

Project Proposal: Space Invader Game with 360-Degree Rotating Rocket

Project Overview

The Space Invader game allow the players to control a rocket to fend off waves of alien enemies and meteors using the touch screen as input. This project will leverage the embedded system concepts such as RNG, Timers, Interrupts/Schedulers, and the DAC for an engaging, interactive gaming experience with sound feedback.

Peripheral and Concept Utilization

1. **Random Number Generator (RNG):** The RNG peripheral will introduce unpredictability:
 - **Randomize Enemy Spawn Points:** Enemies will appear at random positions, keeping players on their toes.
 - **Vary Enemy Movements:** The RNS will randomize movement patterns, each enemy wave will feel different from one another, adding challenge and depth to gameplay.
2. **Timers:** Timers will be essential for managing game pacing and event timing, including:
 - **Scheduled Enemy Waves:** A timer will control the interval between enemy waves, with maybe frequency increase as the player progresses.
 - **Propulsion and Shooting Cooldown:** Timers will regulate forward propulsion and impose a cooldown on shooting, adding a layer of strategy to gameplay.
3. **Interrupts/Schedulers:** Interrupts and schedulers will enable efficient and responsive gameplay by managing touch and game events in real-time.
 - **Touch Screen Input:** Interrupts will process touch events, allowing the player to rotate, propel, and fire the rocket with minimal delay.
 - **Movement Scheduling for Enemies and Projectiles:** A scheduler will handle enemy and projectile movements, maintaining consistent game speed.

For peripheral we did not go over in class

1. **Digital-to-Analog Converter (DAC):** For the unused in class peripheral, I will be using the DAC peripheral to generate sound effects, adding an audio component like a piezo buzzer to the game for improved player engagement. Specific sounds include:
 - i. **Projectile Firing Sound:** A brief sound will play each time the rocket fires, providing instant feedback.
 - ii. **Enemy Hit Sound:** When a projectile hits an enemy, a distinct sound will play, rewarding successful actions.
 - iii. **Game Over Sound:** An alert sound will indicate the game's end, adding an auditory cue for the final screen.

2. **Using the Real-Time Clock (RTC):** The RTC peripheral can track real-world time and record in-game events, allowing for features such as session duration tracking, game history, and in-game timed events. The RTC can be useful for recording the precise timing of gameplay sessions and could enhance score keeping.
- i. **Session Duration Tracking:** The RTC can record the start and end times of a game session. When the game ends, I can display the exact elapsed time, giving players feedback on their session length and helping to assess a score base.
 - ii. **In-Game Timed Events:** The RTC can trigger special in-game events at specific intervals, such as increased difficulty over time or periodic enemy waves that makes the game harder as it progresses.

Project Goals

This Space Invader game will use a simple approach to implement each feature, ensuring well-documented, efficient code. Key project goals include:

- **Fully Interactive 360-Degree Rocket Control:** Touch input will allow the player to rotate, propel, and shoot with responsive, interrupt-driven controls.
- **Dynamic and Randomized Gameplay:** Utilizing RNG and timers, enemies will spawn and move unpredictably, making each game unique.
- **Audio Feedback or Real Time Clock:** The DAC will provide sound effects, enhancing user experience by offering immediate auditory feedback for actions and events or the RTC will keep the time in each stage and help control the game difficulties also associate time keeping with score.