

RUNNING HEAD: TERRA INCOGNITA 4 – THE EUROPEAN ADVENTURE

Terra Incognita 4-The European Adventure: a collaborative, affective-aware, SMS and web-based learning system

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Abstract

In this paper we present a hybrid SMS and web-based game-like learning system. We designed and practically proofed the SMS and web-based four tier system. Our main goal was to provide a community information service that implies the ability to work with PCs and mobile phones, proactive attitude in searching for information, knowledge acquisition and sharing about the European Union, in a pleasant learning environment. The three-month project hosted around 2000 gamers that had a minimum 10 days virtual journey in the European cities. The results are good and are detailed in the article. Almost all participants that responded to the questionnaire are willing to continue to play a similar kind of game.

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Introduction

In our scenario the user is represented by an alter-ego (gnome) that is wandering in a virtual space. The user receives from his avatar a description followed by a question adequate to its location. The next location can be automated or requested at free will (teleporting). A smiley face that changes according to the user's carefulness towards his avatar represents the gnome's mood.

The problems

The general problem that we have tried to solve was: "How can we develop an community information service that implies the ability to work with PCs and mobile phones, proactive attitude in searching for information, knowledge acquisition and sharing about the European Union, in a pleasant learning environment?"

More specific we had:

- A. A didactic problem "How to design a web-based and mobile accessible learning platform to motivate young people learn about European Union? "
- B. A technical problem "How to design a computational and communication system that manages information and questions on European cities and the answers from a big number of users using web-based and mobile interfaces."

The collaborative, affective-aware, SMS and web-based learning system

The learning environment design

First of all we developed a database content for 73 cities from 29 countries: the 25 members of the U.E., and Romania, Bulgaria, Turkey și Croatia (candidate states). Initially there

have been developed 1200 subjects from different domains and then some other were added by the „Gnome’s Word” feature. In the initial set the European Union (institutions, politics, funds programs, symbols etc.) information had a 30% representation. The rest of the content items promoted the European space life style, culture and values, cultural diversity and local traditions of the European people. The domains of interest where:

Economics/Politics (Public politics/Work opportunities)

Travels (How to get there/Lounge/Food)

Lifestyle (Fashion/Lifestyle/Clubs)

Music (Pop/Rock/Electronic/Classic)

Nature (Ecology/Trekking)

Education (Educational System/Study Opportunities/Voluntaries Opportunities)

Civilisation (History/Culture/Traditions)

Digital Culture (Information Technology/Communication/Events)

Arts (Plastic Arts/Spectacles)

Sports (Teams/Events)

Mix (others).

The second concern was to develop a strategy to increase the targeted group of young people ranging from 15 to 30 years old the motivation to learn about the E.U. Some important feature where designed to fulfil this scope:

- The game-like design of the platform stimulating the competition between individuals and teams;
- Chatting with other players and gamers’ discussion forum to improve the communication between the participants;

- Avatars affective states were displayed and modified according to use carefulness in a range of 10 degrees from unhappy to extreme happiness, based on the persona effect (Lester, Converse, Kahler, Barlow, Stone, Bhogal (1997)) (see figure 1);

Figure 1

- Teleporting - the player's possibility to "move" the avatar to a new location besides the ones that were automatically generated;
- Advice – the possibility of the players to ask for advice or to give advice to those soliciting it.
- "Gnome's Word"- a superior module which allowed the players to propose their own subjects, to add information and questions to the already existing database, after being authorized, checked and completed by the administrator

The technical architecture

We proposed a 4-tier architecture where the components are: the graphical user interface, the database, the game engine and the short messages server.

The graphical interface was designed in Macromedia Flash [] like a game gear console (see figure 2) with a picture of the actual location of the avatar and main features interfaces.

Figure2

The database used a MySQL database (22 tables) linked to Flash by AmfPHP. Because the web-based interface had a different location than the SMS-server a second database had to be used on the second one, with a reduces number of tables (5 tables). The two databases were synchronized by a Java application once in 60 seconds.

The game essentially consisted of a player participating at a repetitive cycle of questions and answers. So, the game engine worked as follows:

In each cycle the player's avatar would report from a given location and ask the player a question at the end of its report. The question would have to be answered by the player (a correct answer would add a certain number of points - the player's score), and then the avatar would go idle and wait for deployment into another location. There were two possibilities to trigger this deployment: either by "Teleporting" the avatar (sort of chasing him around the cities of Europe) or by waiting till the avatar would get the desire to move by itself.

If the player did not answer the question the avatar would move to another location by itself after a certain time.

