paper investigates what the most valuable souvenir is in the home of the participant.
To find out more about the everyday use of souvenirs, it was studied whether people's opinions vary as much as the definitions mentioned above or whether there is a straightforward and common agreement? A souvenir focus group was organized with a small group of discussants as input for developing an extensive questionnaire.

2.3. Souvenir Focus Group

A focus group study was conducted to explore the meaning and functions of souvenirs. A focus group seems particularly suitable for this purpose because it only requires a limited number of people who can discuss personal topics in an intimate and secure environment.

2.3.1. Methodology of the Souvenir Focus Group

Five highly educated people (two men and three women, with an average age of 29 years) with good communication skills, together with two facilitators, participated in the focus group, which lasted three hours. The participants each had to bring five souvenirs from home and at the start of the focus group they had to complete a questionnaire, individually, with four questions about each of these souvenirs (see [15] for the original Dutch questionnaire). This short questionnaire asked them to describe the souvenir, to explain how they got it, whether it was already a souvenir when they received it or whether it became one later and which one of those five souvenirs was most valuable to them. In addition to this questionnaire the focus group consisted of four group tasks. During those tasks all the souvenirs were placed in the middle of the table, visible and perhaps inspiring to all. The first task for the group was to come up with criteria for an object to be a souvenir, in order to have a shared definition of souvenirs in the end. The second task was to cluster the souvenirs into different types. The third task was to pick a souvenir from someone else and to try to guess what the story could be that went with that souvenir. This task was based on an assumption by Gonzalez [17], who claimed that one of the functions of a souvenir is to hint at its meaning. This would make it possible for people to identify souvenirs in other people's homes. The fourth and last task for the participants was to create a souvenir themselves that would help them to remember the "focus group" event on a future occasion. The participants could use materials, such as paperclips, wooden sticks and rubber rings, to realize the souvenir.

2.3.2. Results of the Souvenir Focus Group

The first assignment for the participants of the souvenir focus group was to bring each five souvenirs. Those souvenirs were diverse in origin, size, color, material and function (e.g., a pebble, a pipe, a medal, a video, a ring, a CD). It followed from the answers on the focus group questionnaire that all of the souvenirs were bought (57%), received (33%) or found (10%). Also the souvenirs chosen to be most valuable to the participants were selected for different reasons, namely: a painful event, the first holiday without parents, symbolizing a friendship, it is unique, or it symbolizes reaching adulthood. Most objects got the souvenir function as soon as the participants owned it, but some of them became a souvenir later, varying from one month to years later. Sometimes objects became souvenirs initiated by an event, such as finding a lost item again, experiencing a special holiday with this object or after having decided not to throw it away. (For all answers to the focus group questionnaires see [15].)

After the individual questionnaires the group tasks were carried out. The first task concerned gathering criteria for an object to be a souvenir. A total of 49 criteria were gathered, which were categorized by the two facilitators separately after the focus group session was finished. In Table 1 the resulting categories and some example criteria are listed.

Following the criteria exercise the participants had to come up with a definition of the word souvenir. But, they did not come to an agreement, since the opinions varied. Three definitions were selected as candidates by subsets of the participants:

1. A souvenir symbolizes a relation between people, moments, feelings, phases, locations or situations
2. A souvenir is something which has emotional value to you

3. A souvenir is something with which someone can consciously evoke memories.

Table 1. Categories of criteria for an object to be a souvenir, mentioned by the focus group participants

Categories		**Examples of criteria**	**Number of criteria**
Subjective characteristics		Something keeps you from throwing it away; A souvenir is fun to find/discover; A souvenir is special; What can become a souvenir is person-dependent	23
Memory function	General	A good souvenir evokes a memory	8
	Emotional	The material value is lower than the emotional value	2
	Location-based	Objects from a different country do not have to be souvenirs	1
	Time-based	Memory of a moment; memory of something that never comes back	6
	Event-based	Link to a ritual; Memory of a painful moment	2
	Social relation-ships	Symbolical of friendship; A souvenir can bring people closer	3
Objective characteristics		Typical for a certain country	4
Total number of mentioned criteria			**49**

The participants reached consensus when they had to group souvenirs into different types, see Figure 1 for the result. When asked which types of souvenirs had most memories attached to them, the answer was ”souvenirs that are not from a holiday".

