



# Master's degree thesis

**INF950**

**Use of 3D Modeling in the Design of Emergency  
Evacuation Plans**

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Number of pages included the first page: 61

Molde, May 25, 2009



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**Title:** Use of 3D Modeling in the Design of Emergency Evacuation Plans

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**Subject code:** INF950

**ECTS credits:** 30

**Year:** 2009

**Supervisor:** Judith Molka-Danielsen

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## Preface

This master thesis is the final part to finish my Master program in Applied Informatics at Molde University College in Norway. The thesis contributes one semester workload during the spring semester in 2009.

In general, the thesis is the opportunity to provide that phenomenon called virtual worlds with Second Life can be useful for our real world. This study was not cooperated with any company however; predicting future using this approach would be for good to all universities, companies and all humans. At the end, it is human life what is important.

During writing the master thesis I had the opportunity to discover deeply area regarding virtual worlds. Current trends show the huge potential using virtual reality simulations as training tool not just for safety procedures, but to help public safety for real-life threats as well.

I would like to dedicate a special thanks to my thesis advisor Associate Professor Judith Molka-Danielsen for everything; for her time and amazing guiding during my research, for building a model in Second Life and for her valuable feedback and help.

Molde University College, 25.05.2009

Michal Chabada

*To my loving family and beloved Susan.*

## Summary

To do research about virtual world and simulating safety procedures in Second Life was really useful and exciting experience for me. During the research I found, that there is a great potential how to benefit from increasing integrating information technology of virtual environment. This become the space for creating and simulating environment for studying, business, training, teaching seminars, meetings and conferences.

Reviewing previous research in this area, I did not find many studies using Second Life as a research tool to improve safety procedures practices. Researchers usually aimed two different approaches. Some of them were trying to create and simulate their own environment. On the other hand, others were focusing on procedures and advantages or disadvantages applying these procedures in virtual world.

I applied different approach. I did not need to make simulation environment, because there are already virtual worlds created. I choose Second Life because of its easy-to-use environment and free download. Also I do not need any other simulating software to predict human behavior. Avatars and real people behave like during the trials. I believe I have enough information regarding this topic. I searched information on the web, red some relevant newspapers and articles, but the primary data are from my research – surveys and trials made in Second Life.

Important research question is asked and answered during my research. Is this a tool to replace real evacuation trainings with virtual trainings? People who try my simulation think so. People are also able to find exit as soon as possible even if it is unknown environment for them. I measured how long it takes to find the exit in Second Life simulation of building B at Molde University College.

My findings conclude that Second Life or virtual worlds in general has that potential to replace safety procedures trainings as we know them today. People are not afraid of new technology and they had fun during this research. Respondents also liked to do simulations and trials and they are willing to have virtual trainings again.

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# **1 Introduction**

This thesis will provide reader with the phenomenon called virtual worlds and with one of the interpretation of them – Second Life and how virtual worlds could be useful for our real world. Safety procedures simulation in building B at Molde University College represents a tool to prove that virtual worlds are new information technology phenomenon to make world better and safer place to live. No other companies are presented or benefited from this thesis, however, benefits from using this approach should attract and help all humans. Enjoy the reading.

## ***1.1 Background***

### **1.1.1 Virtual worlds**

The World Wide Web was the revolution for asynchronous information delivery. Internet became a tool for world communication unlimited by distance or geography. As WWW or flat web revolutionized asynchronous information delivery, nowadays new platforms such virtual worlds have the potential to change the way of synchronous and semi-synchronous information delivery.

Virtual worlds are fantasy spaces and computer based simulations of our real world, but they can also be used to explain Internet phenomenon such as social networks, and represents some artifacts from real world such as buildings and landscapes.

There is great potential how to benefit from increasing integrating information technology in the companies or shareholders. Virtual environment can become the space for creating and simulating environment for studying, business, training, teaching seminars, meetings, conferences and some other activities conducted in this virtual environment.

Firstly, I would like to define some basic definitions and terms I will carry out during my master thesis, such as Second Life, Second Life Grid, Emergency Exit, exit route, and others.

### **1.1.2 Second Life**

Second Life (Second Life, 2008) is a 3-D virtual world created by avatars represented by real people. Second Life was founded by Linden Lab in 2003 and it has increased and grown explosively (Lab, 2008). Today is Second Life popular and used by millions of people from around the globe.

Second Life is also very attractive for business owners to use this new environment and potential to move their businesses into this virtual space. With Second Life you have your property rights to create your own world, avatar, building, etc, nevertheless, this environment has a dynamic economy too. As this economy started to grow, also it makes itself very interesting for companies and organizations to get the message of their products out here as well.

Nowadays, many companies are trying to use Second Life Grid to enhance their productivity, for example by focusing to use this environment on internal business uses such as trainings and simulations. This is a very good potential for the company to reduce its cost by substituting use of Second Life Grid for real world events and meetings. During the meeting Second Life can give the company. There is also a unique, two-way opportunity for direct contact with company's customers or audience. So far, many companies and organizations find out the advantage of this 3D interaction space to explore customer research or feedback, recruiting and interviews, and other practices. I will also take this advantage in order to focus on availability and usefulness of simulation safety procedures in Second Life.

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*Figure 1: Model of building B in Second Life*



### **1.1.3 Second Life Grid**

What is Second Life Grid? As mentioned in previous chapter, the Second Life Grid is platform which gives organization the opportunity to have a public or secure private space in this 3D virtual world of Second Life (Linden Lab Grid, 2008). There are possibilities to organize virtual meetings and classes, construct product simulations, provide employees with trainings and lots more. This environment will be also my platform for my research.

### **1.1.4 Emergency Exit**

It is necessary and important that a set of safety operating procedures is implemented for every workplace device. These procedures should be regularly updated and made available to all staff via training sessions. Every emergency exit has defined an exit route, which is a continuous and unobstructed path of exit travel from any point within a workplace to a place of safety. An exit route consists of three parts:

- Exit access – portion of an exit route that leads to an exit.
- Exit – portion of an exit route that is generally separated from other areas to provide a protected way of travel to the exit discharge.
- Exit discharge – part of the exit route that leads directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside.

(Occupational Safety and Health Administration, U.S. Department of Labor, 2003)

## **2 Frame of reference**

### ***2.1 Previous research***

In this section I talk about some articles I have found interesting for my research study during my review of previously research in this area. In general, there are many studies about how we can improve our safety procedures practices, and I have found two main approaches in this area: researchers, trying to create and simulate their own environment. Hopefully, I do not need to create new one, because I will use Second Life as my environment. Secondly, researchers were focusing on procedures and advantages or disadvantages applying these procedures in virtual world. But, none of them were using Second Life yet. Let me introduce some of the articles.

#### **2.1.1 Fire Evacuation**

Huibo Li, Wen Tang and Derek Simpson (2004) from University of Teesside investigated virtual reality simulation of crowd movements. They think about virtual worlds as “a powerful tool to assist urban planning, architectural design, and safety assessment.” They tried to describe “a behavior based simulation system for modeling movements of a high density human crowd in buildings under constrains of fire evacuation procedures.” (Li, Tang, Simpson, 2004). They did not forget about different behaviors of people when it comes to fire disasters and they included both normal behavior and behavior against the rules such as panic and some delays. They used interactive 3D virtual environment with a high visualization in real-time. For their research, they needed different age and gender groups. Their survey shows that occupants’ behaviors can be affected by both physical and psychological factors, such as smoke, the situation of the evacuation route, and the panic. Even in the same situation and the conditions, people will behave differently in terms of gender and age. This is very important information for my research and I will try to agreed or disagreed with it. They come up with the conclusion, that “designing refined rules to capture the characteristics of the people’s behavior under the real-life emergency situation requires in depth interdisciplinary study in human behaviors.”(Li, Tang, Simpson, 2004). They also discovered that there is a lack of results and informations about human behaviors from psychology in such situations as emergency disasters.

## **2.1.2 Hospital Evacuation**

Chris W. Johnson (2005) from University of Glasgow has focused his attention on the evacuation of public buildings after terrorist actions (such as the London Underground, the Madrid train bombings, etc.). Based on these consequences, some legislative changes have been made in Europe and the United States. “This legislation encourages a risk-based approach to evacuation. The development of evacuation plans and the provision of escape routes provide owners and managers with means of mitigating the risk of fire.” (Johnson, 2005, p.1) He considers preventing occupants from escaping a building. “The evacuation of the World Trade Center has shown us that the owners and managers of large public buildings must consider the possibility that some emergency exits are blocked and damaged whilst others remain open” (Johnson, 2005). There is also no possibility to use public places, which are often used as a initiation for evacuations.

For the future, there is also necessary to support decisions by evidence from previous disasters to better understand human behavior and learned from it. The lack of this knowledge can be obtained from this material. However, his paper is focusing on computer-based simulation of evacuation a large hospital, as a small part of the building structures, where live emergency exercises are too risky and expensive to demonstrate.

I have found his limitations of ‘live’ fire drills very interesting for my further research, which I would like to shortly describe. This is important point in terms of what are the advantages, disadvantages and ability to escape from large public building, such as hospital or such as building of Molde University College in my case:

### **1. Sustained Costs.**

For many employees, student or teachers, fire drills can be little more than a impertinence every month. There is nothing interesting about it, just MUST. Virtual worlds could make it more interesting.

### **2. Limited Accuracy.**

There is very difficult to simulate all potential hazards and sometimes people do not take this situation so serious, that everyone is aware of where the nearest exit is located.

### **3. Short ‘Shelf Life’.**

Buildings are changing every day; this change can affect the results of “live” simulation.

#### **4. Lack of Design Focus.**

Insight from evacuation drills is not iterative and design effects are not applied real time.

#### **5. Danger.**

There is always threat that during evacuation exercise something goes wrong, known as “workplace accidents” where several people died.

#### **6. Poor Reliability.**

Every time the exercise or research is repeated, different outcome and results are output. But there is a chance, that people performing these exercises will find their own way to complete task how to leave the building.

### **2.1.3 Evacuation Simulation in Underground**

“The correct and quick evacuation of occupants is very important for the save of lives in a public building when it is attacked by a fire” think Aizhu Ren, Chi Chen, Jianyong Shi and Liang Zou (2005) who made their virtual reality system to simulate evacuation in underground station. Reason, to simulate such as environment is simple, it is dangerous and expensive to do it in real life. Based on real life, the evacuation of the occupants can fail because of two possible reasons: “one is that the emergent evacuation is delayed due to the improper layout of the inner structure of the building; the other one is that occupants take unreasonable evacuation measures because of panic and unfamiliarity with the burning building.” (Ren, Chen, Shi, Zou, 2005) To solve first issue, the solution is to simulate emergency evacuation in fire condition during the design process of a building. For the second issue, the solution is to conduct emergency evacuation training and drilling in real building. However, as I have learned from previous articles as well, disadvantage is high cost, poor capacity and easy to cause accidents.