Whenever an avatar reached a new location by "Teleporting" the question posed to the player would be a "regular question" worth 2 points plus 50 teleport bonuses. Teleport bonuses were limited to 200. Each time an avatar reached a new location by itself the location would be considered a key location and the question would be worth 50 points. A player would play the game until its avatar reached 30 key locations.

Example 1: A lazy player would just leave his avatar travel around by itself and receive the key questions by e-mail or SMS without ever logging in to the game interface. Should he answer these questions or should he just ignore it, the avatar would get on with its journey, though less and less happy. Interaction with its owner and correct answers would make the avatar happier again. If his happiness decreased under a certain limit, the avatar would send complaint SMS-es to its owner saying "I feel ignored... please give me more attention." If the player did not react, the avatar would leave the player saying: "You ditched me, I ditch you".

Example 2: An active player would play the game mostly through the game interface offering more interaction possibilities with other avatars/players (e.g. high scores/news, chat,

forum). A typical active player would teleport its avatar to new locations, answer to the non-key questions then let the avatar rest so it will travel on its own again after a certain time.

In designing the SMS server (see figure 3) we evaluated:

1. The minimum time duration for one short message management (received or sent)
2. The number of mobile devices needed to work in parallel.

Figure3

For the minimum time duration when a SMS is sent we experimentally estimated a maximum of 20 seconds. Different values were obtained varying according to connection method (serial or USB port, data cable or Bluetooth) or connectivity settings values (bitrate). Even if some better time duration were obtained when using a higher bitrate (i.e. 921600 kbps) due to phone management software problems experienced later we chose to use the 9600 kbps bitrate as the time advantage could be of only 15%. Regarding the connection method the data cable seemed to be less time consuming (15% gain), cheaper and safer than Bluetooth. The IrDA method was not suitable as the mobile to PC link could be broken due to misalignment or short time maintenance of the IR beam in the mobile phone.

In order to compute the number of mobile devices needed to work in parallel we know that:

- The total number of messages for the whole period was: 270 000
- One mobile phone can manage more than 3 messages in one minute, that is 180 SMS per hour and 2160 in the minimum 12 hours of activity of a day
- The needed mean number of messages per day was $270\,000 / 45 = 6000$. Supposing that in the peak period we can reach an increase with 25% of the total number of

messages per day (7500) we calculated the number of mobile phones as:

$7500/2160=3.472$ that can be approximated to 4.

Results

A. Learning system

The interactive campaign took place between 18 April and 5 July 2006 (78 days), more than previously intended (45 days). As general results we mention:

- Number of users: 1811
- Number of teams: 221
- Number of players in a team: 2.8
- Total number of subjects per visited destinations: 235469
- The mean number of subjects per player: 130 (5 times more than the initial number of subjects)
- Correct answers: 149900, representing 64% from all the answers, to each question not answered correctly the good answer has been given
- The mean number of advices given/received by the player: 5,5
- Advice correctness: 82%
- The number of site visits: 43874
- Unique visitors (by IP address): 28492
- The number of visits exceeding one hour: 9596

The features in the learning platform had the following results:

- *Chatting* with other players and gamers' discussion forum helped players develop a strong community. While discussions were always centered on the game features, the

- full range of human relationships developed on the forum and kept the players emotionally involved. Thus players would watch each other's evolutions, argued about correct/incorrect answers, cheat possibilities and so on. The human dimension attained by human-human interaction on the game forum proved to be much deeper than relationships between gamers and avatars. Although estimated to be of heavy use, the chat engine did not stir relevant interest.
- *Helping each other* - If one player did not know the answer to a question posed by its avatar he could ask for help. Then all the gamer community would see his avatar in trouble and advise him to take this or that option. Advising an avatar in trouble would bring credibility points to the advisor. Increased credibility would contribute to the avatar's happiness. Players advised would see the credibility rate of their ad
 - *Teaching the avatar* - Another game module available to those who played the game online rather than by mobile phones was the "Teach" module. Players could teach their avatars new things about European cities. The new information would enter the general knowledge pool, enriching the content base the players would browse during the game. If an avatar stumbled across a piece of information its master submitted, it would by default know the correct answer, get all the bonus points at stake and go on with its trajectory.

One interesting observation regards cheating or finding backdoors. Several players found a method to get extra points: they would create multiple accounts, and use these as "slaves" i.e. keep asking for help on their behalf then answering the questions with the "master of slaves" avatar. 3 weeks into the game it was necessary to revise the helping/hinting algorithm and to forbid players to give subsequent advices to the same small number of avatars.

