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Fire Prevention in i-Hospitals 2.0

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Active risk management starts before a crisis occurs. In spite of precautions, fire accidents occur often in hospitals. Even large-scale operation of rescue teams cannot always save lives. Preventive fire protection is a matter of importance to avoid fire accidents, especially in big public buildings. Instruction in fire protection is regulated by law and aimed of preventing casualties and damages of assets. In reality, such instructions are not always feasible due to many reasons, such as shift-working, manpower - shortage, and so on. One means to solve this problem is the integration of learning from simulations about fire protection. The project described below is carried out in cooperation with partners from hospitals and the fire brigade.

The Concept

Fire protection is a duty: The law obliges employers to instruct employees about safety, health protection and fire protection in the workplace. In reality, such instruction takes place either once a year or not at all because of lack of control. The implementation is accordingly more or less effective. Instructions in fire protection, which are normally conducted by a qualified fire safety engineer in front of the employees, is very similar to a teacher-centred lecture.

One of the main problems in such a procedure is that not all employees can take part in every instruction. The reason for that can be illness or shift-working. Therefore, not all the employees are sufficiently well-trained to handle the cases of emergency.

In order to solve this problem, we generated learning simulations, which deal with the core subject - preventive fire protection.

In order to make the training more interesting and easy-to-understand, a story was developed in cooperation with experts from the fire brigade and nursing staff. The story presents a typical situation of daily life in a hospital. In the story, a birthday is celebrated in a patient's room. Due to an open flame, a fire breaks out and catches the interior furnishing of the room very quickly. The fire is noticed and the nursing staff demonstrate a suitable handling of the situation. This was compiled in cooperation with nursing experts and fire protection experts.

A Real Virtual Hospital

Modern learning methodologies and case studies point out that it is very important for e-learners to be trained in a familiar environment. In this case, it means that hospital employees must be provided e-learning instructions in an environment which represents their own hospital, instead of a fictional one.



Figure 1. Comparison of the original and virtual hospitals

A realistic model was created in a close cooperation with the "Diakoniekliniken Kassel". As the first step, a 3D-model based on 2D architecture plans from the building was generated. With help and support of the Diakoniekliniken, important areas such as patient rooms, operating rooms, and intensive care units were added into the 3D hospital-model. After this, more details – such as diagnostic equipment, interior fittings and furnishings were added to make the model complete.

All interior settings must be integrated in order to make it possible to develop a realistic 3D-model. For this purpose the architecture plan was combined with the 3D model. Then it was possible to integrate equipment of the 3D-models at the right position in a patient room, intensive care unit or operating room.

Within this 3D model, there are various possibilities for different actions in separate perspectives. For example, one can look into a hospital floor from a bird's eye view and see the reaction of people by an emergency.

The actors in the story are virtual persons. As a representative of a real person, a virtual person, however, has to be provided with a real person's properties, for example to move, to speak or act.

Virtual persons can be varied in body size, features, appearance and voice. Different populations as well as special virtual persons can be generated. Besides, movements can be connected with the virtual persons, which means that it is possible to create animation. In addition, the movements are saved in a database and can be recorded individually through special Motion-Capturing processes. Special movements, such as the operation of a fire drencher, are also presentable. What is more, virtual persons also have a voice output. The voice output in this context means not only the animation of the face, but also the output of the voice through an audio system and/or the output in a speech bubble. The words to be spoken can be provided by means of a text.

The first virtual persons based on anthropometric data were created. They present a cross section of the entire population. These virtual persons correspond to exact measurements, such as body height, length of legs, length of the arms, perimeter of the head or belly etc.

Further more, doctors, nurses and firefighters were already modelled for the project. Their clothes correspond to the original uniform of the hospital, or of the German fire brigade.

The Course

The first step for a better understanding of fire prevention is an e-learning platform: 'Fire prevention for employees in public buildings'.

To improve the knowledge transfer process, we set up an e-learning course which deals with special subjects with respect to emergency management. Videos of emergency management scenarios, produced in a virtual reality environment, improve the visualisation and comprehensibility of the knowledge acquired. Through such visualisation, the quality of the instruction is increased, leading to a better awareness of the seriousness of a fire emergency. Users of this course, in turn, obtain precise instructions and can better handle the cases of a fire emergency or disaster.



Figure 2. Screenshot from the e-learning course: 'Fire prevention for employees in public buildings'

The course is developed with an open source e-learning software, moodle. Moodle permits the handling of a numerous variety of applications and hundreds of users/employees. It contains many activity- modules (such as forums, wikis, databases and so on), not only to establish collaborative learning-communities in diverse learning-subjects, but also to evaluate the learning effect through homework or tests.

With such tests, it is possible to instruct all employees in the subject of fire protection and certify them after successful completion of the course. In this way, one can have a cost-efficient- training module for employees.

The Course in Future

One of our goals is to develop a serious game about fire prevention, in order to increase the efficiency of learning. A serious game may be a simulation which has the appearance and feel of a game, but consists of non-game events like fire prevention. The advantage of a serious game is that the users do not learn only from interactive course materials, but learn by practising in a virtual 'save' environment. Therefore, we will integrate our 3Dmodels into a game environment called Delta3D.

Conclusion

Through the above e-learning course, it is possible to instruct the employees of public buildings in preventive fire protection. Fire does not spare anyone, and each and every employee can take part in such a course to get a better understanding and more knowledge about preventive actions against fire.

E-learning does not depend on time and place. Every employee can learn anywhere at a time of his or her choosing.

Until now, fire prevention courses give learners a task – such as to extinguish a fire in a patient room or call the fire brigade. We are working on a more complicated game.

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