They focused their research on development of Virtual Reality technology to make it possible to overcome this disadvantage. In their virtual environment, the users are able to move and to explore virtual fire. They used model FDS (Fire Dynamic Simulator) for fire simulation, they simulated the flames and smoke to make this environment as real as possible. Navigation and interaction, also immersion provided by the system, there are some important issues which were included in this research and used to simulate occupant evacuation in this virtual environment.

## ***2.2 Review conclusion***

Learned from previous articles, in my thesis I use public and free to download Second Life virtual environment to train and simulate safety procedures. This is very important to the fact, that simulation is no more effected by simulating software to predict human behavior. Real people, invited to join safety procedure training at Molde University College in Second life via their avatars do reflect and behave like they are in the very same disaster situation like in real life. Not really the same situation of course, but more realistic than any other simulation algorithms. Due to this fact, I believe that my results are more valuable. This is also chance to answer important question: is this also the tool to replace real evacuation trainings with virtual trainings and therefore, there is this undiscovered place to improve safety of human beings using virtual worlds to make world safer place in general. The benefits can be discovered also in many different areas of human lives, such teaching, studying, socializing and others. However, this is not a subject of this thesis yet.

## **3 Method**

### ***3.1 Problem Discussion***

In my research, I will think about the ease-of-use between building items on the real world versus finding and building items in-world in Second Life (SL). Second Life can be used to model different situation from real life; to help public safety practice, for education purpose, for medicine purpose and other. Second life is becoming a simulation tool for mentioned situations. Why do we imagine there is such an active economic system within SL and what are its positive and negative aspects? How does 3D design help to simulate safety procedures such as emergency evacuation plans? These and other questions will be included in my Master Thesis and final statement. My master thesis covers the simulation safety procedures in real world. The 3D model is a representation of the B-building at Molde University College in Second Life. The research examines how safety procedures such as an evacuation plan can be designed and tested in a 3D virtual world.

Focusing on the mentioned research problem the following research questions should also be asked and described. How would you escape from your workplace in an emergency? How fast are you able to do it? Do you know where all the exits are in case your first choice is too crowded? Are you sure the doors will be unlocked and that the exit access, such as a hallway, will not be blocked during a fire, explosion, or other crisis? Knowing the answers to these questions could keep you safe during an emergency. What and where in your building is the exit route and how long it will take to reach the exit?

### ***3.2 Purpose***

Based on general advantages of virtual worlds, I feel that there is this potential for simulation of emergency exits; to walk a product team through a prototype to find design problems before committing to real-world construction. The employers are required to have emergency action plan and the employees are required to know this emergency action plan. If companies have 10 or fewer employees, they may communicate the plan orally. If they have more than 10 employees, however, their plan must be written, kept in the workplace, and available for employee review. For such companies, it would be big advantage to allow their employees to access the exit route in virtual world. I am also questioning that during my research, to find out how it is really working in practice.

There is an increasing trend for business and governments to use the resources to gather and collate information for their use. Research for information systems purposes is being carried out in virtual worlds for the look in open sourcing, providing tools without the need for sponsorship of corporate businesses. It provides a look into the virtual world creation and how it is able to spread itself around the Internet for different people from different countries to interact and provide information. It provides an insight how people find the information and how that information is being used by different people.

### ***3.3 Research Methodology***

To make the research effective and useful, I need to have some sources of primary and secondary data. First I tried to get as much as possible information about my topic. I searched some information on the web, newspapers and magazines, research reports, technical articles and literature with relevant information for this research. In the meantime, during the preparation of master thesis I will also use primary data from my research – surveys and trials.

#### **3.3.1 Research Design**

In my research, I use combined approach of research methods, such as Trials, Survey Research, Observational Research and Combined Methods Research. More details are available on following chapters.

##### **3.3.1.1 Archival Research**

Archival research involve the analysis of data from existing data archives, such as the review of literature, articles and previous studies, surveys and public records. These sources were my first primary analyses. They are also baseline and primary data for my research using other methods, as in combined methods research.

### **3.3.1.2 Survey research**

Survey research is in my study attitudes, beliefs, and behavior of people through questionnaires which I administer by Note cards in Second Life and by the Internet. I survey a group of people within Second Life, and also to measure their time, how fast they are in terms to reach the exit, and if they are able to do so at the first place. Second group will be a group of people, my Facebook friends, which I do not suggest that they are using Second Life so far, and I will ask them to do so. If not, I just use my survey in order to ask them about their opinion about this approach and about their experience with safety procedures. This research should also consist interviews within the college, mapping of contacts and observation of work-flow. I will get in touch with external primary data as well regarding the survey and the results based on students experience.

### **3.3.1.3 Trials Research**

Trials Research represents study that follow selected individuals forward in time from a pre-set baseline, some receiving an intervention and some not. This study will measure the effects of virtual environment and safety procedures as well as a random sample of people from Second Life who will try to reach emergency exit as soon as possible. The measurable variables are duration and distance of exit route.

### **3.3.1.4 Observational Research**

Observational research in my master thesis will be based on making movies of some of the individuals within Second Life, calls Machinima, and it will be first-hand observation of emergency procedures in progress. Based on this observation I can better understand the behavior of people during the safety procedures and how they act and behave during emergency in this simulation.



## 4 Safety Procedures

It is very important and necessary that a set of safety operating procedures is implemented for every workplace device. These procedures should be regularly updated and made available to all staff via training sessions. To make this training easier, there is a potential for virtual worlds to make that happen.

### 4.1 University's safety risk management procedures

“The University is required to provide a workplace that is, as far as practicable, free from hazards. These procedures set in place guidelines for staff, students and contractors of the University to identify, assess and control hazards at the University” (UWA, 2009). In this chapter I would like to discuss potential situations which can cause to safety risk and how to take control over them by virtual simulation.

#### 4.1.1 Definitions

<b>Hazard</b>	A source of potential harm or a situation with a potential to cause loss. It can cause loss to: <ul style="list-style-type: none"> <li>• People - Injury</li> <li>• Equipment – Breakage</li> <li>• Property - Fire</li> </ul>
<b>Hierarchy of controls</b>	The preferred list of control measures, in prioritized order that can be used to eliminate or minimize risk.
<b>Incident</b>	Unplanned event that may result in an injury to a person or damage to property
<b>Risk</b>	The likelihood of injury or illness being caused by a hazard Risk is governed by: <ul style="list-style-type: none"> <li>○ Likelihood – is the likelihood that an injury will result from the hazard occurring and affecting someone. Exposure is a component of likelihood and is a measure of the level of contact that people have with the hazard</li> <li>○ Consequence – is the potential degree of harm of the hazard</li> </ul>

*Table 1: Definitions of Safety Procedures (UWA, 2009)*

## **4.1.2 Procedures**

The following procedures are to be followed when identifying safety and health hazards, assessing their risks and implementing risk controls at the University. This procedure can be used to prevent hazards from occurring or recurring (UWA, 2009).

### **Steps**

- 1. Hazard Identification**
- 2. Risk Assessment**
- 3. Risk Control**
- 4. Ongoing Evaluation**

## **4.1.3 Hazard Identification**

There are six groups of workplace hazards:

- **physical hazards**
- **chemical hazards**
- **ergonomic hazards**
- **radiation hazards**
- **psychological hazards**
- **biological hazards**

During my research I do focus on simulation and prevention of physical and psychological hazard, such as heat, noise and stress from the emergency situation.

### **4.1.3.1 Risk Assessment**

In assessing the risks, three essential steps are taken (UWA, 2009):

1. The probability or likelihood of an incident occurring is evaluated.
2. The severity of the potential consequences is calculated or estimated.
3. Based on these two factors, the risks are assigned priority for risk control through the use of a risk rating.

Risk assessment involves examining and evaluating the likelihood and severity (or consequence) of the potential outcomes in order to prioritize risks for control.

## Consequence

What might be the consequence of a hazardous event or situation?

<b>Descriptor</b>	<b>Example Detail Description</b>
Fatality	Death
Major injury	Extensive injuries, lost time injury >5 days , permanent disability (e.g. broken bones, major strains)
Minor injury	Medical treatment required, lost time injury from 1 – 5 days (e.g. minor strains)
First aid	First aid treatment where medical treatment not required (e.g. minor cuts and burns)
Negligible	Incident does not require medical treatment, property damage may have occurred

*Table 2: Consequence of Risk Assessment (UWA, 2009)*

## Likelihood

How likely is it that a hazardous event or situation will occur?

<b>Descriptor</b>	<b>Description</b>
Very likely	It is expected to occur at some time in the near future (daily)
Likely	Will probably occur in most circumstances (weekly)
Possible	Might occur at some time (monthly)
Unlikely	Could occur at some time (six months to a year)
Highly unlikely	May occur in exceptional circumstances (five years plus)

*Table 3: Likelihood of Risk Assessment (UWA, 2009)*

## Risk Table

Calculate the degree of risk from the risk table.

Likelihood	Consequences				
	Negligible Injury	First aid Injury	Minor Injury	Major Injury	Fatality
Very likely	H	H	E	E	E
Likely	M	H	H	E	E
Possible	L	M	H	E	E
Unlikely	L	L	M	H	E
Highly unlikely	L	L	M	H	H

*Table 4: Risk Table (UWA, 2009)*

### Risk Assessment Outcome

This risk matrix comparing the criteria with control strategies to make results defined for the Risk Control. Shortcuts explained below: E: extreme risk, H: high risk, M: moderate risk, L: low risk.

#### 4.1.4 Risk Control

The risk control process starts by considering the highest ranked risks, working down to the least significant. Each risk should be examined having regard to the "hierarchy of controls". This provides a method of systematically evaluating each risk to determine, firstly, if the causal hazard can be eliminated, and otherwise, to find the most effective control method for each risk. The "Hierarchy of Controls" should be used at all times when implementing controls to eliminate the hazard or reduce the risk of a hazard causing loss at the University. (UWA, 2009)

##### 4.1.4.1 Hierarchy of controls

The hierarchy of controls is as follow (UWA, 2009):

1. **Eliminate** the hazard.
2. **Substitute** with a lesser hazard.
3. Use **engineering** controls to reduce hazard
4. **Administrative** controls such as workplace procedures.
5. Personal Protective Equipment.

To eliminate the hazard there is need to protect people and also teach them to protect

themselves. This is part for the trainings, and my research will show up the importance and simplicity in simulated environment in Second Life.

#### **4.1.4.2 Ongoing Evaluation and Simulation**

Regarding this knowledge I will try to eliminate the hazard, which is on the top of hierarchy of controls, by simulation of this procedure. This is to ensure that the process was undertaken properly and that, in hindsight, the conclusions were correct.