The third joint task required the participants to select one of the souvenirs, which was brought by one of them. They selected the object which is shown in Figure 2. Next, the participants, excluding the souvenir owner, had to come up with the true story behind this souvenir. The owner later verified this story. It became clear that the participants did not agree on any of the aspects of the story. Some thought it came from Africa, others from Asia, some said it was from a holiday, others said it was too big and therefore it must have been a longer stay, some people thought the object was bought, others thought it was a gift. The participants clearly did not get any further than guessing and their ultimate conclusion was that it is easy to recognize a souvenir in other people’s homes, because it stands out in the interior or looks like a “standard” souvenir. But one can never guess the complete story behind the souvenir, unless the owner is a close friend or relative.

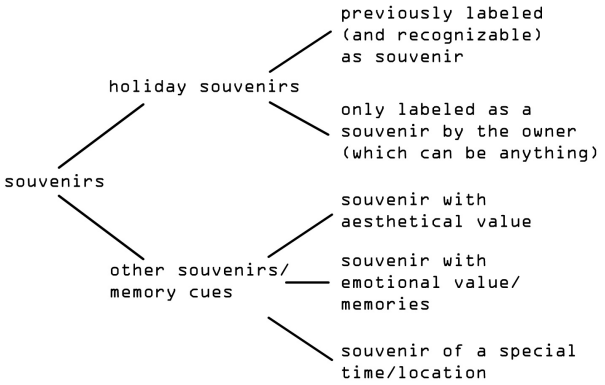

Figure 1. Grouping souvenirs into different types of souvenirs.

After this task the participants were asked whether they used souvenirs, consciously, for recollecting or remembering. Two people answered positively, one person explained that it “just happens to you” and that she did not do it consciously. The other two participants said they only sometimes used souvenirs for recall: e.g., in case the souvenir is a useful object, such as a bottle opener from Italy, they sometimes use the souvenir for opening bottles and sometimes they use it for memory recollecting when they are reminded that it came from Italy.

Another question asked was “why do you use a souvenir for recollecting”? “Because”, participants explained, “a souvenir strengthens the effect, looking at, touching or smelling the souvenir can activate all senses”.

Figure 2. A souvenir of one of the participants, the other participants had to guess the story behind it. The souvenir is a water pipe from a holiday in Tunisia, bought by the owners since they liked the smoking ritual and taste of the tobacco.

The last assignment, creating a personal souvenir of the focus group, resulted in a range of creative and diverse objects, which confirmed that the form and meaning of a souvenir reflecting the same event can be very different when created by different people.

2.3.3. Conclusions from the Souvenir Focus Group

In general, the opinions of the participants on the definition of a souvenir varied greatly. Some people thought everything (even locations) could function as a souvenir, whereas others limited it to physical objects. The following definition of souvenirs: “physical objects to which memories are attached” is part of all participants’ opinions and will therefore be used for the souvenir questionnaires. Several participants told us they used souvenirs for story telling, while others only “used” them when accidentally bumping into them. One strength of a souvenir is that the memories linked to it are hidden which gives the owner the freedom to tell different stories to different audiences. One reason for doing this is that some stories are private and others public. Overall, a souvenir was

believed to have more value when it was unique and not an object labeled to be a souvenir before the owner got it (e.g., "souvenir shops" selling miniature Eiffel Towers).

After the qualitative souvenir focus group a more quantitative questionnaire was created to address some issues that required a larger group of participants, such as "is a souvenir personal", "what do people do with a souvenir in relation to remembering" and, more practically, "how many souvenirs do people possess".

