



# CSEE W4840 Embedded Systems

## Project Proposal

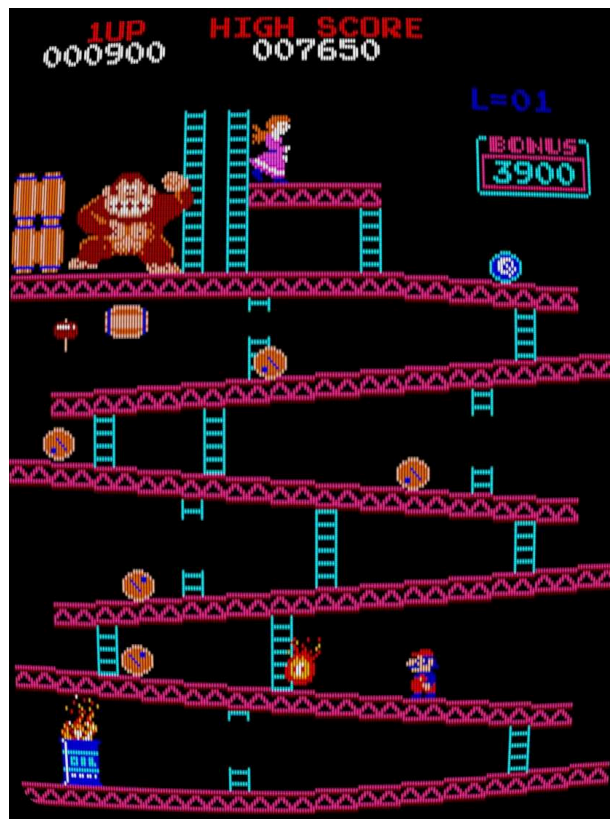


Ines Khouider(ik2512), Sean Stothers(sps2308), Ania Krzyżańska (ark2219)

### Overview:



Our goal is to recreate the 1981 Nintendo arcade game Donkey Kong using the FPGA. The general idea is to implement the basic game mechanics, with the player controlling the display of the mario character using the keyboard or some kind of controller and the environment (i.e. the barrels and fire sprites) causing mario to lose a life. We also plan to incorporate the audio of the game corresponding to the different stages of gameplay.



### Hardware-Software Interface




The hardware side would have the sound control and screen display. It will take an input of sound state to know what sounds to play, as well as an input of location of the graphics. We will also have constantly running background music. We would also send commands from the key peripherals to know what actions the player wants Mario to perform.




The software side would have the status of the game and use input to execute game logic. It would know where Mario is on the map, and would be able to convert from keyboard commands to actions Mario can take.

The communication would happen using the memory that the software would write to. The hardware would read what graphics it needs to display in turn.

## Peripherals

- Display: Computer Monitor 
  - Update display of Mario character with controller input
  - Moving display of barrels to be avoided
  - Background display of platforms and ladders to “walk” on
  - Update point count displayed each time you jump over a barrel
- Speaker
  - This will take audio data and play it
- Keys
  - The players will use this to play the game. We are either going to use the keys on the keyboard or keys in a joystick

## Major Tasks and Challenges

- Design Decisions 
  - Framerate
  - Speaker frequency
  - Memory and memory representation of the graphics and states
- Implement control of Mario’s movement and how he interacts with the environment
  - dying when hit by a barrel, being able to stand on platforms and climb up on ladders, etc.
  - Knowing what part of the map Mario is in
- Implement a dynamic background 
  - Barrels periodically rolling down the ramps
  - include fire sprites that appear and cause damage
  - Mitigating lag
  - Smooth animation of the smaller pieces such as Mario’s hammer and the spinning barrels
  - Ensuring hardware storage of graphics
- Implement audio 
  - Music to indicate the start of the level and completion of the level
  - Background music throughout the course of the level
  - Music that plays when Mario dies
  - Converting the music to the speaker peripheral