# CS4099 - Nintendo Wii Over IP

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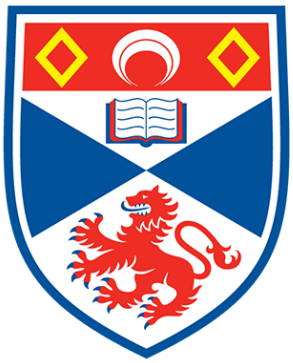

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# Abstract

The Nintendo Wii is well-known for its innovative, motion-based controls and engaging, family-friendly games such as Mario Kart Wii. Despite its hardware limitations compared to modern consoles, its local multiplayer experiences have cultivated a devoted following. However, with the rapid shift toward online gaming, recreating the Wii's in-person, split-screen experiences has become increasingly challenging. This project proposes a solution that vitalises the Wii's input and output interfaces, enabling remote players to enjoy an experience that mirrors local multiplayer gaming.

The approach centres on two key components. First, video and audio streaming techniques capture the Wii's outputs and deliver them to remote devices using low-latency protocols. This ensures fluid gameplay and preserves the authenticity of the original experience. Second, a novel controller input relay system transmits Wiimote signals, including motion and button inputs, over a network. This system addresses challenges such as Bluetooth communication, network variability, and precise synchronisation between audiovisual and control data, ensuring real-time responsiveness.

By bridging the gap between traditional local multiplayer and modern online connectivity, this project extends the life of a beloved console while revitalising classic gaming experiences. Furthermore, it establishes a framework for adapting retro systems to contemporary, distributed gaming environments. The work not only preserves the social and communal essence of local play but also offers broader implications for making nostalgic gaming experiences accessible to players across geographically separated locations.

# Declaration

I declare that the material submitted for assessment is my own work except where credit is explicitly given to others by citation or acknowledgement. This work was performed during the current academic year except where otherwise stated.

In submitting this project report to the University of St Andrews, I give permission for it to be made available for use in accordance with the regulations of the University Library. I also give permission for the report to be made available on the Web, for this work to be used in research within the University of St Andrews, and for any software to be released on an open source basis.

I retain the copyright in this work, and ownership of any resulting intellectual property.

# Acknowledgements

I would like to thank our supervisor Dr Ton Spink for his encouragement, support and counsel throughout my Senior Honours project. We would also like to thank . Finally, I would like to thank the School of Computer Science's Systems Team for their continuous help.

# Contents

# Introduction

# Context Survey

# Requirements Specification

The system is designed to virtualize the Nintendo Wii's local multiplayer experience, adapting it for remote play while retaining the console's authentic appeal.

**Functional Requirements:**

- **Video and Audio Capture and Streaming:** The system shall capture the Wii's video and audio outputs and stream them to remote players with minimal latency. This functionality is critical to preserve the fluid, immersive experience typical of classic Wii titles.
- **Controller Input Relay:** The solution must reliably capture and transmit Wii Remote inputs—including motion data and button presses—over a low-latency network connection. This bi-directional communication is essential for maintaining the real-time responsiveness expected in interactive gameplay.
- **Synchronization:** To ensure a seamless gaming experience, audiovisual data and controller inputs must be synchronized. The system should adjust for network variability and maintain precise timing to replicate local multiplayer dynamics.

**Non-Functional Requirements:**

- **Performance:** The system must operate under strict low-latency conditions to minimize delay and jitter. Efficient processing and optimized data streaming protocols are required.
- **Reliability and Robustness:** The solution should tolerate variations in network quality, ensuring continuous, stable operation even under less-than-ideal conditions.
- **Usability:** An intuitive interface and straightforward setup process should be provided, enabling users to connect and enjoy games with minimal technical intervention.
- **Evaluation:** Comprehensive testing in real-world environments is necessary. Both quantitative performance metrics and qualitative user feedback will be gathered to assess the overall experience.

# Implementation

# Evaluation

## 5.1. Challenges and Solutions

## 5.2. Limitations

## 5.3. Reflection and Future Work

# Conclusion

# A. Ethics Approval Form

UNIVERSITY OF ST ANDREWS
TEACHING AND RESEARCH ETHICS COMMITTEE (UTREC)
SCHOOL OF COMPUTER SCIENCE
PRELIMINARY ETHICS SELF-ASSESSMENT FORM

This Preliminary Ethics Self-Assessment Form is to be conducted by the researcher, and completed in conjunction with the Guidelines for Ethical Research Practice. All staff and students of the School of Computer Science must complete it prior to commencing research.

This Form will act as a formal record of your ethical considerations.
Tick one box

- ☐ **Staff Project**
- ☐ **Postgraduate Project**
- ☒ **Undergraduate Project**

Title of project

Nintendo Wii over IP

Name of researcher(s)

Kieran Fowlds

Name of supervisor (for student research)

Dr Tom Spink

OVERALL ASSESSMENT (to be signed after questions, overleaf, have been completed)

Self audit has been conducted **YES** ☒ **NO** ☐

There are no ethical issues raised by this project

Signature Student or Researcher

Print Name

Kieran Fowlds

Date

26/09/2024

Signature Lead Researcher or Supervisor

Print Name

Dr Tom Spink

Date

30/09/24

This form must be date stamped and held in the files of the Lead Researcher or Supervisor. If fieldwork is required, a copy must also be lodged with appropriate Risk Assessment forms. The School Ethics Committee will be responsible for monitoring assessments.

Computer Science Preliminary Ethics Self-Assessment Form

**Research with secondary datasets**

Please check UTREC guidance on secondary datasets (https://www.st-andrews.ac.uk/research/integrity-ethics/humans/ethical-guidance/secondary-data/ and https://www.st-andrews.ac.uk/research/integrity-ethics/humans/ethical-guidance/confidentiality-data-protection/). Based on the guidance, does your project need ethics approval?

**YES** ☐ **NO** ☒

** If your research involves secondary datasets, please list them with links in DOER.*

**Research with human subjects**

Does your research involve collecting personal data on human subjects?

**YES** ☐ **NO** ☒

If YES, full ethics review required

Does your research involve human subjects or have potential adverse consequences for human welfare and wellbeing?

**YES** ☐ **NO** ☒

If YES, full ethics review required
For example:
Will you be surveying, observing or interviewing human subjects?
Does your research have the potential to have a significant negative effect on people in the study area?

**Potential physical or psychological harm, discomfort or stress**

Are there any foreseeable risks to the researcher, or to any participants in this research?

**YES** ☐ **NO** ☒

If YES, full ethics review required
For example:
Is there any potential that there could be physical harm for anyone involved in the research?
Is there any potential for psychological harm, discomfort or stress for anyone involved in the research?

**Conflicts of interest**

Do any conflicts of interest arise?

**YES** ☐ **NO** ☒

If YES, full ethics review required
For example:
Might research objectivity be compromised by sponsorship?
Might any issues of intellectual property or roles in research be raised?

**Funding**

Is your research funded externally?

**YES** ☐ **NO** ☒

If YES, does the funder appear on the 'currently automatically approved' list on the UTREC website?

**YES** ☐ **NO** ☒

If NO, you will need to submit a Funding Approval Application as per instructions on

the UTREC website.

**Research with animals**

Does your research involve the use of living animals?

**YES** ☐ **NO** ☒

If YES, your proposal must be referred to the University's Animal Welfare and Ethics Committee (AWEC)

University Teaching and Research Ethics Committee (UTREC) pages
http://www.st-andrews.ac.uk/utrec/