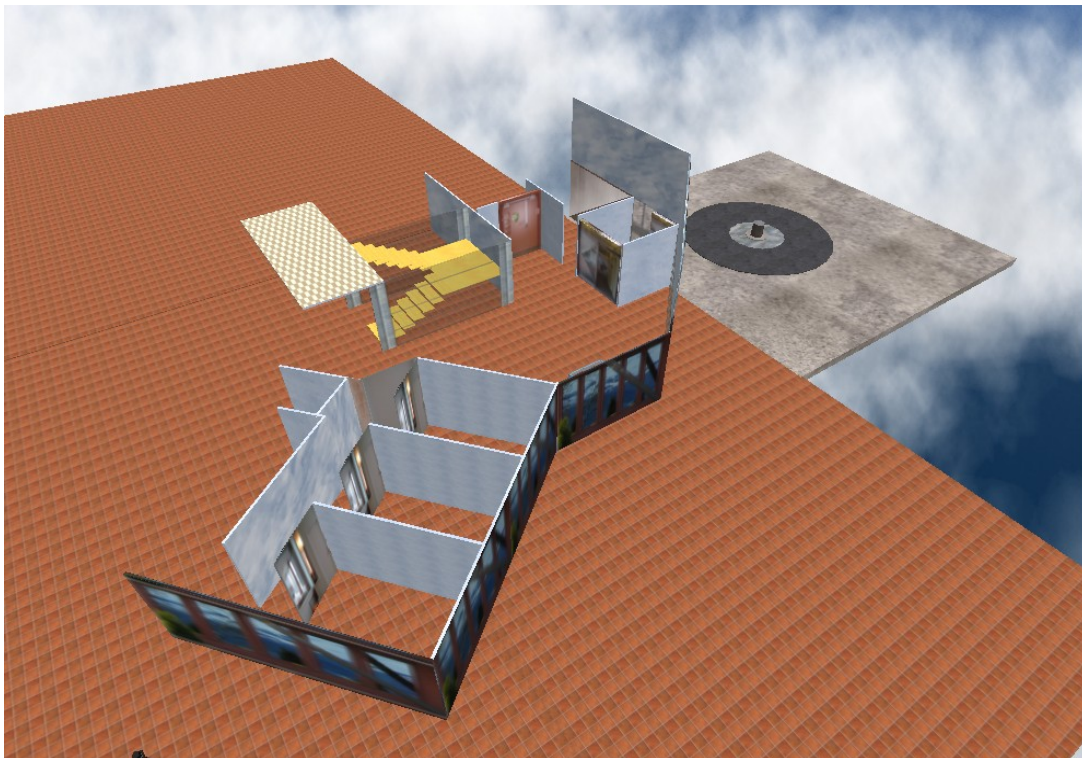
## 5 Model of Building B

My master thesis also includes the model of building B. My advisor at Molde University College is Dr. Judith Molka-Danielsen who designed the Building-B model in Second Life. To design such model you need to be aware of advanced building techniques. Building is made as a duplicate of real building B and it is made from prims and blocks. “The word prim is short for primitive and refers to the most basic building blocks for all Second Life objects” (Aimee Weber, Kimberly Rufer-Bach, and Richard Platel, 2008).



*Figure 2: Molde University College - Building B*

Building B has 3 floors and a balcony on the top. For my research, I do not need to duplicate the whole building. Model includes only ground-floor, and staircase to first floor. On the first floor it is just flame and fire simulated, therefore people will not looking for an exit there.



*Figure 3: Model of the building in progress*

## 5.1 Model and Real Building

Bellow there are two pictures to show real building with the model in Second Life. More picture available in Appendix G: Model of Building B at Molde University College with real building pictures.



*Figure 4: Building B - original picture*

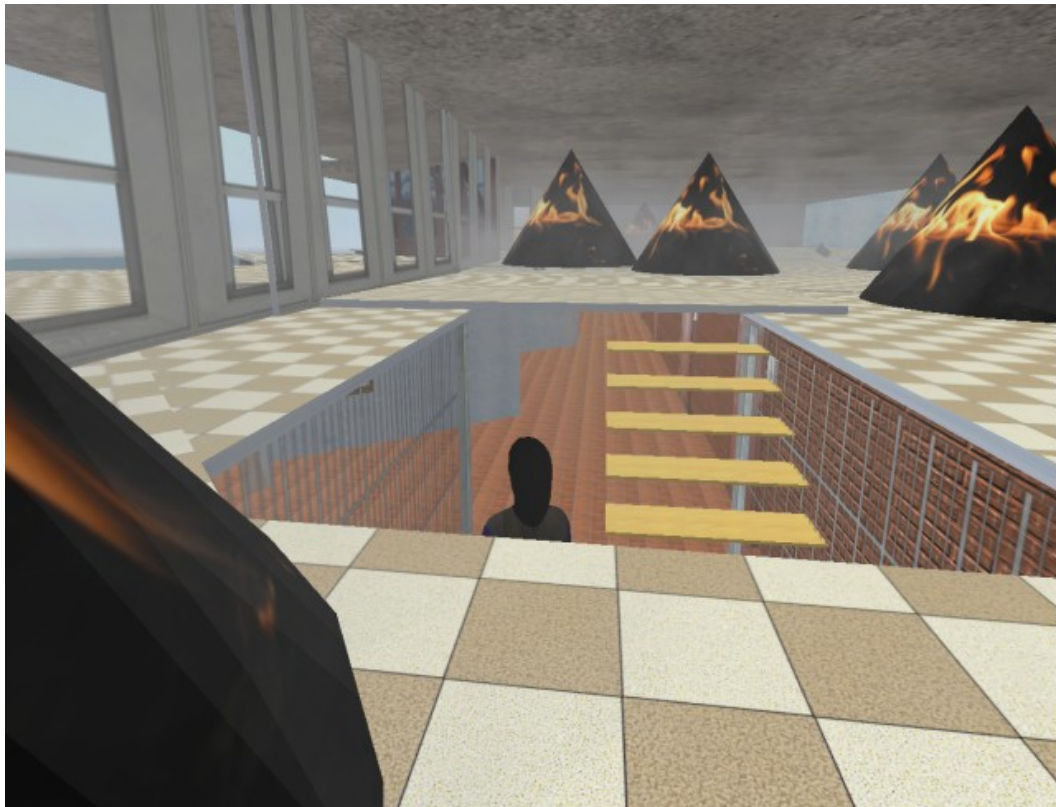


*Figure 5: Building B - Model in Second Life*

## 5.2 Fire Simulation



Simulation of fire disaster is made by flame textures, fog and sound of fire alarm. There is fire simulated on ground-floor as well in order to make simulation more realistic. So people need to run out of the building near flame and fire. Visibility is lower because of the fog on the halls.



*Figure 7: Building B - Fire and fog on the first floor*



## **6 Research**

My master thesis research is about all knowledge and information I earned during my Master Program on Applied Informatics. Not just Research methods during last semester, but also information, skills and awareness acquired through education on course Knowledge Networks and E-commerce class as well.

I want to declare that to do this research was really interesting and useful experience for me, as well as having fun during the trials. Not just for people who made the trial, but for myself as well. I have been using all available tools and resources to make this thesis valuable and important for everyone, who might be interesting in this area, or for those who are looking for right features and tools for their own research with minimum cost and time inputs and maximize outputs, production and power at the same time.

### **6.1 Research tools - Web 2.0**

Everything is on the Web. The use of World Wide Web technology and web design that aims to facilitate creativity, information sharing, and, most notably, collaboration among users. These concepts have led to the development and evolution of web-based communities and hosted services, such as social-networking sites, wikis, blogs, and folksonomies. (Search Engine Marketing, 2009). With Web 2.0 Internet is more interactive and attractive place to browse. There are social networks where you can share everything from your pictures you made at the party last night, videos, your secret thoughts, your every day life pleasures and troubles. There is also full list of tools and features for free which can be used also for educational and research purposes.

My list starts with Google. No surprise, I guess. I used Google as my search engine to look for information, articles, blogs or other posts which could help me out to get as much information as I needed for my research. Next important tool is Google Docs, which allowed me fast to create Survey forms and to put them on the Internet available for everyone. At the end of research, I can choose to view my summary with graphics or just text alone. I have my research online, surveys available for everyone, and online data updated after every response only just for me. I also find this feature important - to have a single web page easy to use and update for personal and education purposes. Free web pages are available at [www.blogspot.com](http://www.blogspot.com).

To observed videos I made, I put them on YouTube ([www.youtube.com](http://www.youtube.com)), where can be found as tag words emergency, exit route, Molde University College, and so on.

## 6.1.1 Master thesis' web page

As I already said, I made a web page for my master thesis with all relevant information. This is how I used the web page to collect data. The page presents the topic of my thesis and gives readers more information. This web page is just one way to get in touch with others.

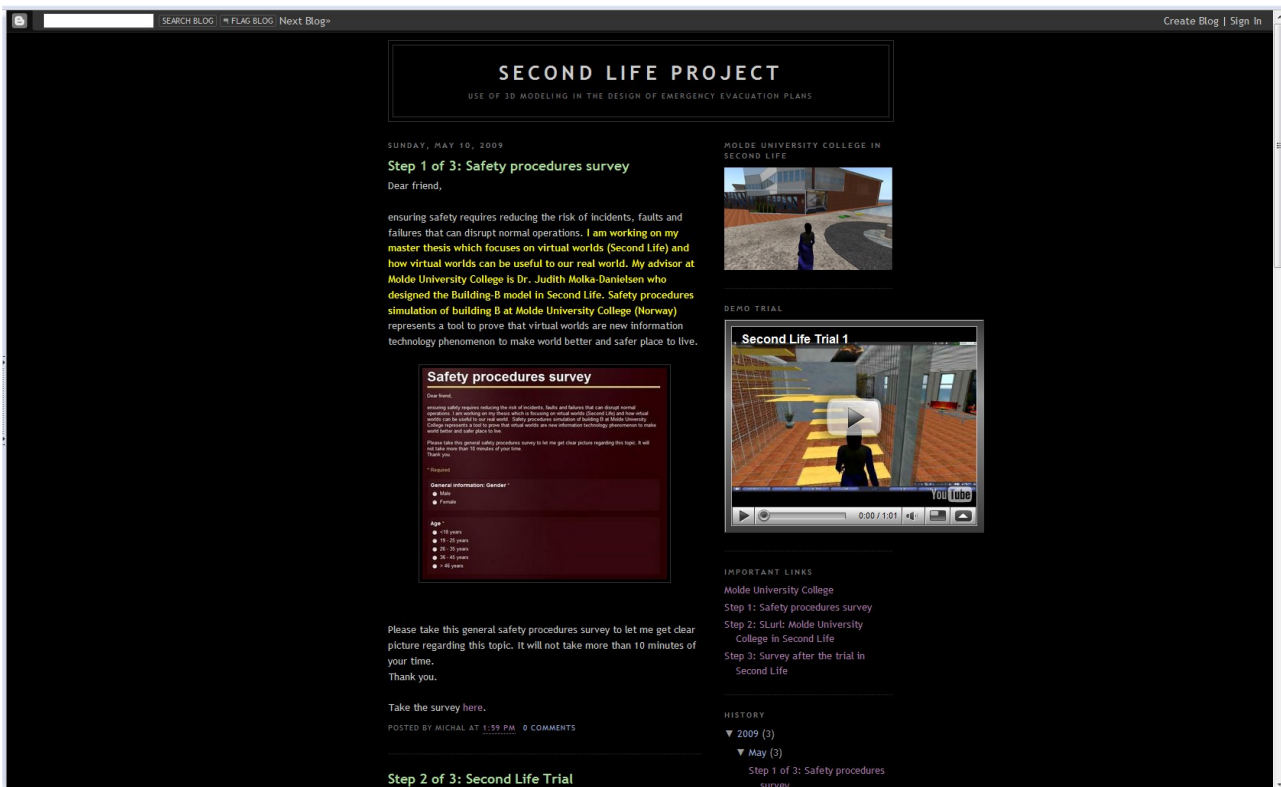


Figure 8: Master thesis web page

Web page is divided into three posts: First post informs general information about the research and my thesis and asks to fill in first survey. Next steps is trial within Second Life, included SLurl(Second Life URL), which provides direct teleport link to Model of Building B in Second Life. There is also briefly described what to do in case if someone does not have Second Life installed and where to get a program and to create an avatar as well.