When the participants finished the game they were asked to fulfil an exit poll. A number of 78 persons responded. The following resumes their opinions:

- I have learned new things about the European Union – 62% of the responders answer with „much” and „very much”
- I have learned new things about the European countries – 77% of them say with „much” and „very much”
- The relevance of the locations for the European cultural space – 75% answer with „much” and „very much”
- I liked to play „Aventura Europeană” („The European Adventure”) – 81% of the exit poll participants say „much” and „very much”
- The experience of the virtual exploration was useful for me – in 75% they say „much” and „very much”
- I have improved my technological abilities – 27% answered with „much” and „very much”.

The features of the platform have been also object of the questionnaire. The results may be seen in the following table:

Table 1

We may observe the impressive impact of “Teleporting” compared to other features like, for example, “Playing by SMS”. We think this happened especially because many of the gamers were very passionate in getting as much points as possible and less on the social, cultural mobile access aspects of the learning platform.

B. Technical results

The system's most important issue that we had to solve in the test period was that from time to time, without any obvious reason, the mobile phones crashed one at a time. A mobile phones web-based monitoring system had to be set-up in order to guarantee that the messages will be delivered, even if will some delay.

In the last days of the game as the number of users decreased we decremented the number of messages interrogations from the PC to phone per minute. As a result, the number of crashes decreased significantly. We concluded that an adaptive system that estimates the right value for the number interrogations per minute could be desirable for a future implementation.

Related work

This learning platform integrates well-known e-learning features as forum and chats and is a web-based game like learning system. Some new feature are integrated like the playing by SMS, the avatar' affective state display, teleporting and "Gnome's Word" even if these are not new on their one.

There are some other SMS-based learning systems like the one presented by Stone (2004) where blended learning is used. The general disadvantages of SMS as described by Shudong and Higgins (2005), that are: the low number of characters (160 in a message), the difficulties in inputting by pressing the tiny keys are solved here as the answer consists in just one letter answer and the cost of the message has a normal tax.

The affective state of the avatar uses the persona effect discovered by Lester, Converse, Kahler, Barlow, Stone and Bhogal and is similar to the Tamagotchi handheld digital pet (www.tamagotchi.com). The only affective state is happiness ranging from low to high intensity (see figure1, where each column from the first 4 columns illustrate the extreme happiness of the same avatar, and the last 4 columns are the opposite- absence of that state).

Acknowledgements

The project “Terra Incognita 4. Aventura Europeana” was co-funded by the European Union through the Phare Program, Europa Fund and the interactive campaign took place from April to July 2006, Grant EUR 2004 – 08 / 108924, budget line 22.02 06 00.

We thank to sponsors, media partners and all people involved in the project, to those who answered the exit poll and to the players.

Conclusions

We designed, developed and tested a web-based and SMS-accessible learning platform that stimulates involvement and encourage competition and proactive learning by using different features. In terms of mobile access we will redesign it such to allow providing links in the short message text and even to receive multimedia messages (MMS), XHTML based interface for mobile internet browsers for supporting the proactive features like teleporting and “Gnome’s Word” use from the mobile devices, too.

References

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Table 1

The learning platform features evaluation in the exit poll

| Feature's usefulness | Very little | Little | Moderate | Much | Very much |
|-------------------------|-------------|--------|----------|------|-----------|
| Gnome's affective state | 19% | 9% | 17% | 31% | 24% |
| Playing by SMS | 18% | 24% | 15% | 26% | 17% |
| Teleporting | 3% | 1% | 6% | 23% | 67% |
| Gnome's Word | 13% | 8% | 22% | 31% | 26% |
| Advices | 12% | 12% | 14% | 31% | 31% |
| Forum | 12% | 18% | 27% | 28% | 15% |
| Chat | 26% | 22% | 22% | 18% | 10% |
| Group | 31% | 13% | 28% | 14% | 14% |

Figure Captions

Figure 1. Four different avatar faces displaying happiness degree (high on the four left columns and low on the right four columns)