2.4. Souvenir Questionnaires

2.4.1. Methodology of the Souvenir Questionnaires

The participants for the souvenir questionnaires were recruited via e-mail and a company newsletter among technology-interested and well-educated people.

The questionnaires started with a short instruction defining a souvenir as "a physical object to which memories are attached" (see above) and continued with 23 questions (see [15] for the original Dutch questionnaire). The questions concerned the following topics: how many souvenirs do people have and where are they located in the home , what do people use their souvenirs for, can self-made objects be souvenirs and which souvenir is of most value to an individual. In the instruction it was explained that the time for completing the questionnaire was estimated to be 30 minutes and that the participants should do this at home within four weeks from the reception date.

2.4.2. Results of the Souvenir Questionnaires

30 Participants (15 men, 15 women) completed the souvenir questionnaires in the period of one month. The average age of the participants was 40 years at the time of completion, ranging from 18 to 72. The average age of the female participants was 37 and of the male participants 43 years.

The first part of the questionnaire focused on one selected souvenir, namely the one most valuable to each participant. The individual answers were diverse, e.g. a saxophone, a painting, a tropical shell and a writing desk were mentioned. From the total of 30 souvenirs, 50% was categorized as "bought on holiday", one was found during a holiday and one was received as a gift during a holiday. The 13 remaining souvenirs were gifts (7), inherited objects (5), and the last one was both a gift as well as an heirloom. This means that 57% of the most valuable souvenirs are from a holiday.

The answers to the question "why is this souvenir so valuable to you" indicate that most people value their souvenirs because of the memories attached to them (57%) (for an overview of all the answers see Table 2). 14 Participants said that their most valuable souvenir was also a souvenir to other people, 15 participants said their most valuable souvenir was only a souvenir to themselves.

Most of these valuable souvenirs can be found in people's living rooms (66%), bedrooms (7%), studies (7%), attics (7%), bathroom (3%), hallway (3%), or around the wrist of the owner (7%). 86% of the souvenirs were placed in the room in such a way that they were visible from the middle of the room, which indicates they were on display. The remaining four souvenirs were not, because two of them were stored in the attic, and the other two were in use. For example, a souvenir spoon was in use as a spoon and therefore temporarily stored in a kitchen drawer.

43% of the most valuable souvenirs have always stayed exactly in the same location in which they currently are. 32% moved around in the same room and the remaining 25% moved around the house, because they have been stored in the attic, or because they were in use.

Figure 3 shows the distribution of the years the souvenirs are in possession. The average favorite souvenir was at least 7.3 years with its current owner. (For the category ">10 years" 12 was used in the calculations, which is probably lower than the actual number.)

Table 2. Categorized answers to the question "why is this souvenir so valuable to you"

Categories	**Participants**		**Example answers**
	(%)	**(n)**	
Memories	57	17	It reminds me of a pleasant holiday
Heirloom	17	5	I inherited it from my grandmother
It was a gift	10	3	I got it for my birthday
Monetary value	10	3	It represents a reasonable value
Aesthetics	7	2	I think it is beautiful
Special event	7	2	I bought it during my honeymoon
It changes my mood	3	1	It gives me a feeling of security
Story	3	1	It links to a nice story

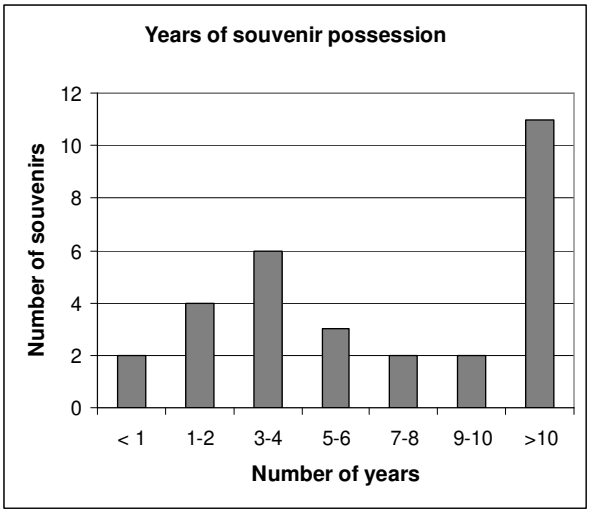

Figure 3. Histogram showing the number of years the most valuable souvenir was in the possession of its owner.

