Overview

Our project aims to create a captivating LEGO art piece depicting the Massachusetts Bay Transportation Authority (MBTA) map in the downtown Boston area, with added features to provide real-time information of the subway system. Through several LEDs spread throughout the map, this project visually represents the precise locations of trains within the MBTA network based on their most recent stop, offering commuters and enthusiasts an interactive and informative experience.

Key Components

- **Microcontroller - ESP-WROOM-32-N4**
  Core of the system that supports both Wi-Fi and Bluetooth connectivity.

- **LEDs – PL9823 RGB**
  Provides multi-color display of each train station and individually addressable.

- **Android Application**
  Acts as the primary interface for users, facilitating essential interactions with the art piece.

Custom PCB

Our custom PCB incorporates an ESP-WROOM-32-N4 microcontroller enabling Wi-Fi & Bluetooth connectivity, ensuring seamless interaction with the Android application and internet. It enables control of the individually addressable PL9283 LEDs and the MAX7219 LED dot matrix, and other electronic components to complete our final product.

Final Product

- **Over 1000 LEGOos**
  Hand placed on this 48in x 36in board.

- **16, 8x8 Dot Matrices**
  Daisy-chained into a long display used to display information related to the Boston transit system.

Hardware Block Diagram

- **Application Initial Setup**
  Download application

- **Application Utilities**
  Display functions to control the board (brightness, map mode, LED display)

- **PCB / Microcontroller**
  Receive messages from user application and APIs over Bluetooth and Wi-Fi

The user downloads the app, connects to the board via Bluetooth, inputs Wi-Fi credentials, and controls the various map functionality including changing the brightness, map mode, or LED display information.

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