

Personalised training tool using Virtual Reality

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1 Introduction

A few, largely preventable, risk factors account for most of the world's disease burden. These are high cholesterol, high blood pressure, obesity, smoking and alcohol. Chronic diseases are the major cause of death and disability worldwide, and increasingly affect people from countries all over the world [1]. Guidelines on diet, physical activity and health serve two important purposes: to guide policy makers and to educate consumers, healthy or ill, about healthy lifestyles. In order to motivate and create adherence to prevention programmes it is highly recommended to stress the importance of lifestyle-health relationship. And it is also essential to analyse how to formulate these programmes and what information they should convey. The strategies drafted by the international institutions competent in the matter stress the importance to increase the overall awareness and understanding of the influences of diet and physical activity on health and of the positive impact of preventive interventions.

The work presented in this paper contributes partially to solve this situation by using one of the most effective strategies: the prevention, through the procedure of education. A tool based on virtual 3D technologies for the Internet [2], using X3D, a powerful and extensible open file format standard for 3D visual effects, has been developed creating an e-learning system, that includes interactive and immersion advantages, key for the success of these systems.

2 Materials and methods

The main advantage of the tool developed is the delivering of personalised information in an environment adapted to the user. This personalisation is performed by taking into account the user's needs, preferences and motivation. To do so, a structured questionnaire about nutritional, statistical, physical activity and motivational data was developed with the help of professionals. The questionnaire is presented in different parts, grouped into: registration, statistical, nutritional and physical exercise and, finally, motivation. After choosing the identification data, statistical, nutritional and physical exercise forms are prompted. Finally, motivational data are requested. All applicable questions need to be answered. After the data are collected, the user profile is stored in the database. Each group of questions has a specific objective: the statistical questions classify the users by age, gender, health status, ICT knowledge or profession. Nutritional questions enquire if the users are vegetarian or if it is common that they often eat out in order to allow, for instance, the creation of customised diets. Motivational questions are related to the importance the users give to their self-care through the lifestyle adopted up to the moment or the intentions to incorporate healthier attitudes in the future. The goal of these ques-

tions is to place the user into a motivation status according to the “Stages of Change” methodology [3] which sets the characteristics of each state and the motivational techniques to be used for citizens positioned in each of them. To carry out the personalisation we selected a number of dimensions that affect the lifestyle of individuals. From a significant number they were reduced down to: age, illness, motivation and self-efficacy. According to these factors, we analysed which of them affected the information provided (i.e. tone, format and content). Afterwards, the data "in the user profile" is matched against these factors and the information is presented accordingly. This was decided with the help of specialists. The following stage is to categorise users into different training groups so that training is provided in a structured and personalised manner. To summarise, the following characteristics are considered:

- type of actor: Healthcare professional, ICT system administrator, patient, Healthy Citizens /support groups, etc
- skills: knowledge on ICT, knowledge on health and education
- consumers attitude and motivation: using ICT devices and caring about their health
- social background: age, cultural background and accessibility to ICT and education

In Figure 1, each circle represents one of these features. Being “inside” a circle means having that feature and on the other hand, being “outside” represents a lack of that ability. Each intersection has its own features and lacks so it shows specific needs in order to train and motivate the users. By placing users in the zones (A, B, C, etc) we classify them into training groups. Table 1 describes the characteristics of the different training groups.

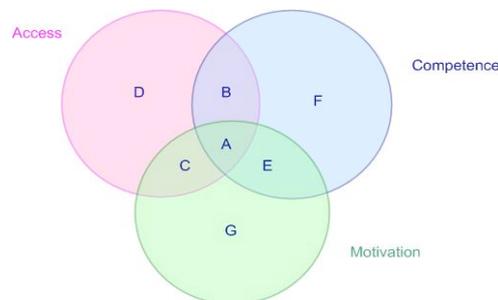


Fig.1. Training features: classification of users Based on the methodology developed for the e-User project [4]

After identifying the characteristics of the training group, we matched the groups against the dimensions explained previously: type of actor, skills, motivation and social background in order to develop a truly personalised training tool. Besides, a lot of effort was put into analysing the expected training outcomes. Before the beginning of the session a survey is handed out in order to know:

- Statistical details: age, gender, disabilities
- Education and ICT education: fields of study, degrees earned, computer literacy
- Cultural background: language, place of origin, traditions, sensitive subjects
- Employment background: experience, time in current job, relationships with other participants
- Motivation: attitudes towards self care, the use of new technologies, status of health, etc

- Expectations: reasons for attending the course, expected results.

