**ANNEX B**

SBS Local Research Ethics Committee

Project Submission Form

Note All sections of this form should be completed.

Please continue on separate sheets if necessary.

Principal Investigator: Faustina Hwang

School: Biomedical Engineering Section, School of Biological Sciences

Email: F.Hwang@reading.ac.uk

Title of Project: Investigating the use of multi-sensory technology in a virtual environment

Proposed starting date: 01/03/2018

Brief description of Project:

In this study we will ask participants to navigate through a simple “hotel” environment in virtual reality. The participants will be tasked with locating a fire inside the environment and attempting to put it out within the virtual world. The virtual environment will have differing levels of fidelity for the user for different aspects of the simulation.

The user’s performance will be recorded by analysing the time it took them to complete the task and the order in which they completed tasks throughout the simulation. Furthermore, we will measure galvanic skin response to assess the participant’s physiological responses to the simulation. Lastly, participants will be asked to complete a brief questionnaire to further gauge the participant’s overall immersion in the virtual environment.

I confirm that to the best of my knowledge I have made known all information relevant to the School Research Ethics Committee and I undertake to inform the Committee of any such information which subsequently becomes available whether before or after the teaching/research has begun.

I confirm that if this project is an interventional study, a list of names and contact details of the subjects in this project will be compiled and that this, together with a copy of the Consent Form, will be retained within the School for a minimum of five years after the date that the project is completed.

Signed:

…………………………………………………….... Date: ……………….…………………

(Investigator)

…………………………………………………….... Date: ……………….…………………

(Head of School or authorised Head of Department)

…………………………………………………….... Date: ……………….…………………

(Student -where applicable)

**Checklist**

1. This form will be submitted to the School Research Ethics Committee and will subsequently, if approved, be signed by my Head of School (or authorised Head of Department)

✓

✓

2. The Consent form includes a statement to the effect that the application has been reviewed by the School Research Ethics Committee and has been given a favourable ethical opinion for conduct

✓

3. I have made, and explained within this application, arrangements for any confidential material generated by the teaching/research to be stored securely within the University and, where appropriate, subsequently disposed of securely.

4. I have made arrangements for expenses to be paid to participants in the research, if any, OR, if not, I have explained why not.

5. EITHER

1. The proposed teaching/research does not involve the taking of blood

samples;

✓

OR

(b) For anyone whose proximity to the blood samples brings

a risk of Hepatitis B, documentary evidence of immunity

prior to the risk of exposure will be retained by the Head of

School or authorized Head of Department.

Signed:

…………………………………………... Date……………………

(Head of School or authorised Head of Department)

6. EITHER

(a) The proposed teaching/research does not involve the storage of human

tissue, as defined by the Human Tissue Act 2004;

✓

OR

(b) I have explained within the application how the requirements

of the Human Tissue Act 2004 will be met.

7. EITHER

1. The proposed teaching/research will not generate any information

about the health of participants;

✓

OR

1. If the teaching/research could reveal adverse information regarding

the health of participants, their consent to pass information

on to their GP will be included in the consent form and in this

circumstance I will inform the participant and their GP

providing a copy of the relevant details to each and identifying

by date of birth;

OR

(c) I have explained within the application why (b) above is not

appropriate.

8. EITHER

1. the proposed research does not involve children under the

✓

age of 5;

OR

1. My Head of School (or authorised Head of Department) has given details of the proposed research to the University’s insurance officer, and the research will not proceed until I have confirmation that insurance cover is in place.

Signed:

…………………………………………... Date………………..…

(Head of School or authorised Head of Department)

This form and further relevant information (consent form and information sheet) should be returned electronically to:

Dr M. Alejandra Perotti

Email: [m.a.perotti@reading.ac.uk](mailto:m.a.perotti@reading.ac.uk)

You will be notified of the Committee’s decision as quickly as possible, and you should not proceed with the project until a favourable ethical opinion has been passed.

