Extrapoint 2 - Quoridor Game

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1 Configuration of LandTiger Board

1.1 Timer usage

- **Timer 0**: This timer is utilized to implement the game timer.
- **Timer 1**: This timer serves as an auxiliary timer to introduce randomness in the NPC easy mode.
- **Timer 2**: This timer is employed to implement the waiting room functionality in twoboards mode.

1.2 Button Usage

- **INT0**: This button is used to start or restart the game. It also triggers the sending of a ping (`0xFF000000`) to the other board during initialization. However, it is disabled in other stages of the execution to prevent unintended interactions.
- **KEY1**: This button is employed to switch between modes: from moving player mode to wall placement mode and viceversa.
- **KEY2**: Enabled exclusively in the wall placement mode, in order to rotate the moving wall. In other modes, KEY2 remains disabled to avoid unwanted actions.

1.3 Joystick Usage

- **Navigation**: The joystick is used to navigate through menu selections (diagonal moves included).
- **Moving Player Pawn**: In moving player mode is controlling the pawn's movement. The direction of movement is determined by the joystick's tilt in the desired direction (diagonal moves included).
- **Placing Wall**: In wall placement mode, the joystick is used to control its movement.

1.4 Bouncing Management with Repetitive Interrupt Timer (**RIT**)

To address bouncing issues and facilitate joystick and buttons interaction, the Repetitive Interrupt Timer (RIT) is implemented.

1.5 CAN Controllers Usage

- **CAN Controller 2:** CAN2 controller is utilized for both sending and receiving data over the CAN BUS: data is trasmitted using CAN messages with an **ID** of **1**, and incoming messages are filtered based on the **ID**, set to **1**.

1.6 Timers/RIT/CAN Initialization

Table 1: *Timer and RIT initialization.*

Timer/RIT/CAN	Initialization Value
Timer 0	0x017D7840
Timer 1	0x3B9ACA00
Timer 2	0x00BEBC20
RIT	0x004C4B40
CAN	1000000 (Bd)

2 Further Implementations

2.1 NPC Difficulty Levels

- **Easy Mode:** The NPC's actions in easy mode are randomized to introduce an element of unpredictability. The decision to move the pawn or place a wall is influenced by a pseudo-random number generated using the timer (Timer 1). The function `srand(LPC_TIM1->TC)` is employed to seed the random number generator, ensuring varied NPC behavior.
- **Hard Mode:** In hard mode, the NPC employs a more strategic approach. It evaluates the **minimum distance**, in terms of the number of moves required to win, between both players. If the NPC's distance is shorter than that of the human player, the NPC opts to move its pawn. Otherwise, it strategically assesses the optimal position to place a wall. This evaluation includes iterating through possible wall positions on the board and calculating the resulting minimum distance between the players. The NPC aims to hinder the opponent's progress while maximizing its chances of victory.

2.2 **Waiting Room**

When both boards select the "Two Boards" board type and choose their respective player (human or NPC), a handshake message (`0xAA000000`) is sent via the CAN bus, serving as an indication that a board is ready to start the game.

At this point, a board enters the "waiting room", actively listening for the same handshake message from the other board. This synchronization ensures that both boards are prepared to initiate the game. After a brief duration, the INT0 button is re-enabled; this allows users the option to return to the initial menu.