When watching their souvenirs the majority of the participants experienced immediate memories popping up (47%) or relived their memories (17%). Some participants realized how much they liked the souvenirs (20%) or started thinking about related issues (10%). Only one person did not think of anything. Of the 20 people recalling memories immediately, seven (35%) thought of a person, six of a location (30%), five of a holiday (17%), two (7%) of a special occasion (such as a birthday).

On average souvenirs have more than one function. The type of functions they have are shown in Table 3.

The previous questions dealt with the functions of souvenirs, while the remaining questions of the first part of the questionnaire ask for associated media with the participants' most valuable souvenir. From the 30 participants only eight (27%) did report they had no media related to their most valuable souvenirs. The rest reported printed photos (60%), physical objects (27%), music/sounds (10%), odors/smells (7%), digital photos (7%), video (3%) and other types, such as books, presentations and travel reports (10%). On average each souvenir has 24.3 media items related to it.

Table 3. The functions people dedicate to their most valuable souvenirs.

Functions of the most valuable souvenirs	**Participants choices**	
	(%)	**(n)**
To watch the souvenir	47	14
To use the souvenir	43	13
To make me think of specific things	13	4
To talk about related things with other people	13	4
To make me remember related things	10	3
Their monetary value	7	2
To change my mood	3	1
To make me relax	3	1
No purpose	7	2

The second part of the questionnaire investigated how the various souvenirs are distributed over different room types in the home. The living room contained most souvenirs, on average 16 per participant (see Figure 4 for the distribution over the participants), followed by the study with 13 souvenirs on average (see Figure 5 for the average percentages over all rooms). The average number of souvenirs in each of the participants' houses was 52.1. (For the category "> 50" the value 53 was used in calculations.)

Part three of the questionnaires asked general questions about souvenirs, starting with the question whether people had fixed locations for "new" souvenirs or for "less interesting" souvenirs. Both questions were answered predominantly negative (83% and 70%, respectively), although some people mention the stove/fireplace for the new and the attic as the location for the less interesting souvenirs.

23% of the participants never brought souvenirs from their holidays, the other 77% did. From the latter category two people did not bring any souvenirs from their most recent holiday this time (7%), but most people brought 1-5 souvenirs (60%), 7% brought 6-10 and only 3% (1 person) brought 11-15 souvenirs. The reasons for bringing these souvenirs from their holiday destination were diverse (see Table 4).

Despite the fact that most people brought souvenirs from their most recent holiday they did not throw away any in the past year (63% of the people). 17% of the participants threw away one to three souvenirs and another 10% four to 6. Only 10% of the people said to have done so over 15 times the past year.

Another topic asked for in the souvenir questionnaires was whether owners of souvenirs talk about their own and other people's souvenirs. The answer was that the majority did (57%), some people only talked about souvenirs with close friends (13%) and roughly one-third never talked about souvenirs.

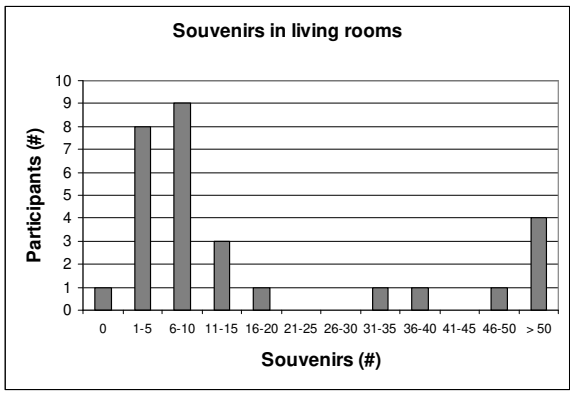

Figure 4. The number of souvenirs the participants have in their living room.

