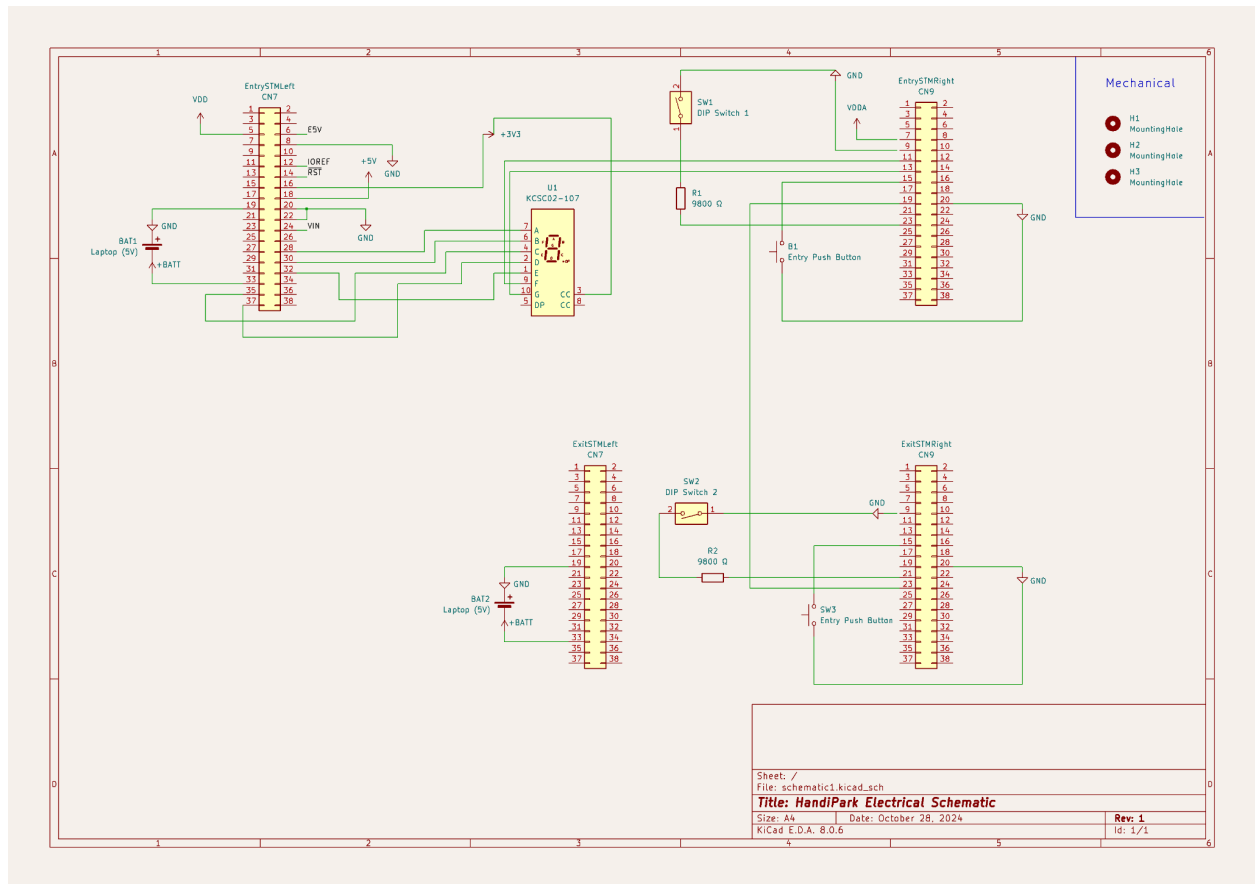


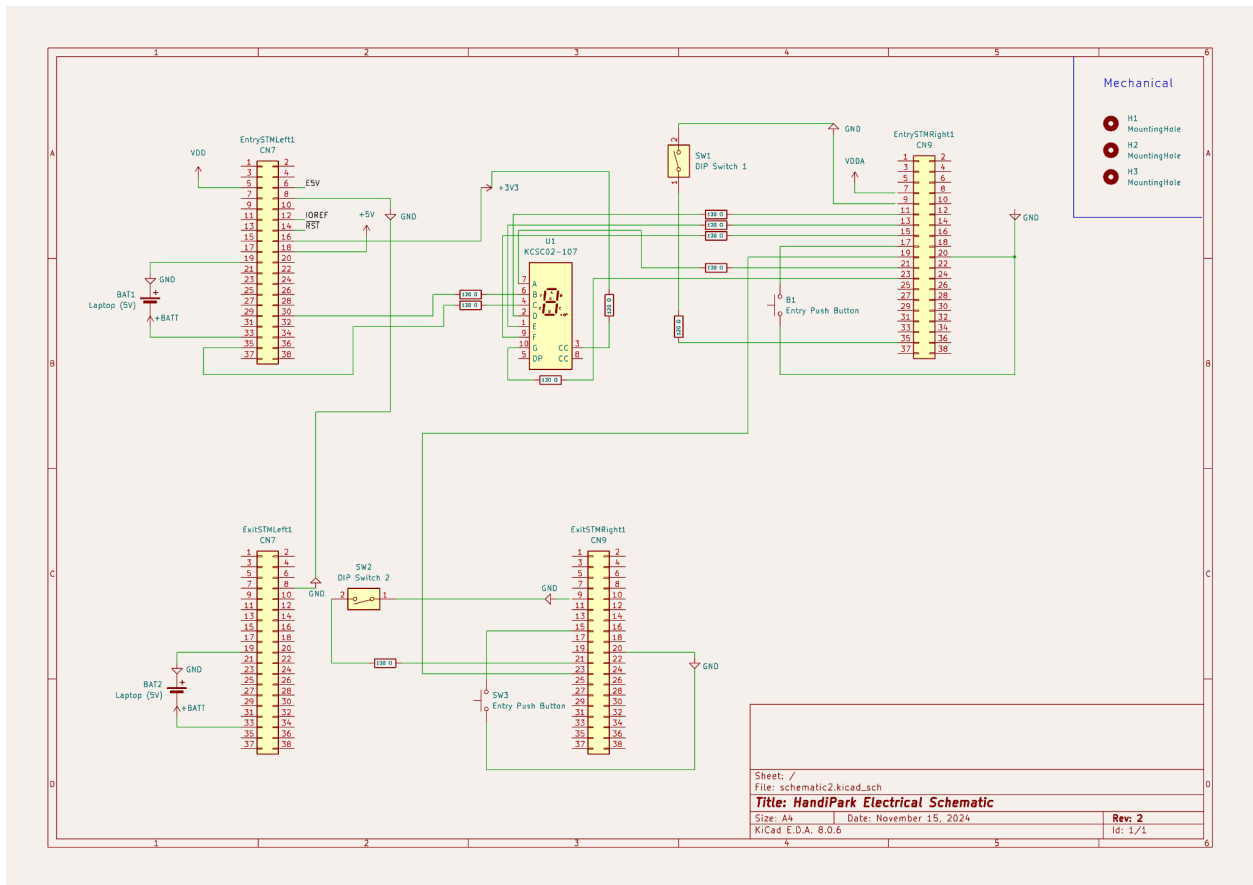
# HandiPark - Design Process Overview

Section : 002  
Group : 5  
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Date : November 27, 2024  
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## Electrical Schematics:

