**Snake Game Documentation**

**Introduction:** Snake Game is a classic arcade game where the player controls a snake that moves around the game field, consuming food items (apples) to grow longer. The objective of the game is to guide the snake to eat as much food as possible without colliding with the walls or its own body. The game can be played by one or two players simultaneously, and the players can compete to achieve the highest score.

1. **System Requirements:**
   * Linux-based operating system (tested on Debian)
   * C programming environment
   * MZ\_APO libraries for controlling the peripherals (LEDs, knobs, LCD display, etc.)
   * MZ\_APO microcontroller
2. **Game Components:** The Snake Game consists of the following components:
   * Game Field: The rectangular area where the snake and apples are displayed. The game field dimensions are 480 pixels (width) by 320 pixels (height).
   * Snake: The player controls a snake that moves within the game field. The snake grows longer as it consumes apples.
   * Apples: Food items that appear randomly within the game field. The snake must consume these apples to increase its length and score.
   * Score: The player's current score (left upper corner), which increases as the snake consumes apples.
   * Menu: The initial screen where the player can select the number of players and difficulty level.
   * LCD Display: The graphical display that shows the game field, snake, apples, and score.
   * LEDs: The row of LEDs that indicates the time remaining before a new apple appears.
3. **Code Structure:** The Snake Game code is structured into several functions, each responsible for a specific task. The main functions include:
   * **draw\_home\_page**: Displays the home page/menu screen where the player can select the number of players and difficulty level.
   * **draw\_game\_page**: Displays the game field and handles the game logic, including snake movement, apple spawning, collision detection, and scoring.
   * **draw\_pixel**: Draws a pixel at the specified coordinates with the given color.
   * **draw\_game\_menu**: Draws the game name and menu options on the screen.
   * **draw\_menu\_choice**: Highlights the currently selected menu option.
   * **draw\_players\_choice**: Displays the number of players selected.
   * **draw\_difficulty\_choice**: Displays the difficulty level selected.
   * **draw\_game\_field**: Draws the game field on the screen.
   * **compute\_movement**: Determines the snake's movement direction based on the player's input.
   * **snake\_init**: Initializes the snake's initial position, length, and score.
   * **draw\_snake**: Draws the snake on the screen with the specified color and updates the score display.
   * **redraw\_snake**: Moves the snake in the specified direction, checks for collisions, and updates the score.
   * **place\_apple**: Places a new apple randomly within the game field.
   * **print\_the\_end\_page**: Displays the end page with the result of the game (e.g., collision type, scores).
4. **Game Controls:** The game controls are based on the knob positions on the MZ\_APO board:
   * Knob 2 (Green): Controls the snake's movement direction for player 1. Menu navigation.
   * Knob 3 (Blue): Controls the snake's movement direction for player 2 (if two-player mode is selected).
   * Knob 1 (Red): End the game by clicking.
   * The knobs can be rotated in two positions (clockwise and counterclockwise) to change the snake's movement direction.
5. **Gameplay:**
   * On the home page, the player can select the number of players (1 or 2) and the difficulty level (easy, medium, hard, death) using the Green knob. The snake head indicates the current row, which can be changed by rotating the knob. Clicking the knob confirms the selection when the moving apple highlights the desired option.
   * Once the game starts, the snake(s) will appear on the game field, and an apple will be randomly placed.
   * Players control their respective snakes using the knobs. Rotating the knob clockwise changes the snake's direction clockwise, and rotating it counterclockwise changes the direction counterclockwise.
   * The snake(s) move continuously in the selected direction until they collide with the walls, themselves or the opponent’s snake.
   * The objective is to guide the snake(s) to eat the apples, which increases their length and score.
   * If a snake collides with the wall or itself, it results in a game over.
   * The game continues until at least one player has collided, and a "Game Over" screen will be displayed. Or until player gets the maximum avalible number of points (impossible).
   * The final scores of all players will be shown on the screen.
6. **Scoring:**
   * Each time a snake consumes an apple, its length increases, and the score is incremented.
   * The score is calculated based on the length of the snake.
7. **Game Over:**
   * When a game is over (at least one player has collided), a "Game Over" screen will be displayed.
   * The screen will show the result of the game, such as the collision type (wall collision, self-collision) and the final scores of all players.
   * Players can press any button to return to menu.
8. **Additional Features:**
   * Two-player mode: Allows two players to compete simultaneously on the same game field.
   * Difficulty levels: Provides different levels of gameplay challenge, affecting the snake's speed.
   * LED countdown: The row of LEDs indicates the time remaining before a new apple appears. The LEDs light up progressively to represent the countdown.
9. **Installation and Execution:**
   * Install the required MZ\_APO libraries and dependencies.
   * Compile and run the Snake Game code using a C compiler in the Linux environment (provided Makefile).
   * Ensure the MZ\_APO board is connected and functional. Check its IP, meaning counting the last row of the squares in binary.
   * Enter the address of the board to Makefile and simply write “make run” into the Terminal (while in project folder).
   * Use the knobs on the MZ\_APO board to control the snake(s) and menu during gameplay.

**Conclusion:** The Snake Game is an entertaining and challenging arcade game where players navigate a snake to consume apples while avoiding collisions. The game offers single or two-player modes, multiple difficulty levels, and a user-friendly interface using the MZ\_APO board. Enjoy playing the Snake Game and aim for the highest scores!