



## FDF

*Summary: This project is about creating a simplified 3D graphic representation of a relief landscape.*

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# Chapter I

## Foreword

This is what Wikipedia has to say about **Ghosts'n Goblins**:

**Ghosts'n Goblins** is a platform game where the player controls a knight, named Sir Arthur, who must defeat zombies, ogres, demons, cyclops, dragons and other monsters in order to rescue Princess Prin Prin, who has been kidnapped by Satan, king of Demon World. Along the way the player can pick up new weapons, bonuses and extra suits of armor that can help in this task..

The game is often considered very difficult by arcade standards and is commonly regarded as one of the most difficult games ever released. The player can only be hit twice before losing a life (the first hit takes away Arthur's armor, and the player must continue on in his underwear until completing the level or finding replacement armor). If the player loses a life, he is returned to the start of the level, or the halfway point if he has managed to get that far. Furthermore, each life can only last a certain length of time (generally around three minutes), the clock being reset at the start of a level. If the clock does run out, the player instantly loses that life.

After defeating the final boss, but only with the cross weapon (if the player does not have the cross weapon, they will be prompted that it is needed to defeat the boss and restart at the beginning of level 5 and must repeat round 5 and 6 again regardless if the weapon is obtained immediately or not) for the first time the player is informed that the battle was a trap devised by Satan. The player must then replay the entire game on a higher difficulty level to reach the genuine final battle.

- Ports

Many conversions to home computers were produced by Elite Systems.

- The Commodore 64 version, released in 1986, is known for its music by Mark Cooksey, which borrows from Frédéric Chopin's Prelude No. 20. Due to the limited resources on the Commodore 64, it was somewhat different from the arcade version. It only features the Graveyard and Forest, The Ice Palace, The Floating Platforms and Firebridge and The Caves in that order. The player also starts the game with five lives. The demon that kidnapped the princess replaces Astaroth in the title screen. Additionally, the cyclops (or "Unicorn") is the boss of levels one to three and the dragon is the final boss.
- The version for Commodore 16/116 and Commodore Plus/4, also released in 1986 by Elite Systems, was even more limited than the C64 version. It was written to work on a Commodore 16, which had only 16 KB of RAM. Therefore, this version features only two levels and no music. In addition, the remaining two levels and the gameplay are simplified. For example, in the graveyard level, the attacking bird, the "plant monsters" and the winged demon are all missing from the C16 version, and there is only one weapon. The title screen features no graphics besides the stylised Ghosts 'n Goblins lettering.
- A version for the Commodore Amiga was released in 1990. While the advanced hardware of the Amiga allowed an almost perfect conversion of the arcade game, it failed to emulate the success of the Commodore 64 version. The player starts the game with six lives and no music is played unless the Amiga was equipped with at least 1 Megabyte of RAM. The standard configuration of an Amiga 500 was 512 Kilobytes.
- The NES version was developed by Micronics. This also serves as the basis for the Game Boy Color version, which uses passwords to allow the player to jump to certain levels. The NES version was ported to the Game Boy Advance as part of Classic NES series, but only in Japan.
- The NES version was also re-released for download for Nintendo's Virtual Console in North America on December 10, 2007 (Wii) and October 25, 2012 (Nintendo 3DS) and in the PAL region on October 31, 2008 (Wii) and January 3, 2013 (Nintendo 3DS) while the Wii U version was released in both regions on May 30, 2013. The arcade version was released on the Wii's Virtual Console Arcade in Japan on November 16, 2010, the PAL region on January 7, 2011 and in North America on January 10, 2011.
- Ghosts'n Goblins was also ported to the ZX Spectrum, Amstrad CPC, MSX, Atari ST, IBM PC compatibles, Game Boy Color, Game Boy Advance. The original arcade version of the game was also included in the compilation Capcom Generations Vol.2: Chronicles of Arthur for the PlayStation (in Japan and Europe) and Sega Saturn (in Japan only), which also contained Ghouls'n Ghosts and Super Ghouls'n Ghosts. The three games (based on their Capcom Generation versions) were later collected as part of Capcom Classics Collection. The game was also featured in the compilation Capcom Arcade Cabinet for the PlayStation 3 and Xbox 360.

