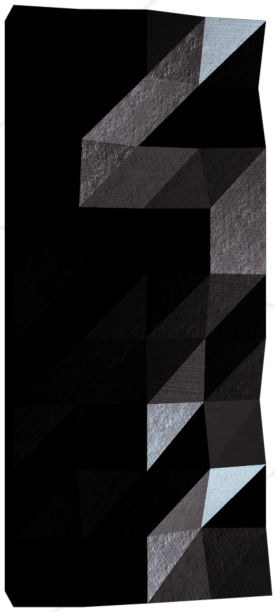

FDF

Wireframe model

Summary:
This project is about representing a landscape as a 3D object in which all surfaces are outlined in lines.

Version: 2

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Chapter I

Foreword

This is what *Wikipedia* says 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 wearing underwear until completing the level or finding replacement armor). If the player loses a life, they start all over again, or from the halfway point if they managed to get that far.

Furthermore, each life can only last a fixed duration (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: The game's cover

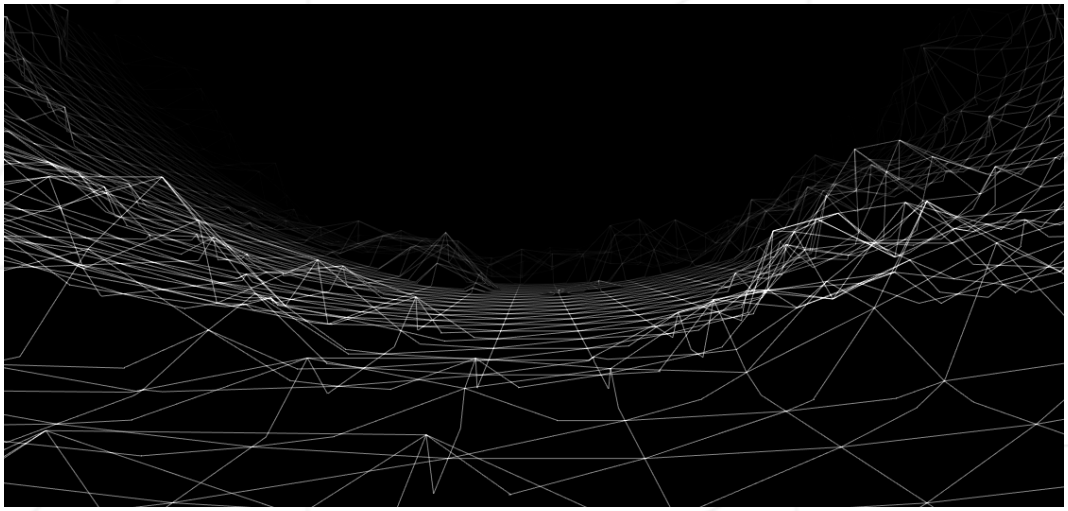
Chapter II

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 phenomena and their evolution, and as a result, be better prepared.

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



FDF is short for 'fil de fer' in French which means 'wireframe model'.

Chapter III

Objectives

It's time for you to create a basic computer graphics project!

You are going to use the school graphical library: the `MiniLibX`! This library was developed internally and includes basic necessary tools to open a window, create images and deal with keyboard and mouse events.

This will be the opportunity for you to get familiar with the `MiniLibX`, to discover the basics of **graphics programming**, especially how to place points in space, join them and, most important, how to see the scene from a specific viewpoint.

Chapter IV

Common Instructions

- Your project must be written in C.
- 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`, use cc, 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}` if the subject does not specify anything else. 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.

Chapter V

Mandatory part

Program name	`fdf`
Turn in files	`Makefile, *.h, *.c`
Makefile	`NAME, all, clean, fclean, re`
Arguments	`A file in format *.fdf`
External functs.	• `open, close, read, write, malloc, free, perror, strerror, exit` • `All functions of the math library (-lm compiler option, man man 3 math)` • `All functions of the MiniLibX` • `ft_printf and any equivalent YOU coded`
Libft authorized	`Yes`
Description	`This project is about creating a simple wireframe model of a landscape.`

This project is about creating a simple wireframe model representation of a 3D landscape by linking various points `(x, y, z)` thanks to line segments (edges).

Your project must comply with the following rules:

- You **must** use the `MiniLibX`. Either the version available on the school machines, or installing it using its sources.
- You have to turn in a `Makefile` which will compile your source files. It must not relink.
- Global variables are forbidden.

V.1 Rendering

Your program has to represent the model in **isometric projection**.