Web page includes pictures of Molde University College, video shows Demo Trial with help and basics instructions. There are also links directly to both surveys, included link to Molde University home page.

## 6.1.2 Facebook popularity



Facebook became the most popular social network page. It is growing every year, according to ComScore “Facebook attracted 132.1 million unique visitors in June 2008, compared to MySpace, which attracted 117.6 million” (ComScore, 2008).

I am also one of the 132,1 million visitors, and I decided to ask my friends on Facebook to help me with this research. In the meantime, I sent about 200 message to each of them. I did send also emails to my friends who are not on Facebook yet. This was my primary target group which I observed and interviewed.

## 6.1.3 Videos

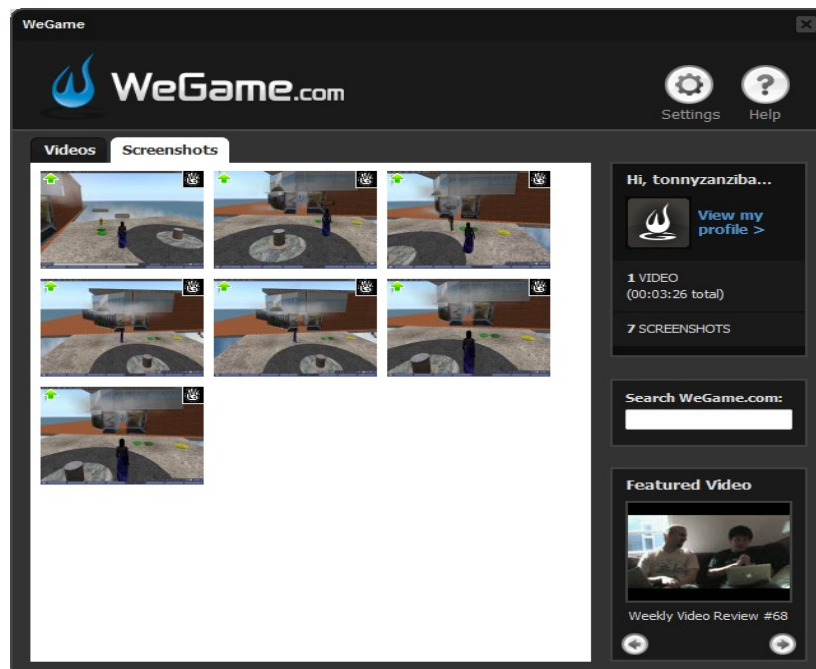


Figure 10: WeGame - tool to record video and screenshots

Video plays also an important part of my research, for trials observation I was using software from WeGame, available for free at [www.wegame.com](http://www.wegame.com).

## 6.2 Survey checklists

During my research I do three surveys. Firstly, I do survey the Manager for Safety Procedures at Molde University College. See General Survey in following chapter. Next I surveyed people regarding emergency exits and safety procedures in general. Group of people are questioning about Emergency procedures in their companies and Universities, only some of the regular questions are used from General Survey. Third step is after simulation within Second Life, where people were asked about the experience and realness of this simulation.

### 6.2.1 General Survey



**Safety procedures survey**

Dear friend,

ensuring safety requires reducing the risk of incidents, faults and failures that can disrupt normal operations. I am working on my thesis which is focusing on virtual worlds (Second Life) and how virtual worlds can be useful to our real world. Safety procedures simulation of building B at Molde University College represents a tool to prove that virtual worlds are new information technology phenomenon to make world better and safer place to live.

Please take this general safety procedures survey to let me get clear picture regarding this topic. It will not take more than 10 minutes of your time.  
Thank you.

\* Required

**General information: Gender \***

- Male
- Female

**Age \***

- <18 years
- 19 - 25 years
- 26 - 35 years
- 36 - 45 years
- > 46 years

*Figure 11: Safety procedures survey*

People were contacted by email or message on Facebook. “Dear friend, ensuring safety requires reducing the risk of incidents, faults and failures that can disrupt normal operations. I am working on my master thesis which focuses on virtual worlds (Second Life) and how virtual worlds can be useful to our real world. My advisor at Molde University College is Dr. Judith Molka-Danielsen who designed the Building-B model in Second Life. Safety procedures simulation of building B at Molde University College in Norway represents a tool to prove that virtual worlds are new information technology phenomenon to make world better and safer place to live. “

This general survey is focusing on these areas: general informations about the group, general knowledge of safety procedures, emergency experience, behavior and preparation for such situation. Last part ends with potential for virtual training and trial in Second Life.

My survey includes normally-scaled variables as Gender, if it is Male or Female, their age (divided into five groups: younger than 18, 19 – 25 years, 26 – 35 years, 36 – 45 years, more than 46 years old) and position: student, employed or unemployed.

Next set of the questions is focusing on Safety procedures training and general knowledge of the group regarding this area. There is important to know, if they are aware of safety procedures in their school or workplace, if they have been trained for safety procedures before. Necessary to know, how crowded the place is, they are live in, so how many people are in the building. Everyone, who has been going to school or to work should be trained for safety procedures. I will find out if they do and how they have been trained. For example on personal training, demo training, online course, in virtual world (for instance Second Life), during the presentation or there was no training at all. If people are trained, they should have some basic knowledge and should be aware of terms such an emergency exit, safety procedures, an exit route, fire alarm system or an evacuation.

They should also know where an emergency exit at workplace or university is. Emergency trainings can be repeated every six months, based on annual basis or more. Also there is an option that people do not get no training at all.

Some people may experienced fire alarm in the building, if not, there is interesting to know what would be the first thing they do in case of emergency. Would they run out of the building, call their family or friend? Or call the emergency. Maybe they just panic, because they do not know what to do or they have other things to do in such situation. But do they feel like really prepared for such emergency situation? And if not, what would make you more confident? I am thinking, to do more practical or video training would make people more comfortable and confident in this situation. There is also possible to already have real experience. Maybe it is chance for virtual training or other possibilities.

Speaking of virtual worlds, at the end of this questionnaire, I do ask people about their opinion if computers and virtual worlds could be a useful simulation tool for such emergency training. And how many of them already use and know Second Life.

If people know Second Life, they are pleased to try out my trial, which provides them with evacuation simulation at building B of Molde University College in Norway simulated in Second Life. They just need to visit SLurl link: <http://slurl.com/secondlife/Kamimo%20Island/186/138/239>



*Figure 12: SLurl link to Trial location*

If people don't have Second Life and they would like to try this trial, they can download Second Life from [www.secondlife.com](http://www.secondlife.com), to create a new avatar for themselves and visit the same SLurl location.

## **6.2.2 The Trials**

Building B at Molde University College in Norway and its first floor is all on fire. Flames and fog are everywhere. Those of you, who know this building would imagine such situation in the nightmares. Of course, this is just model I am talking about. Model of Building B is prepared in Second Life.

There are no exit signs in this virtual-building and no fire-extinguishers. In order to simulate real environment more realistic building should have this exit signs and fire-extinguishers. Just want to trial how it would be without them.

### **6.2.2.1 Trials conditions**

These are several conditions and rules regarding trial:

- The trial persons have to exit a building that represented the floor plan at level 1 of B building at Molde University College in Norway. Only Floor 1 is complete. The floor 2 is only if they make a mistake and go the wrong way, then they are still contained in the building. The top floor is enclosed the exits of the 3 staircases. The floor 2 is on the fire, therefore I do not expect many people going up there, but nobody knows where people can looking for exit to get out.
- At the entrance of the building they pick one of two small starting points, which teleport them directly to different locations in the building. I pick two different places in the building. People will trial both of them.
- They start in that particular room and end at the entrance. There are 2 exits at the building, so I need to measure ending times at each.
- I measure how long it takes trial persons to get out the building
- They can see the room numbers, they do not see emergency plan.
- They do not have access to other materials, any help from other people is also not allowed
- Teleport, Flying and zooming-out of the building is also not allowed.
- There is a smoke, fire and fire alarm during the safety procedure simulation.
- People after trial need to answer last questionnaire by clicking on yellow pad to get a Notecard with link.



*Figure 13: Trial with green pads to teleport and yellow pad for survey.*

### 6.2.3 Questioning after trial

**Survey after the trial in Second Life**

Thank you for your trial in Second Life. There is just last thing to do, please answer following questions.

\* Required

Did you find exit successfully? \*

- Yes, no problem
- No, I was lost
- Yes, but I got some problems to find a way out

How do you like this trial? \*

- I like it very much
- I like it
- I don't like it
- I don't know

Was it realistic experience for you? \*

- Yes
- No
- I don't know

*Figure 14: Survey after the trial in Second Life*

After the trial, there are important points they need to be answered. If person find the exit successfully or not. If they have some problems to find the way out. Do they like this trial or not. How people think about such simulation? Was it realistic experience? Probably not real, just close to real.



In second part I need to know, for how long people use Second Life. If they are just beginners, an expert using SL or it is first experience for them.

I was also interviewing my classmates, so people may know this building and have seen it before. Did they like this simulation or not. Also, there is just first research and there are some weak points of such simulation I am aware of, but what people missed? Lack of realness, no crowded situation or no fire hot environment? There was also no panic scenario and it is also not possible to simulate situation where it is not able to have lack of air and visibility.

Building has no emergency exit signs. But people maybe even did not realize that. They could be guided by their knowledge or spontaneously reactions. I want to be sure about this, that's why I am also asking if they seen any signs of emergency exits.

And last but not least, does simulation in Second Life any future? Did people like this simulation and would they like to test or experience more safety procedure simulations in Second Life? If yes, I believe there is a huge potential for further research and to take this simulation into a practice within the organizations or college.

## **7 Presentation of results**

### ***7.1 Findings from General survey***

During my research I sent almost 200 messages to my Facebook friends and several emails to people who do not have Facebook .At the end of my research, 33 was the final number of returned respondents. Following chapters provide some interesting findings.

