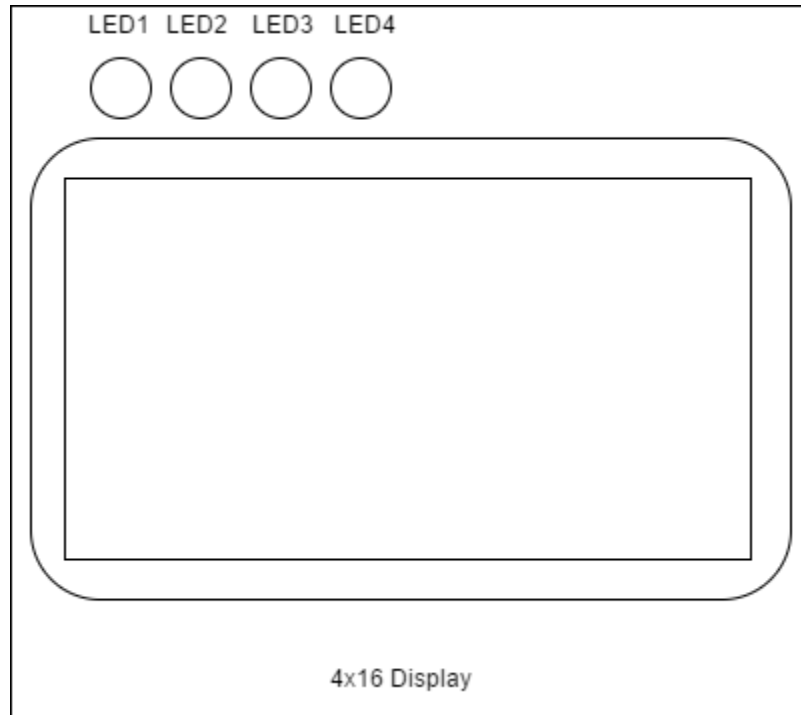# ENEL 387 – Project Functional Specification

Feb. 13, 2017
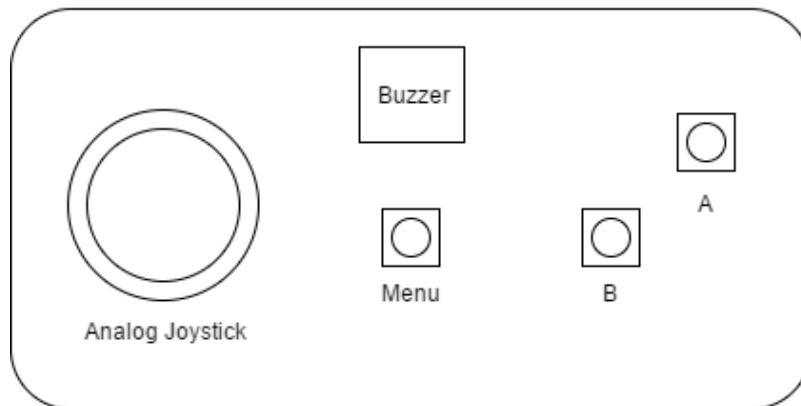
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Tiny Game Console – Functional Specification Document

LED1 LED2 LED3 LED4

4x16 Display

Controller Prototype

Buzzer

A

Menu

B

Analog Joystick

Overview:

The Tiny Game Console is a device capable of running multiple basic video games. At the core of the device is the STM32F100RB micro-controller, and the device comes with a basic controller with an analog stick, two buttons, a menu button, and a buzzer for audio cues. Games run on a 4x16 text display, with games also making use of four LEDs to display the game status to the player. When the system starts, the user is greeted with a menu to pick between available games, and at any point during a game, the user may choose to return to the menu and select a different game to play.

