CSE115 Section 2
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-----------A Retro-Styled Space Invaders Game-----------

ABSTRACT:
This project involved programming a text based, retro styled, spaceship
shooting game created in the C programming language. This game runs in
the console and uses a spaceship that can fire away when the required
input is given. This is a beginner friendly game where basic concepts
like- character positioning, user input, basic animation, loops and
functions are used. Future development might include relaxing spaceship
movement, introducing enemy aliens and collisions between them.

INTRODUCTION:
Space Invaders was the first fixed shooter and video game with endless
gameplay to set the foundation for the genre. Being considered one of the
most influential games to the point of being a pop culture icon is
extraordinary. This program will offer a very simple text-based version
of this very well-known game that inspired endless gamers to code!

CODE IMPLEMENTATION:
The game is built with basic logic using C language. The main parts are-
I. Representing spaceship with the letter 'A' and bullet with '|'.
ii. Specifying position of the spaceship and the bullet.
iii. Making a key to trigger bullet.
iv. Creating a loop to print the bullet until it leaves the screen.
v. Redirecting cursor at the end of the play screen afterwards.

CODE BREAKDOWN:
How the program works step by step:
1. int: Stores integers.
2. scanf(): Takes input given by the user.
3. while(): With a starting point given and following an increment or
decrement, it Loops statement written within it as long as the condition
is true.
4. printf():Displays statement written within.
5. Sleep(): Uses windows.h library to print statement for mentioned
duration. Time is on milliseconds.

CODE EXPLANATION:
```
#include<stdio.h>
#include<windows.h>
int main()
   {int rowA=15,colA=15;
    int rowB=rowA-1, colB=colA;
    printf("\033[%d;%dH",rowA,colA);
    printf("A");
    int duration=2;
    char E; scanf("%c",&E);
    while(rowB>0)
```

```
        {printf("\033[%d;%dH",rowB,colB);
         printf("|\n");
         Sleep(duration*100);
         printf("\033[%d;%dH",rowB,colB);
         printf(" "); //adds a new line to eliminate buffering
         rowB--; //moves the bullet up by one row
    }
    printf("\033[%d;%dH", rowA + 1, 1);
    return 0;
}
```

Here:
-printf("\033[%d;%dH", rowA, colA); assigns spaceship 'A' a specific position by using ANSI escape code. The first %d detects row position and the later one detects column position. '\033' understands the variables mentioned are row and column respectively.
-scanf("%c", &E); waits for the player to press 'Enter' to print '|'.
-while(rowB >0); loops with a decrement 'rowB--' for the condition rowB>0 by assigning the bullet a new position 'rowB=rowA-1' over and over.
-Sleep(duration*100); holds the statement '|' for (2 * 100) = 200 milliseconds before assigning a new position and printing again.
-printf(" "); helps keep the movement from buffering.
-printf("\033[%d;%dH", rowA + 1, 1); repositions the cursor right below the spaceship 'A' by giving row 16 and column 1 by reading 'rowA+1' and '1' respectively.

RESULT AND DISCUSSION:
This program successfully prints 'A' at designated position. Basic shooting animation is seen while pressing 'Enter'. The bullet moves up gradually without major flickering.
Limitations:
1. Single Bullet Firing: Only one bullet can be fired at once.
2. Fixed Spaceship Position: As of now, the spaceship cannot be moved in any direction.
3. Windows Based Game: As it uses windows.h function, in macOS or Linux based system, the game may not run.

FUTURE IMPROVEMENT:
Here are some ways to improve the game:
- Add spaceship movement to move left, right, up and down respectfully.
- Add enemy aliens, and a scoreboard, make collisions to make the game more challenging.
- Make shooting multiple bullets at once possible.
- When an alien catches up to the spaceship, show 'Game Over'.

CONCLUSION:
This program successfully achieved basic user interaction, movement, shooting, animation using loops, functions, libraries and basic ANSI escape codes. This helps build the foundation for future developments.

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