# DUEN Air Hockey Table User Manual

Spring 2023 Cohort

# Software Overview

The RGB Matrix Game is a two-player game that utilizes an RGB matrix display and buttons for player interaction. The goal of the game is to reach a score of 7 before the opponent does. The game display shows the current scores of both players, and the players can increment their scores by pressing their respective buttons. It also includes a reset button to restart the game, which is located near the scoreboard.

## Hardware Requirements

To play air hockey, you will need the following components:
- 64x32 RGB Matrix Panel 3mm Pitch
- Arduino Mega (compatible with RGBmatrixPanel library)
- Three push buttons (one for each player and one for reset)
- Jumper wires
- Power supply for the RGB matrix panel and Arduino

## Wiring Instructions

1. Connect the RGB matrix panel to the Arduino board:
   - CLK pin of the panel to digital pin 11 on Arduino
   - OE pin of the panel to digital pin 9 on Arduino
   - LAT pin of the panel to digital pin 10 on Arduino
   - A, B, C, D pins of the panel to analog pins A0, A1, A2, A3 on Arduino, respectively
   - R1, G1, B1, R2, G2, B2 pins of the panel to digital pins 24, 25, 26, 27, 28, 29 on Arduino, respectively
2. Connect the push buttons to the Arduino board:
   - Player 1 button: Connect one terminal to digital pin 7 on Arduino and the other terminal to GND
   - Player 2 button: Connect one terminal to digital pin 3 on Arduino and the other terminal to GND
   - Reset button: Connect one terminal to digital pin 5 on Arduino and the other terminal to GND

3. Connect the power supply to the RGB matrix panel and Arduino.

## Software Setup
1. Install the RGBmatrixPanel library in the Arduino IDE:
    - Open the Arduino IDE
    - Go to Sketch > Include Library > Manage Libraries
    - Search for "RGBmatrixPanel" and install the library by Adafruit
2. Open the provided code in the Arduino IDE.
3. Upload the code to the Arduino board.

## Game Rules
1. The game starts with both players' scores set to 0, displayed on the RGB matrix panel.
2. Each player has a dedicated push button. Pressing the button increments the player's score by 1.
3. When a player scores a goal, their respective button needs to be pressed to increase their score.
4. The game continues until one player reaches a score of 7.
5. The current scores of both players are displayed on the RGB matrix panel during the game.
6. Pressing the reset button next to the scoreboard restarts the game with the scores reset to 0. It also switches to the title screen.

## Using the RGB Matrix Display
The RGB matrix panel is capable of displaying scrolling text and static text messages.
    - During the game, the panel displays the current scores of both players.
    - The text color goes through a rainbow gradient.
    - The text scrolls from right to left and wraps around when reaching the end.

## Troubleshooting

If you encounter any issues while running the RGB Matrix Game, consider the following:

- Double-check the wiring connections to ensure they are correct.
- Make sure you have installed the RGBmatrixPanel library correctly.
- Verify that you are using a compatible Arduino board.
- Check the power supply for the RGB matrix panel and Arduino.

*Note: This user manual provides a basic overview of Air Hockey. If you require further assistance or have specific questions, please consult the documentation of the RGBmatrixPanel library and the Arduino board you are using.*

## Software Documentation

The code for the scoreboard program uses the following libraries:

- RGBmatrixPanel.h
- string.h
- ezButton.h
- Stdlib.h

The program for the entire scoreboard runs in an entire loop. We have multiple helper functions that display the DUEN logo, initiate the score, and run the game.

# Air Hockey Table

## Materials
- Acrylic
- Wood
- Puck
- Goal
- Shop vacuum
- LED Strip
- Handles

## Acrylic Sheet
1. The extruded acrylic sheet is a 5' by 3' sheet with a 3/16" thickness from TAPS plastic.
2. With the protective sheet on, use a ⅛ size dulled out acrylic drill bit to drill holes into the acrylic 1.5 inches apart.
   a. Start at a slow speed. As the drill bit heats up, move to a medium speed.
3. Remove the protective sheet and use alcohol wipes to remove the residual dirt and wood scraps.
4. Use acrylic paint to paint the DUEN logo.
5. Place the acrylic on top of the wooden frame.

## Wooden Frame
1. Out of plywood
   a. For the inner frame
      i. Cut out 2 pieces of 34" by 3.5" wooden planks
      ii. Cut out 2 pieces of 60" by 3.5" wooden planks
   b. For the outer frame
      i. Cut out 2 pieces of 37" by 5" wooden planks
      ii. Cut out 2 pieces of 61" by 5" wooden planks

2. Center the corresponding smaller inner frame pieces with the smaller outer frame pieces leaving 1 inch from the top. Using wood glue, glue the corresponding pieces together.
3. Repeat step 2 with the larger pieces of inner and outer frame wood planks.
4. Allow for the wood glue to fully dry
5. To create the bottom wooden sheet, cut a 5' by 3' board from plywood
6. Using screws, connect the bottom plywood to the inner frame
7. Drill holes through the side of the frame to create holes for the buttons and shop vacuum hose. Choose the right diameter hole depending on the size of the button and hose
8. Create slits in the center of the 37" outer frame for the goal
9. Add 5 support pieces for the acrylic sheet to lay on inside the inner compartment of the air hockey table
10. Lay the acrylic gently into the air hockey table

## Puck

1. Using a 3D printer, print out [CAD file](CAD file) for puck

## Goal

1. Using a 3D printer, print out [CAD file](CAD file) for goal
2. This is a two piece goal due to the size restrictions of the 3D printer. If the 3D printer is large enough to print both parts, then combining the CAD files and doing one print is sufficient
3. Glue the two goal parts together
4. Attach a net to the hooks of the goal
5. Attach the goal to the ends of the air hockey table using epoxy

## Airflow

1. Insert the hose from the shop vacuum through the side of the air hockey table
2. Seal the edges of the hole with foam/styrofoam to prevent air from escaping the table

## Electronic Parts
1. Insert wiring, arduino, and LEDs within the inside compartment of the air hockey table

## Handles
1. Predrill screw holes slightly smaller than the diameter of the screw eye hooks through the sides of the frame, horizontally spaced 4" apart and vertically center halfway from the top and bottom of the frame
2. Insert screw eye hooks into the predrilled holes until threads are covered and hooks are vertically aligned
3. Cut four pieces of rope at about 12 inches
4. Wrap the rope around the screw eye hooks and connect the two ends of the rope together with super glue and hold together until dry
5. Bind the rope with a 3 inch piece of wire. Knot the wire together and superglue at the knot.

## Maintenance
1. To prevent splintering of the wood, use sandpaper to rough out edges and polyurethane spray to add a protective coating
2. Be very careful when handling the acrylic sheet. Acrylic can easily break when mishandled
3. If holes of acrylic are accumulating dust, re-drill holes to clear them out
4. Clean the acrylic surface with alcohol wipes to avoid scratching and denting
5. Regularly clear out the shop vacuum to prevent clogs and dust from building up
6. Unplug electronics when not in use
7. Store in a safe and dry area

# Materials Catalog

1. Electronics
    a. Buttons
    b. Power Supply Adapter
    c. LED Matrix Panel
    d. Power Supply Adapter Cord for Arduino
2. Air Hockey Table
    a. Acrylic Sheet
    b. Epoxy
    c. Brackets
    d. Shop Vacuum
    e. Wood
    f. Sandpaper
    g. Magnets
3. Accessories
    a. Gold Paint
    b. Purple Spray paint
    c. 12 ft extension cable
    d. Polyurethane spray
    e. White spray paint