TYPE	DESCRIPTION
A	User of platform: the target to achieve in this case is to maintain the user in the current situation (access, competences and motivation on ICT and health).
B	Lack of motivation on health but access and competence given, most likely from user experience at work or from basic education. Good competence in ICT. Focus should be given to make aware of self-care benefits.
C	Access and motivation on health given, but lack of competence. Traditional target for ICT training measures, high probability of success of such measures.
D	Only access given, but neither competence nor motivation on health. Severe barriers exist before online services will be used. Likely to apply for many older persons who live in households together with their children who provide the access.
E	Only access is missing. The bottleneck here is infrastructural equipment, which may need to be provided by the state as in the case of free public Internet access points. Also applies to many disabled who need special devices and services to access mainstream computer applications. The use of mobile (easy-to-use) equipment could be an approach here.
F	Only competence given, most likely from basic education. Motivation on the self-care process benefits is likely to be the bottleneck here.
G	Only motivation on health exists. Applies for parts of the poor population who show a strong commitment to society, but lack the means to gain competence and access to the Net. ICT training and mobile equipment could be a solution here.

Table.1. Training group characteristics

Furthermore, three different levels are then taken into account to perform the personalisation:

- The content of the information provided is adapted to the users' needs
- The environment is personalised according to the user preferences
- The tone in which the information is presented, that depends strongly on the user's state of motivation.

In this sense, only relevant information in the appropriate mode (direct, indirect, soft, etc.) is delivered to the user through a scenario accordingly personalised (avatar, colours, links, etc.). This personalization is performed by applying several rules, which allow the system to infer the content, the environment and the tone to be applied to each instance of the different profiles.

The tool is integrated in an e-learning environment which is interactive and immersive. X3D allows the description of a virtual world in XML format by means of predefined tags. The scenarios are virtual worlds that simulate a real daily world. A training activity in the system consists of an Internet multimedia session that shows personalised information by means of an attractive visual interface.

3. Results

In addition, the tool implemented has been developed to present the following features:

- To be visual and interactive
- To be integrated in an e-learning system

- To offer personalised information in form and content

A training activity consists of an Internet multimedia session that shows personalised information by means of an attractive visual interface.

The personalisation of the scenarios involves, presenting different information (links, articles, recipes, sport videos, etc.) to each user profile. In order to perform the personalisation, the system accesses the database and extracts the model files stored. Adapting the information includes not only the content but also the form (i.e. tone in which it is presented). This depends strongly on the user motivation state [12] to follow advice and to adopt changes to a healthier lifestyle, identified in the profiling stage.

The tool has been tested with a number of users to check whether the tool and the information provided suited the users' needs. A survey was handed out for completion after the first training session in order to measure their satisfaction with the system. The survey is structured in different parts, related to the adaptability of the contents, the appropriateness of the relation between the scenarios and the information showed in each of them, the choice of Virtual Reality as the interface and the usability of the global tool. Statistical data were also collected, such as the age, the profession or the computer knowledge level.

The sample was formed by 52 citizens and covered people from a large range of ages (18, >60) and different occupations (medical, technical and other). The results of the survey indicate that 72% agree with the high potential of e-learning systems. This percentage is similar for every age range. However, Virtual Reality is valued quite negatively among people over 46 (35%) opposed to the students and technical professionals (70%). The usability of the tool is ranked positively (75%), although it is stated that users would like to see a more dynamic application. Furthermore, 80% of the users state that the relation between the scenarios developed and the information provided in each of them was tailored to their needs and the contents were marked as a good educational tool to adopt a healthy lifestyle. Figure 2 shows the system appearance.

4. Discussion

4.1 Quality healthcare information

It has been long argued that the Internet can potentially support consistent and effective health promotion and disease prevention strategies to both the health care provider and the patient [6]. The existence of easily accessible clinical and patient information resources provided by the use of these tools will likely change, the traditional clinician-patient relationship as both parties use information resources to educate and inform themselves and each other about diagnosis therapy, and prognosis [7].

Moreover, reasons for the growth of the consumer's online health information-seeking include the development of participative consumer-oriented healthcare models, the growth of health information that makes any one clinician incapable of keeping pace, cost-containment effort that reduce clinicians' time with patients and raise concern about access to "best" care, emphasis on self-care and prevention, and ageing population with increased healthcare needs, and increased approaches to health care [8].