School of Biological Sciences

**Application Form**

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| SECTION 1: APPLICATION DETAILS |
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| Project Title: Investigating the use of multi-sensory technology in a virtual environment.  Date of Submission: Proposed start date: Proposed End Date:  24/01/2017 01/03/2018 11/04/2018 |
| 1.2  Principal Investigator: Dr Faustina Hwang  Office room number: 160, Polly Vacher Internal telephone: ex 7668  Email address: F.Hwang@reading.ac.uk  Other applicants (role):  Alfie Sargent; [Alfie.Sargent@student.reading.ac.uk](mailto:Alfie.Sargent@student.reading.ac.uk) (final year, robotics BSc) |
| 1.3  Project Submission Declaration  I confirm that to the best of my knowledge I have made known all information relevant to the Research Ethics Committee and I undertake to inform the Committee of any such information which subsequently becomes available whether before or after the research has begun.  I understand that it is a legal requirement that both staff and students undergo Criminal Records Checks when in a position of trust (i.e. when working with children or vulnerable adults).  I confirm that a list of the names and addresses of the subjects in this project will be compiled and that this, together with a copy of the Consent Form, will be retained within the School for a minimum of five years after the date that the project is completed.  Signed…………………………… (Principal Investigator) Date:…………  Signed…………………………… (Student) Date:………… |
| 1.4  University Research Ethics Committee Applications  Projects expected to require review by the University Research Ethics Committee must be reviewed by the Chair of the School Ethics Committee or the Head of School before submission.  Signed………N/A………… (Chair of School Committee) Date:…N/A…………  Signed………N/A…………… (Head of School) Date:…N/A……… |
| 1.5  External research ethics committees  Please provide details below of other external research ethics committees to which this project has been submitted, or from whom approval has already been granted [e.g. NHS Committee]   |  |  |  |  | | --- | --- | --- | --- | | Name of committee | Date of submission/approval | Reference | Status | | N/A | N/A |  |  | |  |  |  |  | |

|  |  |
| --- | --- |
| SECTION 2: PROJECT DETAILS | |
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| --- |
| 2.1  **Lay summary**  In this project, we have created a virtual environment simulating a fire fighter scenario. Within this environment, we can vary the levels of visual, audio and haptic (touch and thermal) feedback. This study aims to investigate how changing these parameters affects the user’s immersion in the virtual environment.  Participants will be asked to wear an HTC Vive virtual reality headset and navigate the virtual environment and interact with object within that environment. Furthermore, the participant will have a galvanic skin response (GSR) unit attached to them whilst they are in the virtual world. The virtual world that the participant will be navigating will have differing elements for each participant. There will be four different factors that will change: Audio  1. no sound  2. sound from a point source  3. 360 degree audio  Visual  1. Low quality graphics and a small amount of objects in the virtual world.  2. High quality graphics and a large amount of objects in the virtual world.  3. 3- high quality graphics, a large amount of objects in the virtual world and basic NPC AI  Input  1. keyboard and mouse  2. a “joystick” movement input  3. a “projection” movement input  Heat  1. no heat simulation  2. heat will be simulated for the user  By having different levels of fidelity for these different factors we are able to ascertain what factors affect the participant the most in creating an immersive virtual world that they interact in. The GSR will gather biometric data for each participant and a short questionnaire at the end of the session will be used for further evidence. The individuals who will be participating in this experiment will all be over the age of 18 and will only be participating for between 30 and 45 minutes per session. |
| 2.2  **Procedure**  The study will involve participants being asked to complete two tasks:  The first task requires the participant to enter the virtual environment and for 1 minute to simply move around the environment and interact with objects in the environment to make them adjust to the virtual world. After this small initial preparation period, the simulation proper will begin. Dependent upon the simulation, the participant will have to interact with the virtual world, attempting to locate a fire and consequently put it out. The parameters of this simulation will vary between user:   * The most basic simulation will have the user locate the fire in the virtual world and put it out. There will be very little interaction with the virtual world, no NPC’s will be visible and the majority of the objects in the virtual world will not be interactable for the user. Furthermore, the user will be using a simple keyboard and mouse to navigate the virtual world. There will be no heating simulation for the user. * The next level of the simulation will have more interactable objects in the world, requiring the user to physically open doors that they encounter with a real-world gesture. Moreover, Objects will be interactable, thus increasing the presence and immersion that the participant will feel within the simulation. No NPC’s will be in this simulation and the user will use some virtual reality controllers to control the gestures. Heat will be simulated in this scenario. * The final level of immersion for the user will have interactable objects at a high visual fidelity as well as very basic NPC interaction. The participant will use the virtual reality controllers to navigate this virtual world. Heat will be simulated in this scenario.   The session for a participant should last about 15 minutes, after which the participant will have a short break to process what they have been doing and then a small questionnaire will be completed  The second task for the user will be a simple questionnaire that will involve questions about their previous experience with other similar technologies, how they themselves would rate the experience with descriptions of immersion and presence. |
| 2.3  **Location**  The study will take place in Building 38, Biomedical Engineering on the University of Reading’s Whiteknights Campus. (TBC) |
| 2.4  **Funding**  This study a 3rd year project and has a budget of £50. |
| 2.5  **Ethical Issues**  No ethical issues, apart from matters relating to data storage, data protection and confidentiality – see Section 2.8. |
| 2.6  **Deception**  This study does not involve any deception. |
| 2.7  **Payment**  Participants will not receive any payment. |
| 2.8  **Data storage, data protection and confidentiality**  The data being collected comprises: questionnaire about their year of birth, handedness, gender (see Appendix D); assessments of dexterity and spatial abilities (see Appendix C); logs of interactions with the computer; videos; questionnaire on their subjective workload in using the haptic systems (see Appendix D).  Each participant will be assigned an anonymous user ID, and data from the study will be stored, processed, and reported using this anonymous user ID. Hardcopies of data will be transcribed into electronic form, and the hardcopies stored in a filing cabinet in SBS, separate from the consent forms, and destroyed 5 years after completion of the project.  Anonymised electronic data will be stored on a password protected University network drive, accessible to members of the research team. These anonymised data will be stored indefinitely, may be made accessible to future members of the research team, and may be made publicly available via a research data repository for example.  Videos will also be stored on a password protected University network drive, accessible to members of the research team. The videos will be stored indefinitely, may be made accessible to future members of the research team. Although the filenames will be anonymised, the participants could be identifiable in the video and photos. However, these files will not be distributed outside of the research team. We will ask participants for explicit consent for the videos and photos to be used in presentations or publications, and if they agree for the materials to be shown, whether they wish to have their faces anonymised. |
| 2.9  **Consent**  Participants will be asked to provide their name and contact details and to provide written consent prior to participating in the study. |