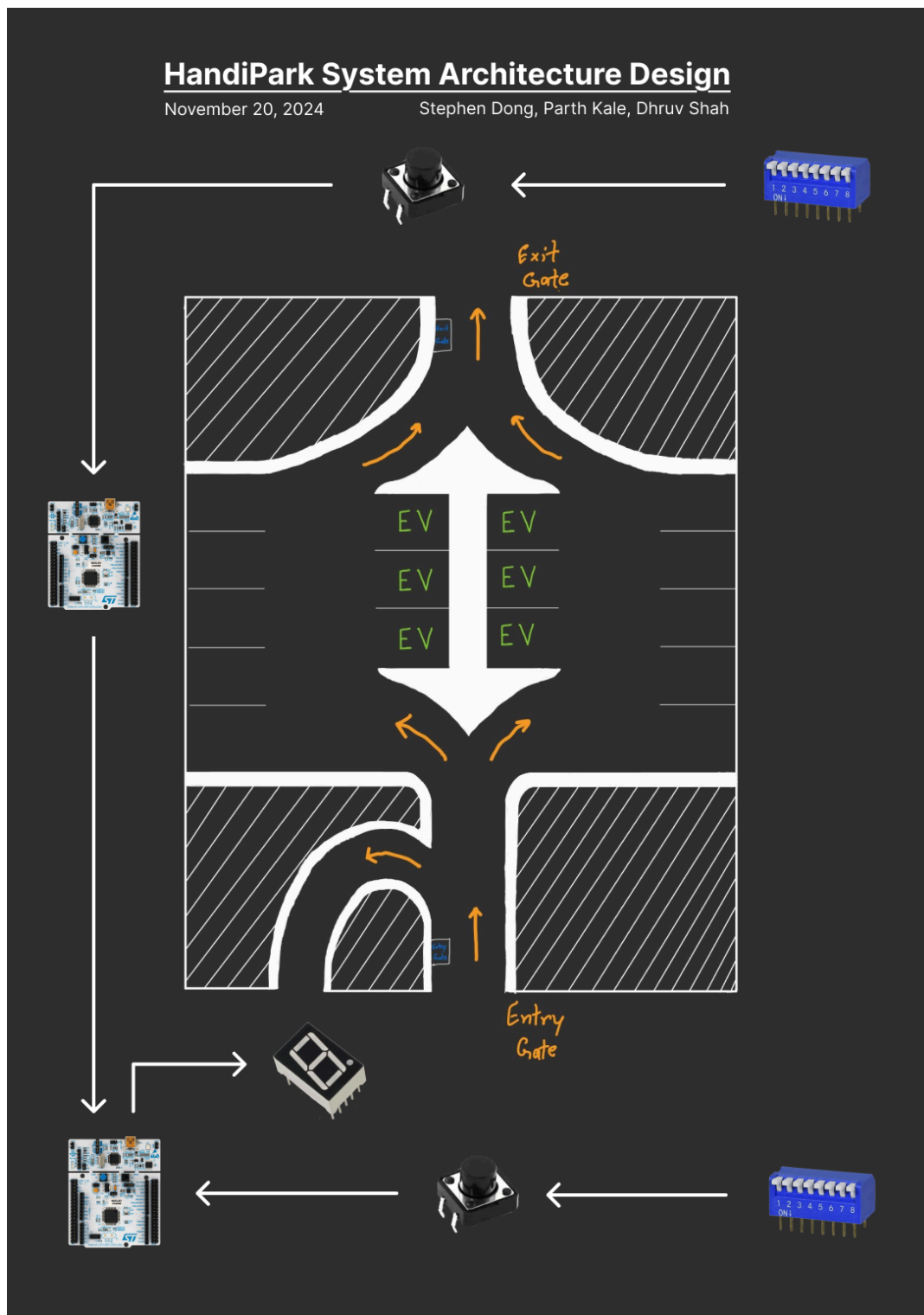
### Rev #1:





## System Architecture Drawing

Rev #1:



## Revision Explanation:

### Electrical Schematic:

October 28, 2024

Rev #1:

- **STM32F401RE Microcontroller:**
  - Two STM32 boards are shown, each powered via a 5V supply (battery/computer).
  - Communication between the boards is facilitated by a USART wire (labelled as 1m long).
- **Buttons and Switches:**
  - Entrance Button: Connected to PA7/PA8 pins of the STM32 for user input at the parking entrance.
  - Exit Button: Connected similarly to PA7/PA8 on the second STM32 board for user input at the parking exit.
  - Handicap Switches: Two switches (one for handicapped and one for non-handicapped parking) connected to the STM32, likely to direct vehicles based on parking type.
- **Seven-Segment Display:**
  - A seven-segment display (X2) connected to each STM32 is used to show parking-related data (e.g., available spaces).
  - The data lines for the display are connected through several GPIO pins.
- **Resistors:**
  - Pull-down resistors (9.8kΩ) are included for each button and switch to ensure a stable signal when they are not pressed.
- **Power Supply:**
  - Both STM32 boards are powered by 5V, supplied from a USB or external source.