- Reception

Computer Gaming World called Ghosts'n Goblins "an excellent example of what the [NES] can do ... while hardly groundbreaking, represents the kind of game that made Nintendo famous". Ghosts 'n Goblins was runner-up in the category of Arcade-Style Game of the Year at the Golden Joystick Awards. The NES version of Ghosts 'n Goblins was rated the 129th best game made on a Nintendo System in Nintendo Power's Top 200 Games list. It was also a best seller for the NES, selling 1.64 million units. Ghosts 'n Goblins is often cited as an example of one of the most difficult games of all time to beat, due to its extreme level of difficulty and the fact the player must play through the game twice in order to beat the game.

- Legacy

Ghosts'n Goblins was followed by a series of sequels and spin-offs eventually becoming Capcom's 8th best-selling game franchise, selling over 4.4 million units. Its sequels include Ghouls'n Ghosts, Super Ghouls'n Ghosts, and Ultimate Ghosts'n Goblins in addition to producing the Gargoyle's Quest and Maximo spin-off series. Though originating as an arcade title, the franchise has been featured on a variety of PC and video game consoles with the latest entries in the series, Ghosts 'n Goblins: Gold Knights, released on the iOS. Additionally, the franchise frequently makes cameo appearances—the character of Arthur in particular—in other Capcom titles, the latest of which being Ultimate Marvel vs. Capcom 3.



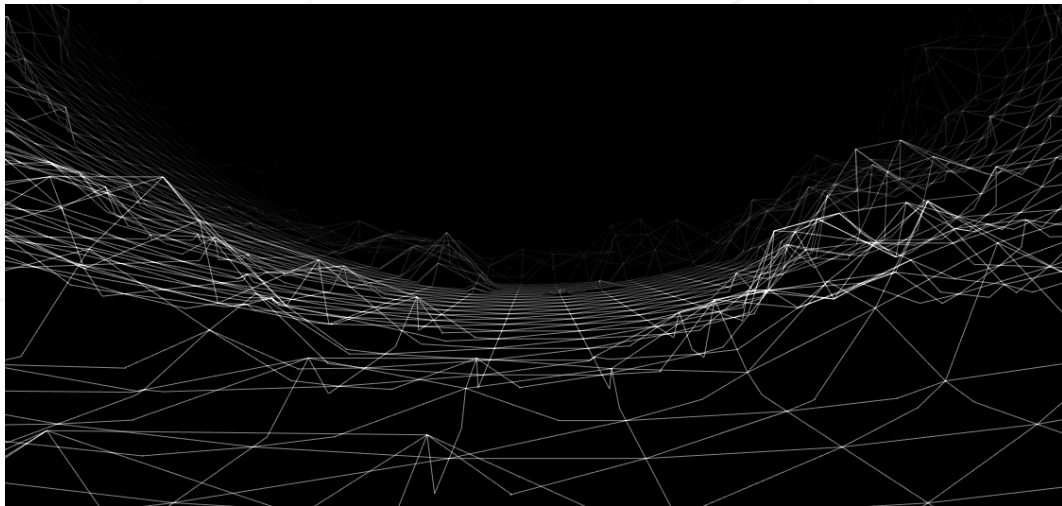
Figure I.1: Game's cover

# Chapter II

## Introduction

The representation in 3D of a landscape is a critical aspect of modern mapping. For example, in these times of spatial exploration, to have a 3D representation of Mars is a prerequisite condition to its conquest. As another example, comparing various 3D representations of an area of high tectonic activity will allow you to better understand these phenomenon and their evolution, and as a result be better prepared.

It's your turn today to modelize in 3D some magnificent landscapes, imaginary or not...



# Chapter III

## Objectives

In this project you will discover the basics of graphic programming, and in particular how to place points in space, how to join them with segments and most importantly how to observe the scene from a particular viewpoint.