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| SECTION 3: PARTICIPANT DETAILS |
| 3.1  **Sample Size**  A target of 10-15 students will be recruited. This number of participants is in-line with other similar studies in the virtual reality field. |
| 3.2  Will the teaching/research involve vulnerable adults (e.g., adults with mental health problems or neurological conditions)?  NO. |
| 3.3  Will your teaching/research involve children under the age of 18 years? NO.  Will your teaching/research involve children under the age of 5 years? NO. |
| 3.4  Will your research involve NHS patients, NHS staff or Clients of Social Services? NO. |
| 3.5  **Recruitment**  Participants will be recruited through the University by word-of-mouth. |



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| *Researcher (principal)*: Dr. Faustina Hwang  *Email*: f.hwang@reading.ac.uk  *Phone*: +44 (0) 118 378 7668  *Student*: Alfie Sargent *Email*: Alfie.Sargent@student.reading.ac.uk |
|  |

School of Biological Sciences

Biomedical Engineering Section

University of Reading

Reading RG6 6AY

**Appendix A: Participant Information Sheet**

**Project Title: Investigating the use of multi-sensory technology in a virtual environment.**

**What is the purpose of this study?**

We are developing a system that uses 3D virtual reality and multi-sensory devices (i.e. heat and virtual touch) to measure the immersion and presence a user feels when different stimuli are stimulated. For this particular study, the participant will be placed in a VR simulation with a certain visual, audio, touch and heating fidelity and tasked with navigating an environment and completing a firefighter task.

The purpose of the study is to determine what stimuli are most essential in making an immersive experience in virtual reality

**Who can participate?**

We are inviting adults over the age of 18 to participate in this study.

**What will I be asked to do?**

You will be tasked with navigating a virtual environment and tasked with putting out a virtual fire in this environment. Your body temperature and skin moisture will be measured during the small simulation.

Once the simulation has ended you will then answer a small questionnaire about the environment that you were just in, asking how immersive you thought the experience was. You will also be asked what other experience you have with similar technology.

The entire session should take between 15 and 20 minutes.

**What data will be collected, and how will it be used?**

In addition to your responses to the questionnaire items as described above, we will also collect data on how you operated within the virtual world and be measuring biometric data as you progress through the simulation. These data will be logged automatically by the computer. The data will help us characterise each aspect of the simulation, and to understand the relative strengths and weaknesses of each element of the simulation.

The data collected in this study will be used for scientific purposes, and may be published.

Furthermore, with your permission, the simulation will be recorded and used for further analysis (not the real-life footage of the participant but the screen capture of the simulation).

**Confidentiality, storage and disposal of information**

You will be asked to provide your name and contact details, and to sign a consent form so that the University can keep a record of your participation in the study. The consent forms will be stored securely in a locked filing cabinet in the office of the Principal Investigator, and destroyed 5 years after completion of the project.