### 7.1.1 General information: Gender and Age

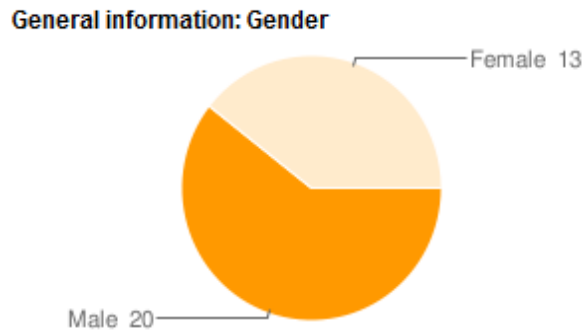


Figure 15: General information - Gender of respondents

Fully 61% of respondents were male and 39% were female. Controlling for age shows that 52% of respondents were people between 19 and 25, following by 33% group of people between 26 and 35 years. It is also interesting to find out, that 9% of people were older than 46 years old. There was one person younger than 18 and one respondent between 36 – 45 years old.

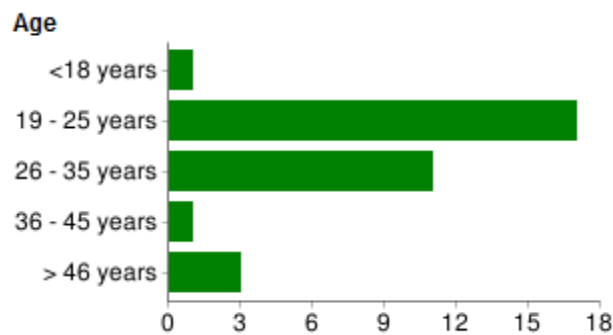
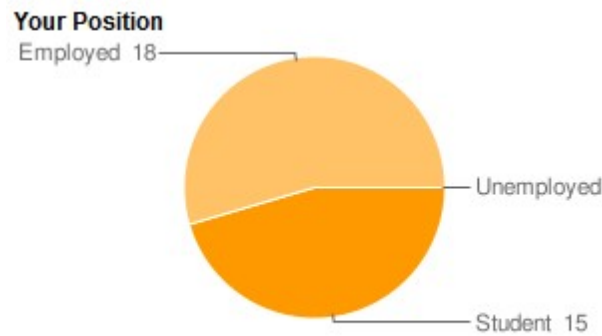


Figure 16: Age of respondents

## 7.1.2 Position



Respondents taking my survey were employed people, exactly 55%. The rest were students. Nobody was registered as unemployed.

## 7.1.3 Safety procedures awareness

Are you aware of safety procedures in your university or workplace?

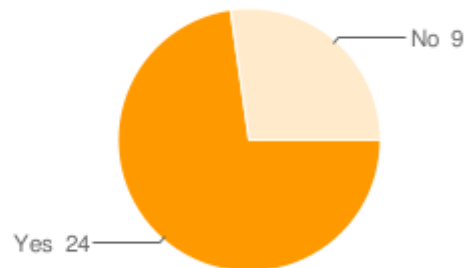
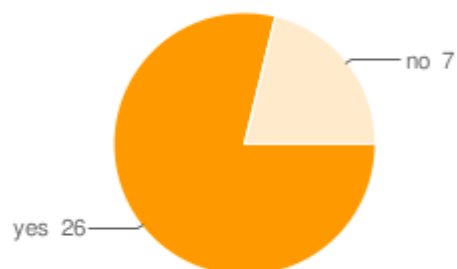


Figure 18: Safety procedures awareness

This is important information, only 73% of respondents are aware of safety procedures in their workplace. It is almost one third, 27% of people are not aware of safety procedures.

## 7.1.4 Safety procedures training

Have you been trained for safety procedures?



79% of respondents have been trained for safety procedure. Only 21% haven't been trained,

probably because 45% of respondents were students and there is no regular training on the college.

### 7.1.5 Size of the companies

“The EU has started to standardize the concept. Its current definition categorizes companies with fewer than 50 employees as "small", and those with fewer than 250 as "medium"(European Commission, 2003).

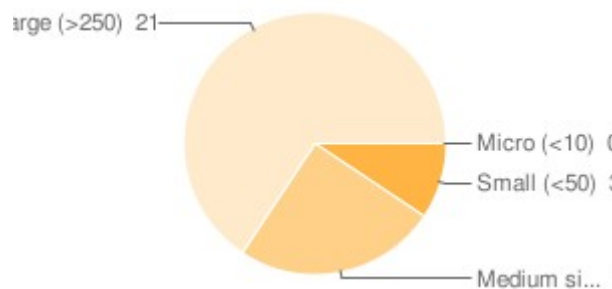


Figure 19: Size of companies

People are working for large companies; there are 64% of respondents who say so. Medium size company employs 24% and for small companies work only 9% of respondents. There was only one person who works within company of 6 people.

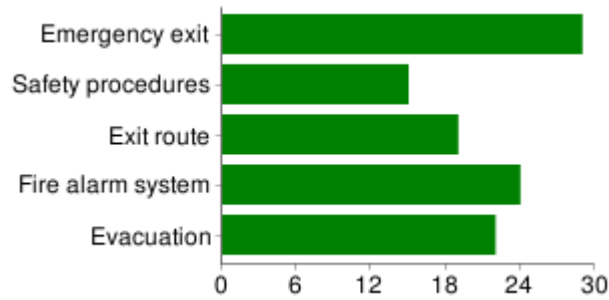
If there is so many people working for SMB and Large companies, there is more difficult to provide all employees with relevant and useful safety procedures training. This is potential and effectiveness for simulating such training in virtual world, Second Life.

### 7.1.6 Training types



Respondents are most trained through the presentation, 55% people selected this option. 30% of people were trained via online course or personal training. Demo training is relevant for 12% of respondents. Nobody was trained in virtual world yet. People may select more than one option, so percentages add up to more than 100%.

### 7.1.7 Safety terminology



The trainings also teach people terminology, which 80% of the respondents are confident about term “Emergency exit”. 73% of people are aware of “Fire alarm system”. “Evacuation” knows 67% and 58% respondents selected term “Exit route”. Shocking, only 45% of respondents are aware of “Safety procedures”. People may select more than one option, so percentages add up to more than 100%.

### 7.1.8 Where is the emergency exit?



Figure 20: Where is the emergency exit?

People know where is nearest emergency exit. Fully 94% of respondents know exactly where the emergency exit is. This is very good number, because people know where to go in case of emergency. Only two people did not know where the exit is.

### 7.1.9 Training periodicity

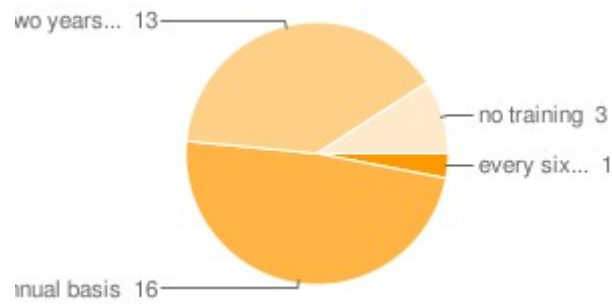


Figure 21: Training periodicity

Companies pay relevant attention when it comes to training periodicity. Fully 48% people have trainings every year, and 39% every two years. There is this 9% of people who haven't have training and only one person is trained every six months.

### 7.1.10 Experience with fire alarm

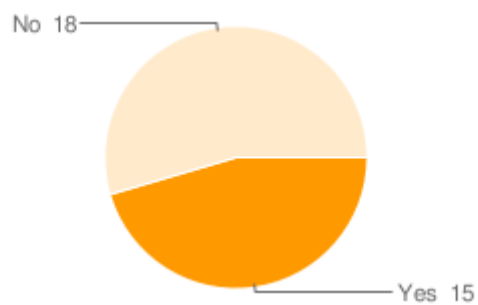


Figure 22: Experience with fire alarm

Another important finding, there is 45% of people, who already experienced fire alarm. But more that half, 55% people did not.

### 7.1.11 The first thing I would do is...

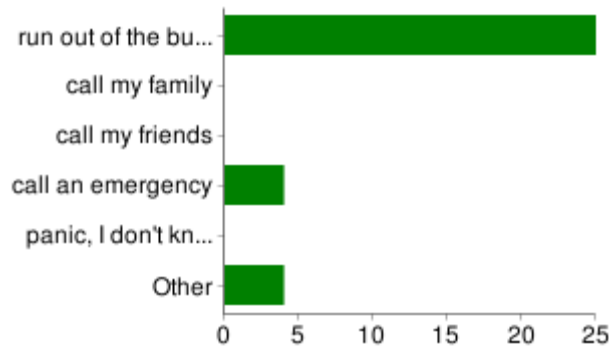


Figure 23: First thing I would do

In case of emergency 76% respondents would run out of the building. Fully 12% would call an emergency. Also another 12% would do something on their own, like to take most important things, inform others and leave the building. Or they will try to help other people. One respondent said that he or she would stay in the room because there is just one stairs in this building and it could be dangerous to go there in case of fire. This is probably the case of micro company, where place is not so crowded.

### 7.1.12 Do you feel really prepared?

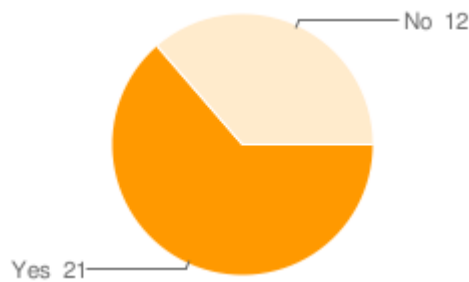


Figure 24: Do you feel really prepared?

Most of the people claimed that they feel prepared. It was 64% of respondents. But there is also 36% people who do not think this way. What could help them to be more sure? Let's see next question.

### 7.1.13 What would made me more confident

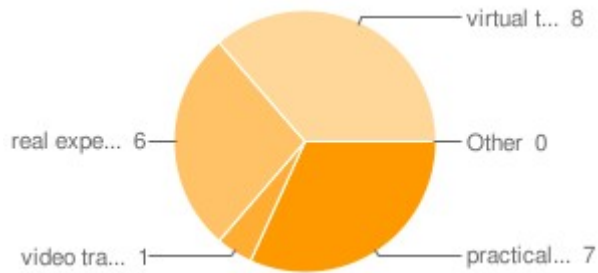


Figure 25: What would make you more confident?

Fully 36% would appreciate virtual training to make them more confident for fire situation. This is great news for virtual worlds and Second Life as well. Practical training would take 32%. Only 27% of respondents would like to have real experience. Video training voted only 5% respondents.