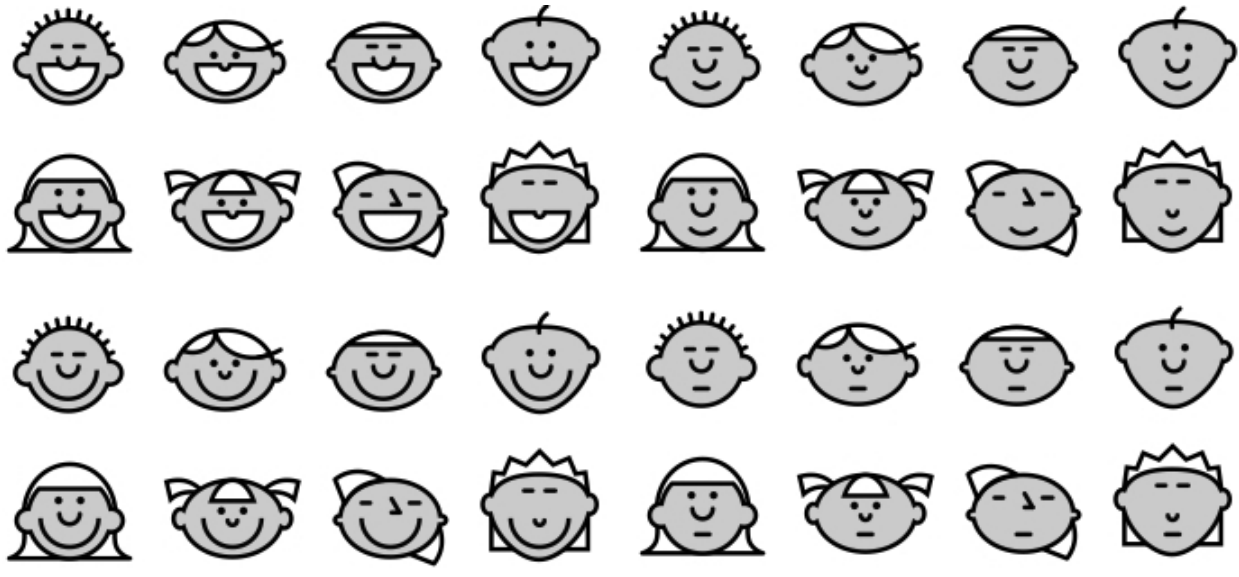


Figure 2. The player's graphical interface

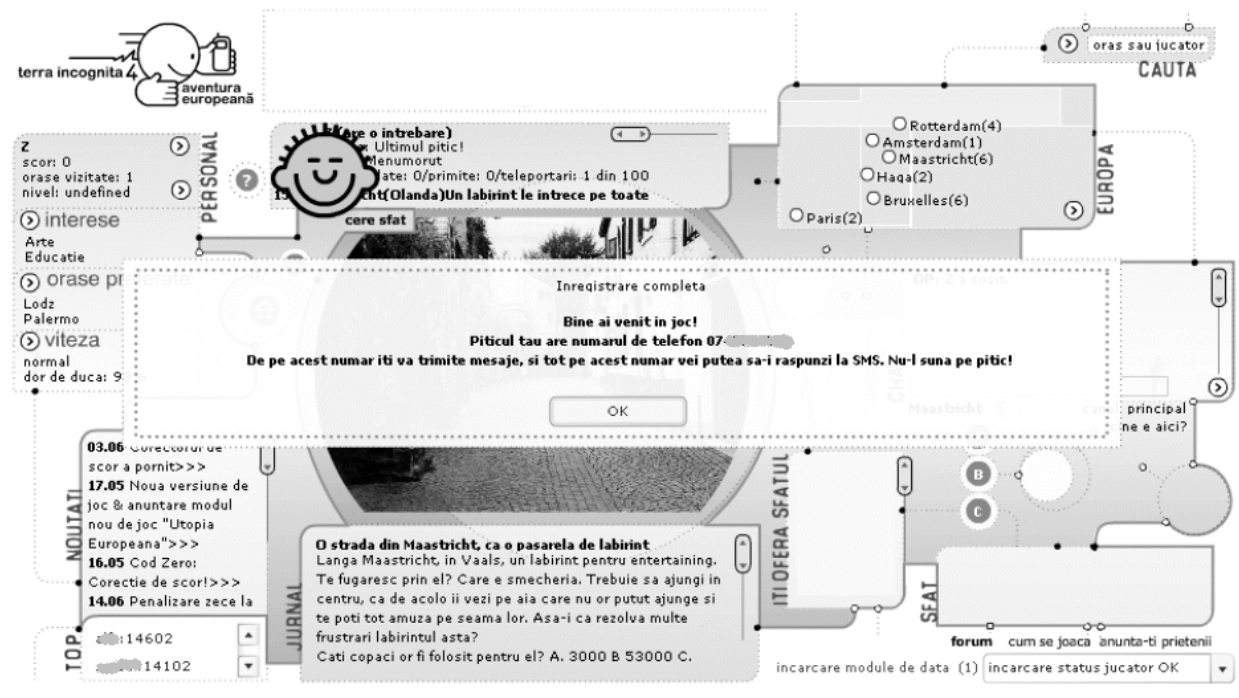


Figure 3. The mobile phones connected by data cable to the server computer