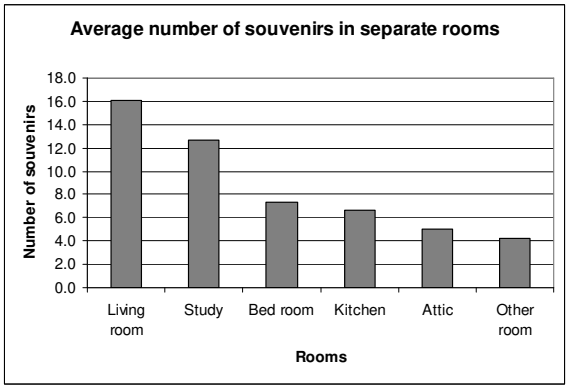

Figure 5. The average number of souvenirs in each room of the homes of the participants.

Table 4. Reasons why people bring souvenirs from a holiday.

Reason	**Participants agreeing**	
	(%)	(n)
As a memory of the holiday	45	13
The souvenirs are beautiful	34	10
I want to use the souvenirs as gifts	17	5
The souvenirs are of great value	3	1
By accident	0	0
Without reason	0	0
Different reasons	10 (7% were gifts, 3% was for a collection)	3

3. Conclusions

On average each participant had over 50 souvenirs in his/her home. Most of them could be found in the living room and the study. About a quarter of the participants never brought souvenirs from their holidays, but the majority did and most of that majority did not throw away any souvenirs during the last year. From the most recent holiday about half of the souvenirs was brought primarily as a memory of the holiday.

Participants were asked to name their most valuable souvenirs and only half of them were from a holiday, other categories were heirlooms and presents. These most valuable souvenirs are mainly used for watching them and using them but some

people use them for thinking about, talking about or recalling related things. But when they are asked to watch their most valuable souvenirs the first things that they experience are memories popping up in almost half of the cases, some people realized how much they liked the souvenir and others answered they relived memories.

Assuming that an Augmented Memory System (AMS) will mainly be used in the living room means that an average of 16 souvenirs is nearby. In the majority of cases one of those souvenirs is the most valuable souvenir (two-thirds of the people keep it in the living room), with which three-quarters of the participants have other media-type associations, on average 24 per souvenir.

Since 45% of the most recent holiday souvenirs are brought as a memory of the holiday, there is a relatively large collection of objects that could be used in combination with an AMS. This collection consists of three souvenir categories: holiday souvenirs, heirlooms and gifts. All three categories made the participants recollect memories when they looked at their most valuable souvenirs, meaning they serve as external memory for those people.

Neisser [18] describes a study on external memory aids used by students. They were asked what aids they used to remember future or past events and one of the results was that students do not know which types of external memory they use, unless they are explicitly mentioned, such as "do you use diaries for remembering". This result is consistent with results found in the investigation presented in this paper, because the souvenir-questionnaire participants did not mention remembering as a function of their souvenirs. But apparently they did use their souvenirs as external memory, because when they were asked what happened when they looked at their most-cherished souvenirs half of the participants mentioned that memories popped up or were relived.

4. Subsequent work

On the basis of the results of the above-mentioned study it appeared that personal souvenirs are suitable as Ambient Intelligent objects in an augmented memory system and therefore it was decided to design and build an Ambient Intelligent augmented memory system. Everyday souvenirs formed, together with a touchscreen device, a Tangible User Interface which could be used as memory cues and as physical shortcuts to subsets of digital photos in the Digital Photo Browser. (For more details on this demonstrator see [15, 19]).

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