

CSEE W4840 Project Proposal: Battle Tank Game

Team Name: Tank

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Overview

Our team proposes to build a classic video game named Battle Tank, which is a multi-directional shooter [video game](#).

The player, controlling a [tank](#), must destroy enemy tanks in each level, which enter the playfield from top-right and top-left corners. The enemy tanks attempt to destroy the player's base, as well as the human tank itself. A level is completed when the player destroys all enemy Tanks, but the game ends if the player's base is destroyed or the player loses all available lives. If the player wins, the player can go to the next level, which the enemy goes faster and have a higher IQ for attacking the base and yourself. And also, based on the different music, the background and the speed of enemy tank can be changed by the style of music.

Hardware and software specification

Hardware:

- Keyboard: This game use keyboard to generate the input data to control the tank.
- VGA driver: Display the game on the screen according to VGA graphical standard.
- DDR3 SDRAM: Use SDRAM to load/store the result of computation and data gained from the game.
- Audio sensor: This game use audio sensor such as microphone to get the sound signal and send it to the FPGA.

Software:

In this design, we need to implement following module in software by SystemVerilog:

- VGA display module

- Enemies' action module
- Defenders' action module
- Enemies' generation module
- Background sound effects module

Algorithm Description

This typical Battle Tank game has 2 modes – single player mode and double player mode. The double player mode can be two players using same keyboard or through Ethernet connection. The game follow the typical game rules and it comprises 3 levels based on game difficulties (i.e. No. and speed of opponents and map layout). The opponent tanks are randomly generated at the top-right and top-left corners. Besides, they are moving in random direction and shoot randomly. Furthermore, the obstructions in the map includes brick walls (can be destroyed by tank shots), steel walls (cannot be destroyed) and river (tank shots can pass trough it).

In summary, the game features are:

- USB keyboard control, capable of fast movement and shots.
- VGA graphic display using RGB color and simple 2D graphic effects for actions and scenes.
- Sound effects for shooting\moving\winning\died actions and background music.
- Three large scenes with interactive environmental objects.
- A simple algorithm for opponents routing plan.
- Multiple selection of game modes, including single player and double mode (single keyboard input, multi keyboard input through Ethernet (optional))

Timeline

Milestone 1

- Setup keyboard
- Setup VGA
- Setup Ethernet connection
- Design game rule
- Design algorithm for tank movements and shots

Milestone 2

- Create all game maps based on VGA
- Game rule description with C
- Implement the algorithm with FPGA
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Milestone 3

- Improve the interface
- Complete the integration of each part in milestone 2.
- Test the functionality of the entire program.