### 7.1.14 Is virtual world useful simulation tool?

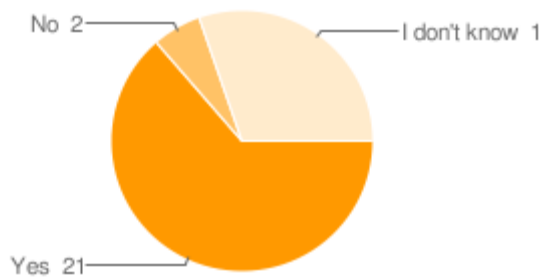


Figure 26: Is virtual world simulation tool?

Virtual training from previous question appreciates most people. And also 64% of people think that virtual world is an useful simulation tool for such training. There is still lack of information regarding virtual worlds, because 30% respondents do not know if this is the right tool. Only two people said “no” to virtual world.



### 7.1.15 Do you know Second Life?

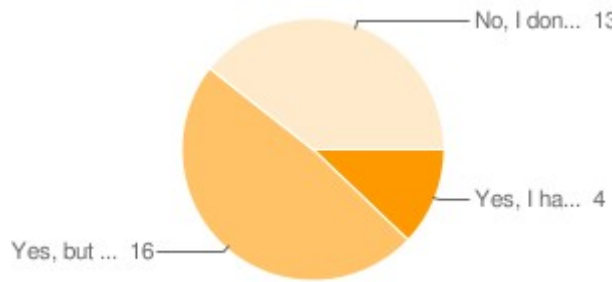


Figure 27: Do you know Second Life?

Second Life is probably not that popular as it seems to be. Only 12% respondents have their avatar. People know Second Life, but do not have a reason to use it. This is a case of 48% people, who know Second Life but do not use it. People don't know Second Life in 39% of cases.

### 7.2 Trials measure and observation

I am realistic, so I do not expect that people just download Second Life and create an avatar just because of me and my research. Therefore, I also have people use my own avatar to do the trial. So, I was sitting by them when they did the trial. It was also way how to find someone for my research who hasn't been in Second Life.

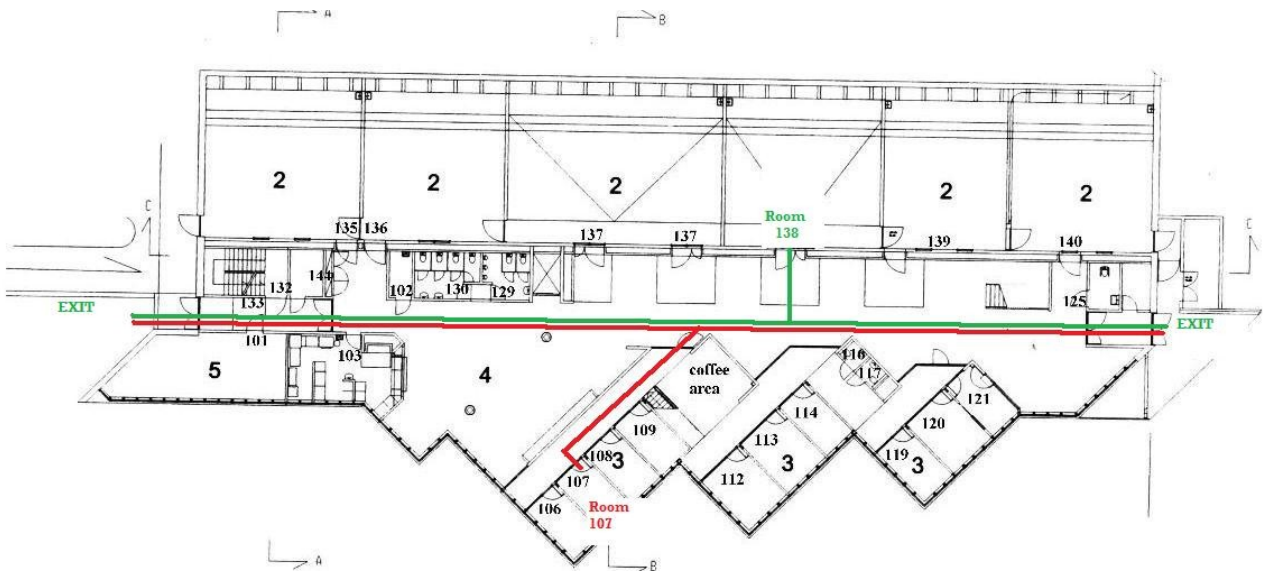


Figure 28: Trials - from room 138 and 102

During the trials, I do teleport people to two different locations. As you can see on floor plan picture above, one teleport goes to room 138 and second location is from room 102. From first location is emergency route shorter and easier to find the way out.



*Figure 29: Teleporting pots in Second Life*

### **7.2.1 Trial One observation**

There were exactly twelve people making this first trial. Everyone succeed and found the way out, also one person who did not find exit by himself and was guided by me to exit building. See red line on following picture. Measuring by my stopwatch, I measured following run times: 18.06, 37.75, 57.5, 23.8, 24.7, 25.02, 220, 28.04, 30.77, 27.08, 32.16, 37.42 seconds. Calculating average time is 46.85 seconds. The fastest runtime was 18.06 seconds, measured for a person who likes to play games, so it was not that problem for him to make movements really fast. The slowest person found exit in 3 minutes and 40 seconds. Compare to the fastest respondent, he was 12 times faster than last one. During my observation I figured out, that people could be even faster, but for many of respondents this Second Life environment was something new and people did not get used to the movement controls.

This trial was quite simple and easy to find the exit. In most cases people looked around that 138 room, that follow the door to get on the hall. Some of them looked right and left and took the left way directly to the exit. Flame and fog were simulated on the floor, but it was still clear view to the east exit. In two cases, people before they exit the building turned left and right to check inside the office and a working room. But they returned back and exit the building.

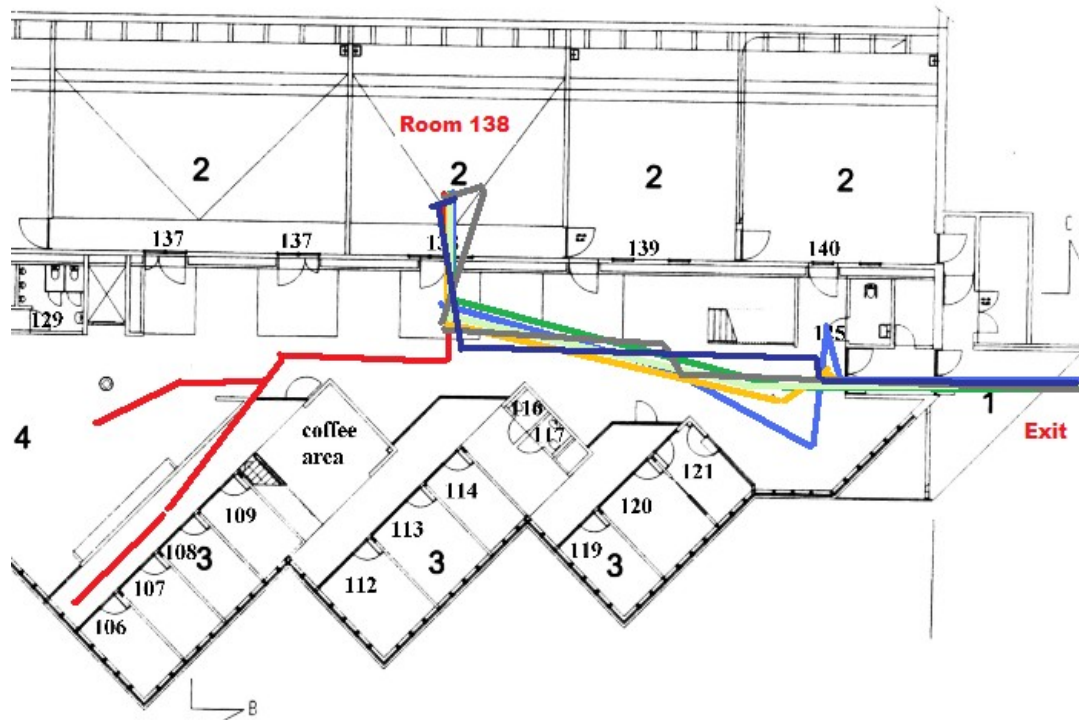


Figure 30: Floorplan and first trials

## 7.2.2 Trial two observation

To find exit from room 107 was more difficult as in trial one. Room 107 is more hidden and people were not that sure and more confused where they are and where is the exit. But at the end, all eleven respondents have found the exit and was saved.

There were two points, when people were confused about. Leaving room 107 and looking left, some people even thought that that could be the exit. They turned around and follow down the hall. In three cases, people turned to a coffee area, walking around the whole place and return back to the hall.

Just in one case person was confused about the area behind the coffee area, and turned right to look for exit there (blue line on the following picture). After checking this area for a while, he came back to main hall and exits the building.

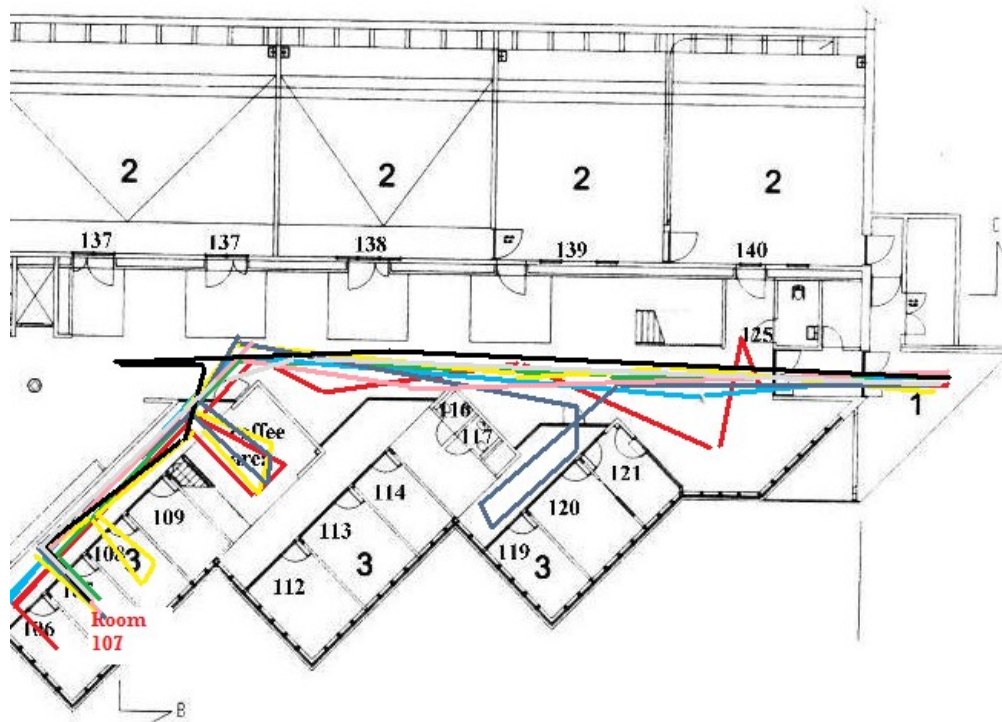


Figure 31: Second Trials exit routes

Measured times for second trial:

1:20,00      2:39,30      1:53,2      41,2      30,7      1:41,69      59,32  
 2:40,00      1:21,19      53,20      1:17,03

Average time was higher than in previous trial. It took 1 minute and 20,71 seconds (80,71 seconds) to exit the building in average. The fastest person found exit in 30,7 seconds, on the other hand slowest time was 2 minutes and 40 seconds. This is interesting because compared to first trial times, it was faster in average, but the slowest person from first trial did not find way by himself and needed help to exit the building.