The coordinates of the landscape are stored in a `.fdf` 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  0  0
0  0 10 10  0  0 10 10  0  0  0 10 10 10 10 10  0  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 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
$>
```

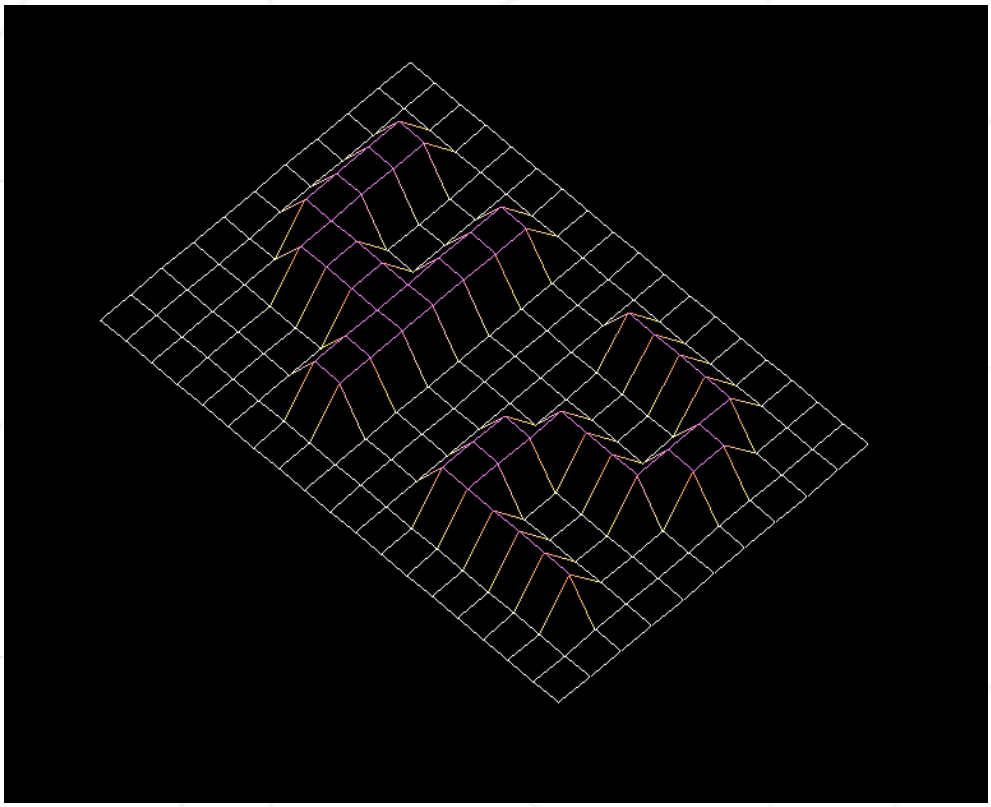
Each number represents a point in space:

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

Executing your `fdf` program using the example file `42.fdf`:

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

Should render a landscape similar to:



Remember to use of your `libft` the best way you can! Using `get_next_line()`, `ft_split()` and other functions will allow you to read data from the file in a quick and simple way.

Keep in mind that the goal of this project is not to parse maps! However, this doesn't mean that your program should crash when run. It means that we assume the map contained in the file is properly formatted.

V.2 Graphic management

- Your program has to display the image in a window.
- The management of your window must remain smooth (changing to another window, minimizing, and so forth).
- Pressing `ESC` must close the window and quit the program in a clean way.
- Clicking on the cross on the window's frame must close the window and quit the program in a clean way.
- The use of the `images` of the `MiniLibX` is mandatory.

On the intranet project page, a binary file called fdf as well as the example file 42.fdf inside a fdf.zip are available to download.

Chapter VI

Bonus part

Usually, you would be encouraged to develop your own original extra features. However, there will be much more interesting graphic projects later. They are waiting for you!! Don't lose too much time on this assignment!

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 will get some extra points if you can:

- Include one extra projection (such as parallel or conic)!
- Zoom in and out.
- Translate your model.
- Rotate your model.
- Add one more bonus of your choice.

```
The bonus part will only be assessed if the mandatory part is
PERFECT. Perfect means the mandatory part has been integrally done
and works without malfunctioning.  If you have not passed ALL the
mandatory requirements, your bonus part will not be evaluated at all.
```

Chapter VII

Submission and peer-evaluation

Turn in your assignment in your `Git` repository as usual. Only the work inside your repository will be evaluated during the defense. Don't hesitate to double check the names of your files to ensure they are correct.

As these assignments are not verified by a program, feel free to organize your files as you wish, as long as you turn in the mandatory files and comply with the requirements.