

# Senior Design Proposal

Group Name: Project SD (Sudden Death)

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## 1 Introduction

We currently utilize advanced sports metrics because they provide in-game productivity and measurements. They allow us to predict player performances, highlight strengths and weaknesses, and in general provide objective ways of consuming sports media coverage.

There is an increasing interest in eSports (that is, electronic sports). League of Legends and DotA 2 are two massive online multiplayer video games with millions of viewers and participants around the world. Both of these games have been updated to include an in-client way to watch competitive matches that shows live statistics in an infographic in order to enhance the viewing experience. Additionally, there is an even more in-depth version of this available to commentators so they can provide the best analysis possible.

Super Smash Bros Melee currently has no in-client method for tracking statistics. Since there is no means to see statistics as the match happens, viewers do not have a good method for digesting the match in front of them through relevant statistics and that commentators cannot offer the highest quality of analysis possible. Despite this need, Nintendo has no desire to patch a game that is operated on a console that is 15 years old--almost three generations old.

In fact, Melee currently has a thriving and ever-growing competitive following even with Nintendo's disinterest in its own game. The Evolution Championship Series (EVO) 2016 SSBM tournament had 2,350 entrants and a peak of 232,900 viewers on the video game broadcasting website Twitch. EVO has been televised on ESPN2, with roughly 2 million unique viewers and 201,000 peak concurrent viewership for EVO 2016 finals (not including the Twitch numbers). These numbers for each platform are comparable to a regular season baseball game broadcast on the MLB network, which averages 260,000 viewers for regular season games.

Although Major League Baseball games broadcast on other networks typically garner more viewers, the comparison between two dedicated channels like Twitch and the MLB network demonstrates incontestable interest in a specific sport, or in this case, eSport. While Melee is an order of magnitude below major sports in viewership, it is clear that the community is not to be ignored.

SD stands for Senior Design but also refers to a player who has committed suicide on the battlefield: sudden death.

## 2 Problem Description

Since Melee has no built-in way to see match statistics as a competitive match happens, viewers and commentators alike are hindered. This is the case because the statistics recorded by the game engine are mostly trivial--who killed who, how much damage a character dealt total--and are only presented at the end of a match.

There is also a list of small "awards" handed out to each player. These clearly involve a game functionality of keeping track of statistics such as whether a player used a certain move

repetitively or survived a long time when close to death, but there is no way in the game to see the detailed statistics behind these awards. If this information is being tracked, there must be a way to extract and interpret it.

## 3 Proposed Solution

Our understanding of how a GameCube games works is the following: There are two inputs in the form of the game disc and the user controller. The GameCube microprocessor interprets these inputs and provides three outputs: a visual form, audio, and memory. We want to grab information that is being temporarily sent to memory during the match and interpret it.

A user that goes by the name “Fizzi” posted on SmashBoards.com about a year ago that he utilized a breakout board that can be inserted into the the memory card slot to interact with an SPI-like device in a Wii in order to read the information that the game is transmitting in real time. It measures the electrical signals that the game is transmitting through the microprocessor of the Wii.

For our project, we want to create a similar device that extracts information in a similar way to “Fizzi”, and then outputs the information on a Wi-Fi chip so that it can be viewed live on a website. We will have to then interpret the data and display it in a user-friendly format. We will be using the GameCube instead of the Wii since it will be more relevant to competitive Melee tournaments.

## 4 Demonstrated Features

- Ability to extract game data
- Program
  - Interprets the information
  - Puts it in a readable form
  - Passes information to a WiFi chip
- Website
  - Live infographic (statistics that are happening in real time)
  - User interface to be able to pick and choose what to see
  - Archive of past matches.
- Statistics that we might try to demonstrate in May:
  - Which moves were used to deliver knockouts and how often
  - Hit percentage with a certain move
  - Hit percentage over time, or a over a given time
  - Most importantly: all this information in real time.
  - Percentage success rate of certain advanced techniques used in competitive play

## 5 Available Technologies

The technologies that we are looking to use and the cost of these technologies are listed below.

Memory card breakout board ~ \$7.50  
FPGA ~ \$50  
Wi-Fi chip ~ \$5  
GameCube ~ \$40  
Domain ~ \$10/year (assume 1 year)  
Total estimated cost: ~\$112.50

This leaves additional budget for add ons or unexpected expenses. This way, if we find any additional features that become feasible we will be able to accommodate those ideas. On the other hand, if we find that certain features need more advanced technologies we can purchase more.

## 6 Engineering Content

The Gamecube communicates with the memory card via a 27 MHz EXI bus. The EXI protocol is similar to an SPI protocol. We need to utilize hardware (most likely a breakout board from the memory card slot) that can read this EXI bus. Subsequently, we will need to program a microcontroller (potentially an FPGA) that takes this information from the device that reads the EXI bus outputs and then shows this information in a digestible format. For testing at this stage, we will need to potentially output the data we acquire to a text file or a terminal window. Then, we will need to connect a wifi transmitting chip to our microcontroller. Once successfully configure this, we will then send then information over this chip to a website. Another engineering challenge at this stage will be the creation of a website that receives the data, displays it, and has a functional GUI for users to interact with the data.

## 7 Conclusions

- Feasible
  - A proof of concept already exists for this project.
- Affordable
  - We are significantly under budget at first appraisal.
- Concerns
  - Interpreting data
  - Data storage
  - Finding appropriate information challenging
  - Time consuming