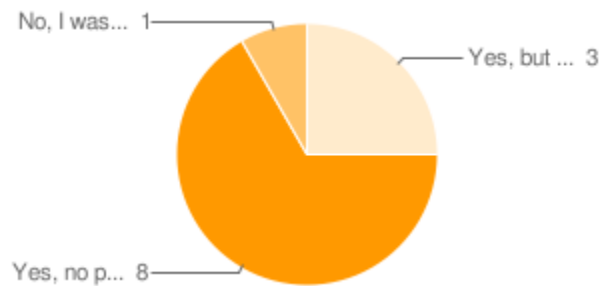
### 7.2.3 Video observation

I made also video from both trials. Some interesting videos will be presenting during my master thesis defense in order to demonstrate observation approach.

I believe that my research demonstrates that even if people are not familiar with the building, they can still find exit somehow and with some delay. I want to claim that nobody was hurt or burned during these trials and everyone was saved from the building. Even person who could not find the way on his own, I guided him to nearest exit and safe area.

## 7.3 Findings from Second Life Survey

### 7.3.1 Found the way out



I am happy to say this, everyone found exit from the building. With no problem it was 67% people. 25% observant was probably confused and unfamiliar with unknown area and they had some problems to find exit. One person was lost, and did not find exit on his own.

### 7.3.2 I like this trial

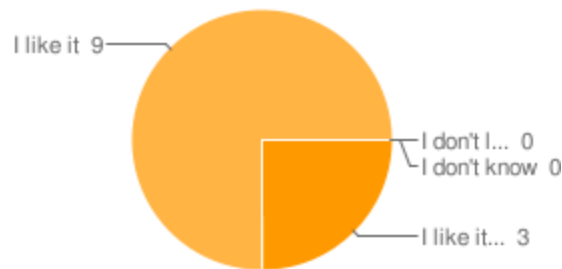


Figure 33: People like this trial

Everyone liked this trial; there was no one who did not. And 25% liked it very much and 75% just like it.

### 7.3.3 Was it realistic?

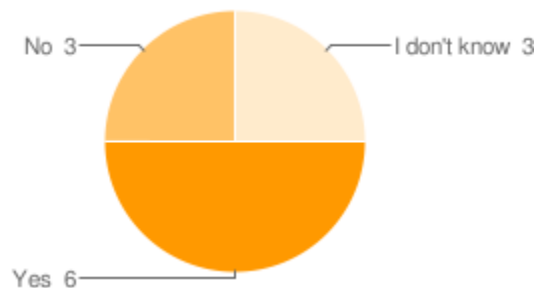


Figure 34: Realistic trials

People were not that sure when it comes to realistic of this simulation. A half of the people think that this was real enough, 25% do not think so or another 25% don't know.

### 7.3.4 I am new to Second Life

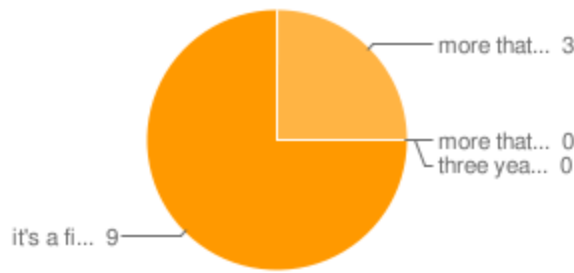


Figure 35: I am new to Second Life

People are not familiar with Second Life, they have tried Second Life for the first time in 75% cases, rest of people are also just beginners and they use Second Life more that three months in 25%. No one has avatar longer that one year.

### 7.3.5 I haven't seen that building before

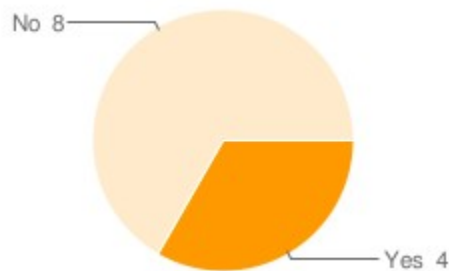


Figure 36: People haven't seen building B before

People haven't seen building B before in 67% cases. Some of my class mates also took the trial and it was 33% of all respondents.

### 7.3.6 I like this simulation of the building

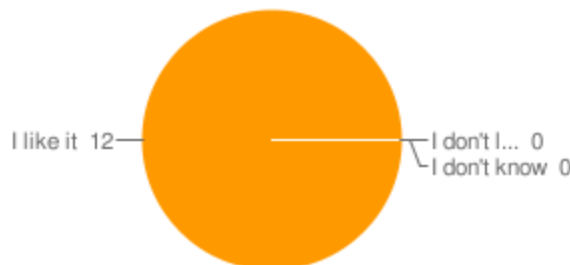


Figure 37: People liked simulation of the building

Everyone liked simulation of this building, even if they haven't seen it before.

### 7.3.7 Weakness of such simulation

People do not think that this simulation is real enough in 58% of cases. They are also missing crowded situation in 42%, 17% respondents do not agreed with no fire hot environment. Panic scenario was missing by 25% people and 17% do not think that can be simulating unexpected breath and see conditions.

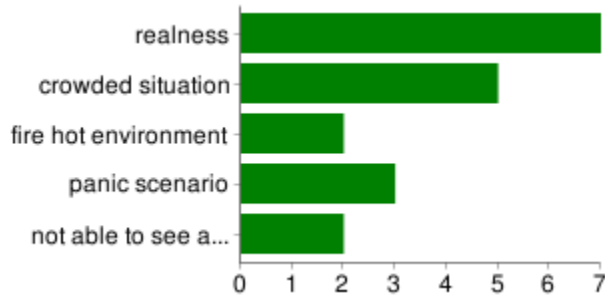


Figure 38: Weakness of this simulation

People may selected more than one choice, so percentages may add up to more than 100%

### 7.3.8 Emergency exit and direction signs

Emergency exits and direction signs were not implemented in my simulation. This is check question to find out if people notice that they are missing to prove if they are looking for such help during emergency. 50% people said they haven't seen them and 50% was sure there were no such signs.

### 7.3.9 I would like to test trial again

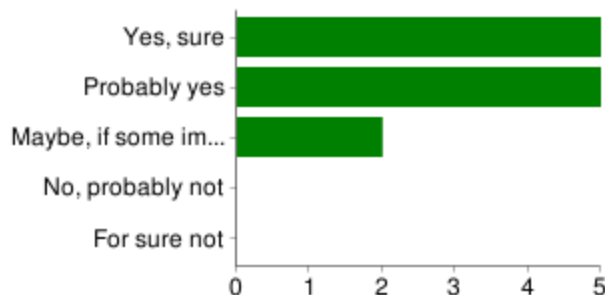


Figure 39: I would like to test trial again

This chart proves that people are willing to have simulations in Second Life again. In ordinally-scaled variable question, 42% people were sure they would, “probably yes” said 42% of respondents. People expect some improvements are made stated 17% people.

## **8 Conclusion**

### ***8.1 Conclusions***

I believe that my results are valuable because I have answered important question: is virtual world the tool to replace real evacuation trainings with virtual trainings? People think about virtual world as a tool for virtual training simulation. And my research examines how safety procedures such as an evacuation plan can be designed and tested in a 3D virtual world.

Why do we need emergency exits anyway? Some of you may ask this question. There could be several answers, but the most important thing is: It is you and your life that is in danger. Protect your life and life of others. The first priority is to ensure that all people who may be in danger are warned.

An important finding is that only 73% of respondents are aware of safety procedures in their workplace and 79% of respondents have been trained for safety procedure. This numbers should be higher, but I believe that it has something to do with the size of companies. Many people work for companies with more than 250 employees; therefore there are no enough resources to provide people with relevant and useful safety procedures training. Second Life and virtual simulations can solve this issue effectively by simulating such training.

Research also showed not permanent training periodicity. Fully 48% people have trainings every year and there are some people who haven't been trained at all. Therefore people claimed that they feel prepared only on 64% respondents. To make people feel more confident and not afraid of safety procedures, 36% would appreciate virtual training. This is the potential for virtual worlds and Second Life as well. Virtual training would expect the main group of people. Also 64% of people think that virtual world is a useful simulation tool for such training. Companies should start experience with the idea to let their employees have virtual training within Second Life.

My results clearly show that this is the way to do virtual trainings. There is still lack of information about virtual worlds. And Second Life is probably not that popular as it seems to be, because only 12% respondents have and use their avatar. Many people know what Second Life is, it was fully 48% of respondents, but they do not use it. And still, there is group of people who has no idea what Second Life is.



I discovered that people are not afraid of new technologies and virtual worlds. People are willing to have simulations in Second Life, they do not think about virtual training just as a tool but they also like doing training in this environment.

## ***8.2 Improvements and Further Research***

There is also a weakness with simulating real environment. There would never be real enough, and people also think so in 58% of cases. Simulation did not include crowd and this was also missing for 42% respondents. These could be solved by build model more realistic. Trials also could invite more people in one place, so there would be crowded place, not so far away from real.

There are some comments, which are difficult to simulate. For instance there is not possible to simulate hot fire environment or make people unable to breath and see. To lower visibility is achieved by fog textures.

During my trials, people did not see any emergency or exit signs. For further research, there is this option to build a model, building with more floors and rooms, than there would be not that easy to find exit. Training can be divided into two parts: people start trial with no signs at the walls and second trial would show these signs, therefore people may experience how easier is to follow this emergency signs to exit unknown building. Comparing results would show how efficient and useful emergency signs are or if they are not confused for visitor. I believe, based on this simulation people would pay more attention on these emergency signs during real emergency situation.

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# Appendix A

## ***General Safety procedures Questionnaire:***

Gender:

- a) Male b) Female

Age:

- a) <18 years b) 19 – 25 years c) 26 – 35 years d) 36 – 45 years e) >46 years

Position:

- a) Student b) employed c) unemployed

Are you aware of safety procedures in your school or workplace?

- a) Yes b) no

Have you ever been trained for safety procedures before?

- a) Yes b) no

Your workplace or university is a large building? About how many people are in the building?

Number

How have you been trained for safety procedure in your building?

- a) Personal training
- a) Demo training
- b) Online course
- c) In virtual world (for instance Second Life)
- d) Presentation
- e) No training

Which terms are you aware of? (Checked all you are aware of)

- a) Emergency exit
- b) Safety procedures
- c) Exit route
- d) Fire alarm system
- e) Evacuation

Do you know where an emergency exit at your workplace or university is?