Furthermore, concerns about the quality of healthcare information found on the web led to the focus of one "Healthy People 2010's" health communication objective, "quality of Internet health information sources", as public health officials recognise that "the potential for harm from inaccurate information is significant" [10]. Quality of health information found on the Internet should be subjected to the same standards as traditional information, including source and message characteristics, as well as adaptability to targeted

audiences. Therefore, personalised healthcare information, continuous patient supervision by medical doctors and certificated healthcare information is fundamental to promote and effectively enhance the patient's healthcare process.

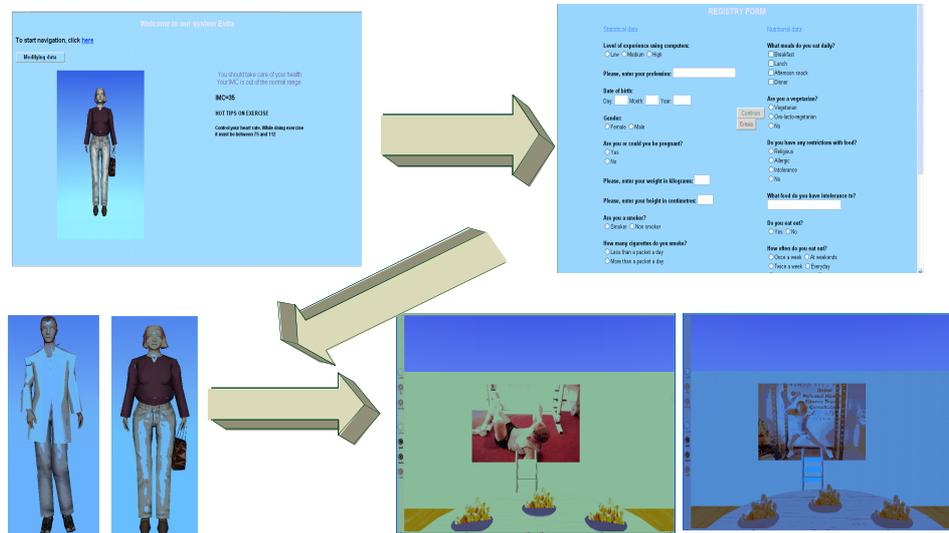


Fig 2. The system appearance.

4.2 Personalisation and motivation to achieve results

Healthcare professionals stress the importance of motivation and determination in order to stick to a plan to lead a healthy lifestyle. There are numerous studies that analyse the motivation to lead a certain conduct or treatment and analyse the change of behaviour depending on the individual's attitudes: the basis is the Self-Determination theory [9, 11]. As results depend on the motivation of the individual (UCLA Center for Human Nutrition, 1996) [12], one of the goals of our tool is to provide information that motivates the users and takes them through the different stages of motivation described in the model called "Stages of Change".

The new healthcare delivery process models tend to be citizen/patient centred, that are respectful of the individual preferences, needs and values and place information and training at the heart of the healthcare delivery strategies [12]. People should have better access to trusted sources for the information they need, tailored to their individual requirements.

To conclude, the tool developed provides certified information and achieves personalisation by considering different dimensions of people's lifestyle and filtering the information according to:

- Who the user is: a Healthcare professional, a Citizen, etc.
- What the user needs: different information or services the user may need
- Where the user is: considering different scenarios, including "on the move"
- How the user needs the service: considering different type of devices

Moreover, we believe that the tool developed provides an enhanced mechanism to train the user in the management of personalised information to promote a healthier lifestyle. Although human interaction should not be avoided [13], the support of an Internet tool is

key to access information personalised, certified and motivates the user [14]. In conclusion, the tool developed is a significant improvement to empower citizens to evolve in the self-care process providing them more control over their own lives.

5. Conclusions

An interactive and visual tool has been developed and integrated in an e-learning system that offers personalised information about healthy lifestyles. We consider that this is a very interesting research line due to the increase of e-learning systems and the importance of having access to quality information related to health. Joining both in the same system provides citizens with a way to obtain information to be responsible for their own health. Moreover, the implemented tool adds a motivational feature with the aim of making users feel taking control of their own self-care.

Our intention is to focus on a more dynamic tool, so that the promotion for adherence to therapies and compliance matches the dynamic lifestyle of the users. Besides, we feel that a new dimension should be included: the idea of “self-confidence” or “self-efficacy”. Our research will go in this direction.

Acknowledgements

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