Block Diagram:
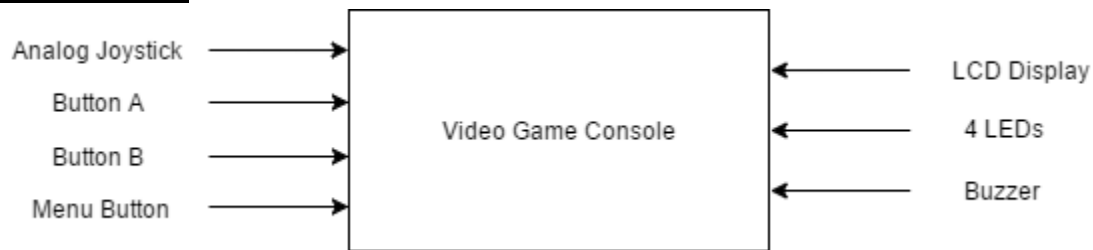
System Inputs:

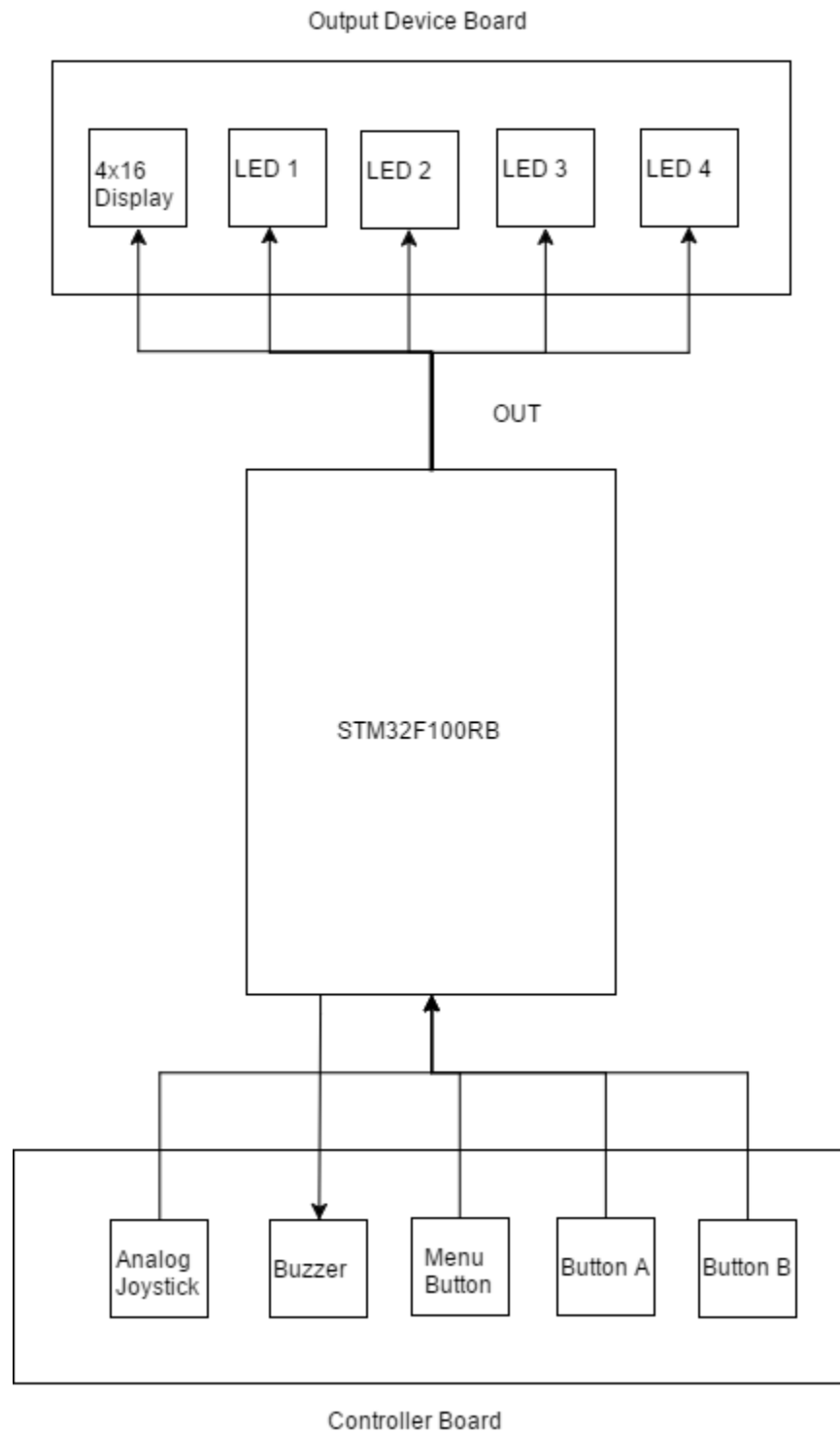The following is a list of inputs available to users of the system, and their purpose:

- Analog Joystick
  - The analog joystick provides movement and selection capabilities. With it, the user may navigate through the interface and select games. Different games can use the joystick differently (e.g. character movement, option selection)
- Button A and Button B
  - Buttons A and B are general purpose user buttons. In general, A is used to 'accept' an action, and B is used to 'cancel' an action. Within a game, these buttons may be bound to different operations depending on game controls.
- Menu Button
  - The menu button serves to allow the user to return to the main menu and select games. Returning to the menu can be done from any game, at any point in the game.

System Outputs:

The following is a list of outputs available to the system, and their purpose:

- LCD Display
    - The 4x16 text display is the main output of the system. It is the primary device that users use to interact with the menu and various video games. Different video games can use the device differently, and each may have its own user interface.
- 4 LEDs
    - The 4 LEDs complement the LCD display by providing additional information to the user during gameplay. Different games may implement usage of these LEDs differently, with features such as displaying remaining player health, or flashing when a round ends.
- Buzzer
    - The buzzer is a form of basic audio output from the system. It provides the user with different cues depending on the game played. For example, it may alert the user when they take damage, or when a round completes, accompanied by visual cues from the LEDs and LCD display.

Physical System Hardware Diagram:

Output Device Board

| 4x16 Display | LED 1 | LED 2 | LED 3 | LED 4 |

OUT

STM32F100RB

| Analog Joystick | Buzzer | Menu Button | Button A | Button B |

Controller Board

System Functions:

- **The system displays a splash screen during boot**
  - A splash screen identifying the system's name, author, and version will be displayed for several seconds to the user prior to the main menu. This screen is only displayed during the initial boot, and not when switching games.
- **The system boots to the Main Menu**
  - The entry state of the system after the splash screen is always the main menu, from which the user can begin interacting with the system.
- **The user may select one of three games in the menu, with navigation controls provided on the screen**
  - A list of games and controls are shown on the screen, allowing the user to select a game from the list of games that the system supports.
- **Game 1 – Snake clone**
  - The user may play a clone of the game snake, in which the analog stick allows for the user to move the head of the snake, and the goal is to avoid obstacles while collecting tokens. Once a certain number of tokens is collected, or the player hits an obstacle or the edge of the screen, the game ends, at which point the user is given the option to begin a new round of the game.
- **Game 2 – Tic-Tac-Toe**
  - The user may play a game of tic-tac-toe. The user plays vs. an AI with a randomly selected turn order. Standard rules of tic-tac-toe apply, and once a game is deemed finished, the user is given the option to begin a new round of the game. The analog stick in this game allows the user to select which cell to place their icon in.
- **Game 3 – Connect Four**
  - The user may play a game of connect four. The user plays vs. an AI with a randomly selected turn order. Standard rules of connect four apply, and once a game is deemed finished, the user is given the option to begin a new round of the game. The analog stick in this game allows the user to select which cell to place their icon in.

- **At any point, the user can press the Main Menu button to return to the main menu screen.**
  - The system allows the user to preemptively exit any game and return to the main menu to select another game. This can be done from any game, during any time in a game.

Basic System State Diagram:

Main Menu pressed

Game 1
Snake

Main Menu pressed

user choice

Splash

Main Menu

Game 2
Tic-Tac-Toe

~2s timer expires

user choice

user choice

System Reset

Game 3
Connect Four

Main Menu pressed