- a) Yes b) no

How often do you regularly have safety procedures trainings?

- a) Every six months
- b) Annual basis
- c) two years plus
- c) No training

Have you experienced a fire alarm in the building?

- a) Yes b) no

What would be the first thing you do in case of emergency?

- a) Run out of the building
- b) Call my family
- c) Call my friends
- d) Call an emergency
- e) Panic, I do not know what to do
- f) Others

Do you feel like you are really prepared for an emergency situation?

- a) Yes b) no

If not, what would make you more confident?

- a) Practical training
- b) Video training
- c) Real experience
- d) Virtual training
- d) Other

Do you think that computers and virtual worlds could be an useful simulation tool for such emergency training?

- a) Yes b) no c) I do not know

Have you heard about virtual world called Second Life?

- a) Yes, I have my avatar
- b) Yes, but I do not use it
- c) No, I do not know Second Life

Available at: <http://spreadsheets.google.com/viewform?formkey=cIFpYXFMS2g0dldMODVqalhuR2IQVEE6MA>

## Appendix B

### *Survey after the trial in Second Life*

- Did you find exit successfully?
  - a) Yes
  - b) No
  - c) Yes, but with some problems to find the way out
- How do you like/perform this trial:
  - a) I like it very much
  - b) I like it
  - c) I do not like it
  - d) I do not know
- Was it realistic experience for you?
  - a) Yes
  - b) No
  - c) I don't know
- How long do you use Second Life
  - a) It's my first time
  - b) More than three months
  - c) More than one year
  - d) three years plus
- Have you seen the building-B at Molde University College before?
  - a) Yes b) no
- How do you like this simulation of the building?
  - a) I like it
  - b) I do not like it
  - c) I do not know
- What is the weakness for such simulation? (Select all that apply)
  - a) Realness
  - b) Crowded situation
  - c) Fire hot environment
  - d) Panic scenario
  - e) Not able to simulate lack of air and visibility

- Were the directions to emergency exits marked with visible signs?
  - a) Yes
  - b) No
  - c) I haven't seen them
- Were all emergency exits illuminated and marked with an exit sign?
  - a) Yes
  - b) No
  - c) I haven't seen them
- Would you like to test or experience more safety procedure simulations in Second Life?
  - a) Yes, sure (5)
  - b) Probably yes (4)
  - c) Maybe, but some improvements are needed (3)
  - d) No, probably not (2)
  - e) For sure not (1)

Also available at: <http://spreadsheets.google.com/viewform?formkey=cjl2X0NidTRTb1YzazNNRUdrYXQwbmc6MA>

# Appendix C

## Second Life Project Web page – Step 1 of 3: Safety Procedures Survey

# SECOND LIFE PROJECT

USE OF 3D MODELING IN THE DESIGN OF EMERGENCY EVACUATION PLANS


SUNDAY, MAY 10, 2009

### Step 1 of 3: Safety procedures survey

Dear friend,


ensuring safety requires reducing the risk of incidents, faults and failures that can disrupt normal operations. **I am working on my master thesis which focuses on virtual worlds (Second Life) and how virtual worlds can be useful to our real world. My advisor at Molde University College is Dr. Judith Molka-Danielsen who designed the Building-B model in Second Life. Safety procedures simulation of building B at Molde University College (Norway) represents a tool to prove that virtual worlds are new information technology phenomenon to make world better and safer place to live.**

MOLDE UNIVERSITY COLLEGE IN SECOND LIFE



DEMO TRIAL

**Second Life Trial 1**



### Safety procedures survey

Dear friend,

ensuring safety requires reducing the risk of incidents, faults and failures that can disrupt normal operations. I am working on my thesis which is focusing on virtual worlds (Second Life) and how virtual worlds can be useful to our real world. Safety procedures simulation of building B at Molde University College represents a tool to prove that virtual worlds are new information technology phenomenon to make world better and safer place to live.

Please take this general safety procedures survey to let me get clear picture regarding this topic. It will not take more than 10 minutes of your time. Thank you.

\* Required

**General information: Gender \***

- Male
- Female

**Age \***

- <18 years
- 19 - 25 years
- 26 - 35 years
- 36 - 45 years
- > 45 years

Please take this general safety procedures survey to let me get clear picture regarding this topic. It will not take more than 10 minutes of your time. Thank you.

Take the survey here.

POSTED BY MICHAL AT 1:59 PM

---

0 COMMENTS:

IMPORTANT LINKS

- [Molde University College](#)
- [Step 1: Safety procedures survey](#)
- [Step 2: SLurl: Molde University College in Second Life](#)
- [Step 3: Survey after the trial in Second Life](#)

HISTORY

- ▼ 2009 (3)
- ▼ May (3)

Step 1 of 3: Safety procedures survey

# Appendix D

## Second Life Project Web page – Step 2 of 3: Trial in Second Life


# SECOND LIFE PROJECT


USE OF 3D MODELING IN THE DESIGN OF EMERGENCY EVACUATION PLANS

SUNDAY, MAY 10, 2009


### Step 2 of 3: Second Life Trial

Building B at Molde University College on fire! Of course not in real. Only in virtual world called Second Life.







If you know Second Life, please try out my trial, which provides you with evacuation simulation building B at Molde University College in Norway simulated in Second Life. Visit this link.



#### MOLDE UNIVERSITY COLLEGE IN SECOND LIFE



#### DEMO TRIAL



#### IMPORTANT LINKS

- Molde University College
- Step 1: Safety procedures survey
- Step 2: SLurl: Molde University College in Second Life
- Step 3: Survey after the trial in Second Life

#### HISTORY

- ▼ 2009 (3)
- ▼ May (3)
- Step 1 of 3: Safety procedures survey



# Appendix E

## Second Life Project Web page – Step 3 of 3: Survey after the Trial in Second Life

# SECOND LIFE PROJECT

USE OF 3D MODELING IN THE DESIGN OF EMERGENCY EVACUATION PLANS

SUNDAY, MAY 10, 2009

### Step 3 of 3: Survey after the trial in Second Life

Thank you for your trial in Second Life. After this trial, there is just last thing to do. Please, answer following questions [here](#).

#### Survey after the trial in Second Life

Thank you for your trial in Second Life. There is just last thing to do, please answer following questions.

*\* Required*

Did you find exit successfully? \*

- Yes, no problem
- No, I was lost
- Yes, but I got some problems to find a way out

How do you like this trial? \*

- I like it very much
- I like it
- I don't like it
- I don't know

Was it realistic experience for you? \*

- Yes
- No
- I don't know

POSTED BY MICHAL AT 1:16 PM

0 COMMENTS:

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[Home](#)


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#### MOLDE UNIVERSITY COLLEGE IN SECOND LIFE



#### DEMO TRIAL

#### Second Life Trial 1



#### IMPORTANT LINKS

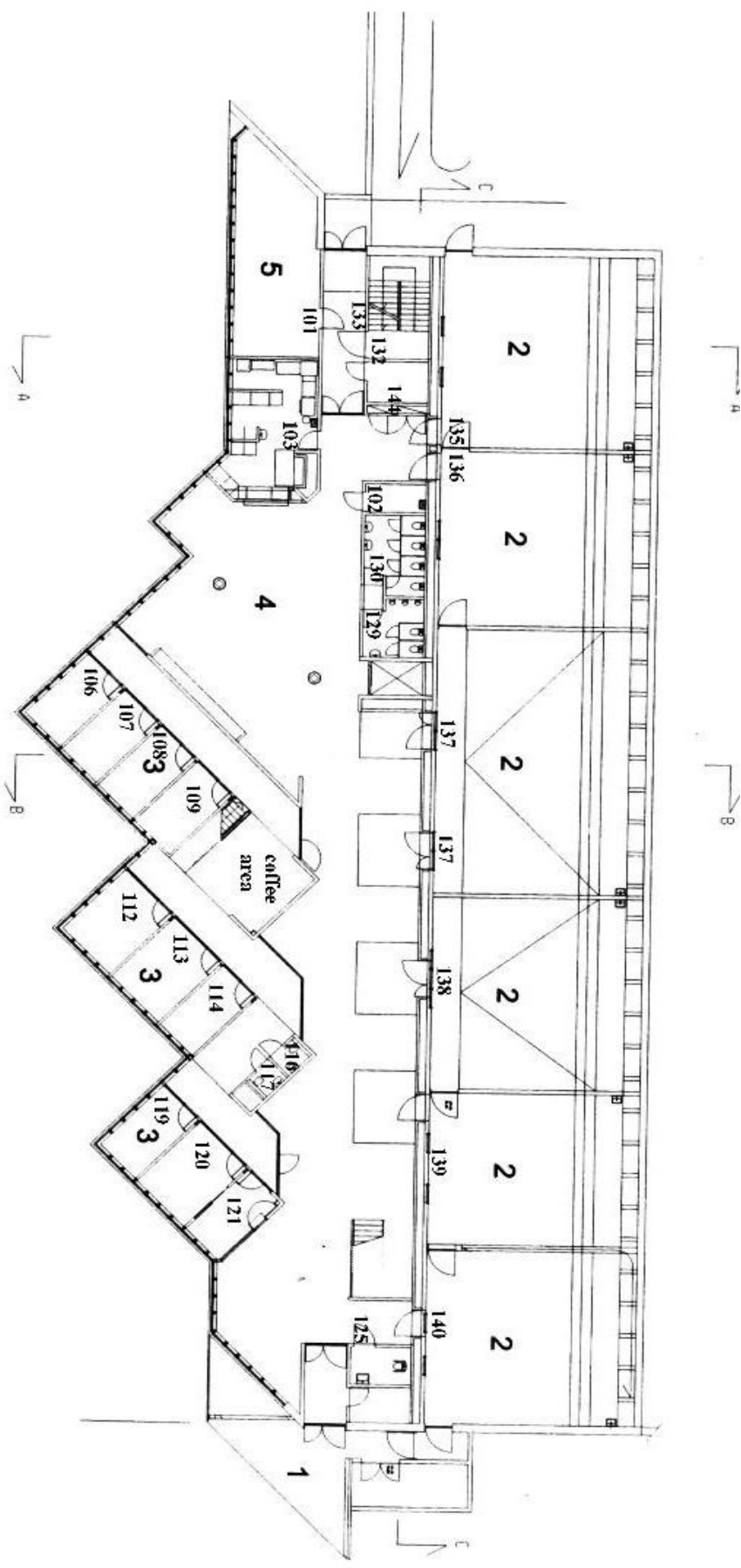
- [Molde University College](#)
- [Step 1: Safety procedures survey](#)
- [Step 2: SLurl: Molde University College in Second Life](#)
- [Step 3: Survey after the trial in Second Life](#)

#### HISTORY

- ▼ 2009 (3)
  - ▼ May (3)
    - [Step 1 of 3: Safety procedures survey](#)

# Appendix F

## Floor plan of Building B at Molde University College



**Appendix G**

***Model of Building B at Molde University College with real building pictures***





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