You will also discover your first graphic library: `miniLibX`. This library was developed internally and includes the minimum necessary to open a window, light a pixel and deal with events linked to this window: keyboard and mouse. This project introduces you to “events” programming.

# Chapter IV

## Common Instructions

- Your project must be written in accordance with the Norm. If you have bonus files/functions, they are included in the norm check and you will receive a 0 if there is a norm error inside.
- Your functions should not quit unexpectedly (segmentation fault, bus error, double free, etc) apart from undefined behaviors. If this happens, your project will be considered non functional and will receive a 0 during the evaluation.
- All heap allocated memory space must be properly freed when necessary. No leaks will be tolerated.
- If the subject requires it, you must submit a **Makefile** which will compile your source files to the required output with the flags `-Wall`, `-Wextra` and `-Werror`, and your **Makefile** must not relink.
- Your **Makefile** must at least contain the rules `$(NAME)`, `all`, `clean`, `fclean` and `re`.
- To turn in bonuses to your project, you must include a rule **bonus** to your **Makefile**, which will add all the various headers, librairies or functions that are forbidden on the main part of the project. Bonuses must be in a different file `_bonus.{c/h}`. Mandatory and bonus part evaluation is done separately.
- If your project allows you to use your **libft**, you must copy its sources and its associated **Makefile** in a **libft** folder with its associated **Makefile**. Your project's **Makefile** must compile the library by using its **Makefile**, then compile the project.
- We encourage you to create test programs for your project even though this work **won't have to be submitted and won't be graded**. It will give you a chance to easily test your work and your peers' work. You will find those tests especially useful during your defence. Indeed, during defence, you are free to use your tests and/or the tests of the peer you are evaluating.
- Submit your work to your assigned git repository. Only the work in the git repository will be graded. If Deepthought is assigned to grade your work, it will be done after your peer-evaluations. If an error happens in any section of your work during Deepthought's grading, the evaluation will stop.



- This project will be corrected by humans only. So, feel free to organize and name your files as you wish, but within the constraints listed here.
- The executable file must be named `fdf`.
- You must submit a `Makefile`.
- You cannot use global variables.
- You **must** use the `miniLibX`. Either in the version that is available on the system, or from its sources. If you choose to work with the sources, you will need to apply the same rules for your `libft` as those written above.
- For your mandatory part, you are allowed to use the following functions:
  - `open`, `read`, `write`, `close`
  - `malloc`, `free`
  - `perror`, `strerror`
  - `exit`
  - All the functions defined in the `math` library (`-lm` and `man 3 math`)
  - All the functions defined in the `miniLibX` library.
- You are allowed to use other functions to complete the bonus part as long as their use is justified during your evaluation. Be smart!
- You can ask your questions on the forum, Slack, etc.

# Chapter V

## Mandatory part

This project is about creating a simplified graphic “wireframe” (“fils de fer” in french, hence the name of the project) representation of a relief landscape linking various points (x, y, z) via segments. The coordinates of this landscape are stored in a file passed as a parameter to your program. Here is an example:

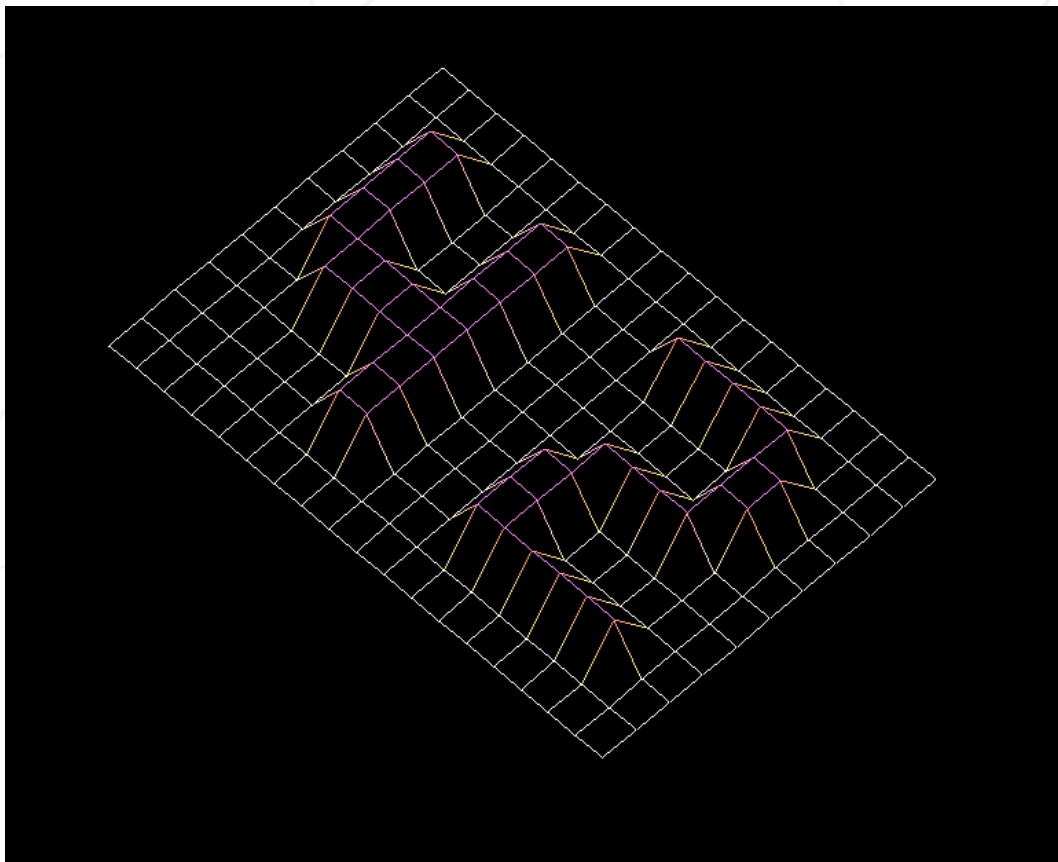
```
$>cat 42.fdf
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 10 10 0 0 10 10 0 0 0 10 10 10 10 10 0 0
0 0 10 10 0 0 10 10 0 0 0 0 0 0 0 10 10 0 0
0 0 10 10 0 0 10 10 0 0 0 0 0 0 0 10 10 0 0
0 0 10 10 10 10 10 10 0 0 0 0 10 10 10 10 0 0 0
0 0 0 10 10 10 10 10 0 0 0 10 10 0 0 0 0 0 0
0 0 0 0 0 0 10 10 0 0 0 10 10 0 0 0 0 0 0
0 0 0 0 0 0 10 10 0 0 0 10 10 10 10 10 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
$>
```

Each number corresponds to a point in space:

- The horizontal position corresponds to its axis.
- The vertical position corresponds to its ordinate.
- The value corresponds to its altitude.

If you execute your program `fdf` on this file, we should see something like this:

```
$> ./fdf 42.fdf
$>
```



Remember to make optimum use of your `libft`! The use of `get_next_line`, `ft_split` and `ft_getnbr` will allow you to quickly and simply read data from the file.

Remember that the goal of this project is not to parse maps! This doesn't mean that your program can crash when runned... it means that the map contained in the file will be properly formatted.

Regarding the graphic representation:

- Your `fdf` have to show the map using isometric projection.
- You must be able to quit the program by pressing `'esc'`.
- The use of `images` from `minilibX` is not required to validate the project, even we strongly encourage you to use them.
- Find attached a binary called `fdf` as well as the example `42.fdf` inside `fdf.zip`).



`man mlx`

# Chapter VI

## Bonus part

Usually we would encourage you to add you own original bonuses, but there are other graphic projects much more interesting waiting for you out there!! Don't get crazy here, move forward fast!

You will gain some extra points if you are able to:

- Include an extra projection (ex: parallel or conic) !
- It could be very nice to be able to zoom in and translate your map, no?
- What about rotating your map?

# Chapter VII

## Submission and peer correction

Submit your work on your `GiT` repository as usual. Only the work on your repository will be graded.

Good luck! :)