All other data from the study will be stored, processed, and reported using an anonymous user ID. Hardcopies of data will be transcribed into electronic form, and the hardcopies stored in a filing cabinet in SBS, separate from the consent forms, and destroyed 5 years after completion of the project. Anonymised electronic data will be stored on a password protected University network drive, accessible to members of the research team. These anonymised data will be stored indefinitely, may be made accessible to future members of the research team, and may be made publicly available via a research data repository for example.

If you give consent for videos to be taken, the video files will be saved using anonymous user IDs on a password protected University network drive, accessible to members of the research team. The videos will be stored indefinitely, may be made accessible to future members of the research team. It is possible that you could be identified in these recordings, however, they will be used only for research purposes by the project team, and will not be shown outside of the project team without your explicit consent.

**Do I have to take part?**

Participation is entirely voluntary, and you can withdraw at any time without giving a reason, and this will be without detriment.

**Where will the studies take place?**

The study will take place in the Polly Vacher Building on the University of Reading’s Whiteknights campus. A researcher will contact you to provide further directions, and to arrange a time slot for you.

**Can I learn the results of the study?**

If you would like to learn the results at the end of the study, please contact the researchers.

**Who has reviewed the study?**

This project has been subject to ethical review, according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.

**Contact details for further questions:**

For questions about this study, please contact either or both:

* Alfie Sargent, Robotics Student BSc, [Alfie.Sargent@student.reading.ac.uk](mailto:Alfie.Sargent@student.reading.ac.uk)
* Dr. Faustina Hwang, Associate Professor, Biomedical Engineering [f.hwang@reading.ac.uk](mailto:f.hwang@reading.ac.uk), 0 118 378 7668.

**In the event of a complaint**

If you have any comments or if you have a complaint, please contact Dr David Leake, Email: [d.s.leake@reading.ac.uk](mailto:d.s.leake@reading.ac.uk).

**Thank you for your help**.

Appendix B: Consent Form

1. I have read and had explained to me by ……………………………………………..…

the accompanying Information Sheet relating to the project on:

**“Investigating the use of multi-sensory technology in a virtual environment.”**

* 1. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.
  2. I understand that participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment.
  3. EITHER
* I agree to the sessions screen capture being **video and audio** recorded.

OR

* I DO NOT agree to the sessions screen capture being **video and audio** recorded.
  1. If you agree to the interview/session being **video and audio** recorded:

I agree for the video and/or audio to be used in presentations and publications.

* WITHOUT anonymization.

OR

* I DO NOT agree for the video and/or audio to be used in presentations nor publications.
  1. This project has been subject to ethical review, according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.
  2. I have received a copy of this Consent Form and of the accompanying Information Sheet.

Name: ………………………………………………

Signed: ……………………………………………...

Date: ………/………/………

User ID: ………………

**Appendix C:** **QuestioNnaire**

Haptics Lab

Biomedical Engineering

Unit name goes here

**Assessment of Multi-Sensory Virtual Reality Simulation**

**Section 1: Information about you**

|  |  |
| --- | --- |
| **Personal details** | |
| Date |  |
| Participant ID |  |
| Preferred Hand | Left  Right |
| How would you describe your experience interacting within a virtual environment? | This is my first time interacting with a 3D computer system.  I have tried them once or twice before, but not used them extensively.  I have tried them more than once or twice before, but not used them extensively.  I frequently interact with 3D systems (e.g. computer gaming).  I frequently interact with immersive virtual-reality systems. |

Section 2: Assessment of the Virtual Environment

|  |  |
| --- | --- |
| **Scale titles** | |
| **Mental Demand**  How mentally demanding was the task? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Physical Demand**  How physically demanding was the task? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Performance**  How successful were you in accomplishing what you were asked to do? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Frustration**  How insecure, discouraged, irritated, stressed and annoyed were you? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Visual Fidelity**  How would you rate the quality of the environment visually? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low Very High |
| **Audio Fidelity**  How would you rate the quality of the sounds and audio you experienced? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Interactivity**  Did you find that the environment was easily intractable and movement within the environment came to you easily? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Easy Hard |
| **Correspondence Fidelity**  How well do you think the simulation mimicked your movements and interactions in the world? | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Realistic behaviour**  **How realistic did you think objects in the environment behaved?** | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very unrealistic Very realistic |
| **Heat simulation**  Did you feel any change in temperature as you progressed through the environment? | No  Yes |
| **Overall Immersion**  How would you rate your overall immersion in the simulation? (Did the *environment* of the simulation feel realistic?) | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |
| **Overall Presence**  How would you rate your overall presence in the simulation? (did you feel like a realistic *participant* in the virtual world?) | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   Very Low VeryHigh |