November 15, 2024

Rev #2:

### Key Changes & Improvements:

- **Resistor Values:**
  - All resistors in this version are standardized at 120Ω, as explicitly labelled, whereas the previous schematic used 9.8kΩ pull-down resistors.
  - This reflects a design optimization or a change to meet the requirements of the attached components, especially for the Seven-Segment Display).
- **Seven-Segment Display Connection:**
  - The wiring for the seven-segment display is clearly outlined, with resistors added to each segment (a, b, c, d, e, f, g). This change ensures appropriate current limiting for each segment, protecting the LEDs in the display.
- **Input Devices (Push Buttons and DIP Switches):**
  - DIP switches are introduced in this design, replacing the simple handicap switches in the earlier schematic. These provide configurable input for handicapped and regular parking spaces.
  - DIP switches are connected to pins PA13 on the entry board and D12 on the exit board.
  - The push buttons remain in use but are shown more explicitly connected to pin D2 on the entry board, and D13 on the exit board.

- **Communication:**
  - The USART connection between the STM32 boards is now labelled as TX and TX at their respective ends, making it clearer which pins are used for transmitting and receiving data.
  - Communication with the laptops is labelled as USB Mini, indicating how the microcontrollers are connected to external systems for strictly power usage.

## **System Architecture Drawing:**

**November 20, 2024**

**Rev #1:**

- **At the Entry Gate:**
  - A user presses the push button to indicate their intention to enter.
  - If the DIP switch is toggled to handicap mode (on), the system reserves a disabled parking spot (# of handicapped spots decreases by one).
  - If the DIP switch is toggled to regular mode (off), the system reserves a regular parking spot (# of disabled spots decreases by one)
  - The STM32 updates the Seven-Segment Display to reflect the available parking count.
- **At the Exit Gate:**
  - A user presses the push button to signal exiting.
  - If the DIP switch is toggled to handicap mode (on), the system signals to increase the handicapped parking spot count.
  - If the DIP switch is toggled to regular mode (off), the system signals to increase the regular parking spot count.
  - The exit STM32 communicates with the entry STM32 to update the parking spot count for either general or disabled spots.
- **Real-Time Spot Availability:**
  - The Seven-Segment display dynamically updates the number of available parking spots as vehicles enter and exit.
  - Users at the entrance can toggle the switch to see how many handicap and regular spots there are at any time but must flip back the switch to the spot they are occupying when entering.
- **Parking Spot Layout:**
  - EV Parking Spots: Electric vehicle parking zones are represented in the center.
  - General and Disabled Parking Spots: Areas outside the EV section, with disabled parking spots managed via the DIP switch and internal database.

**Git Merge #1:**

**November 12, 2024**

We established the functionality of the Seven Segment Display and wrote code that allows the Seven Segment Display to decrement by 1 whenever a button is pressed. The number will stop decrementing if the number reaches 0.

## **Git Merge #2:**

### **November 21, 2024**

We added the functionality of a switch which allows the user to select what type of parking spot they will take up. When the switch is flipped on, the user implies they will take a handicap parking spot and the Seven Segment Display shows the current number of handicap parking spots available (maximum of 8). When the switch is flipped off, the Seven Segment Display shows the current number of regular parking spots available (maximum of 8). When the button is pressed, the current number on the Seven Segment Display will decrement, indicating that one spot in the current mode has been taken up.

## **Git Merge #3:**

### **November 22, 2024**

In this merge, we added functionality of UART cable communication between the two boards that allows users at the exit board to press a button that increments whatever number is currently showing on the entrance Seven Segment Display.

## **Git Merge #4:**

### **November 22, 2024**

In this final merge, we added the full functionality of a switch and button breadboard system on the exit board. When the switch is flipped on at the exit board, the user implies they are vacating a handicap parking spot. Thus, the total number of handicap parking spots in the database will increase by 1 (up to a maximum of 8). When the switch is flipped off, the user implies they are vacating a regular parking spot. Thus, the total number of regular parking spots in the database will increase by 1 (up to a maximum of 8).

**Link to GitLab Repository (protected):**

[https://git.uwaterloo.ca/s58dong/ece198\\_2\\_5](https://git.uwaterloo.ca/s58dong/ece198_2_5)