



FINNJET 3D

The development of a computergenerated virtual model

by
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Introduction

I'm working on a 3D-model of the Finnjet since 2005, but my wish for building a model of the Finnjet lasts much longer. In 1977, in the age of five and shortly after my two first voyages, my father proposed me to build a own model out of LEGO-bricks. Of course, I have admired the LEGO-model sold on board, but making a model for my own?

After a short check of my assortment of bricks, I refused the thought. There were no suitable parts for the angled bridge windows...

In 1981, I walked through Helsinki and somewhere near Aleksanterinkatu, I saw in a window a huge model of my favorite ship and I stood a long time in front of the window, gazing at the model.

Possibly it was the yardmodel, it must be in 1:100 scale and very detailed, but I don't know more about it and the cause of displaying. A few hours later, I was on board the Finnjet and got the beloved LEGO-model...

In 1984, I made my first attempt and built a very small Finnjet out of wood and painted it. It was later a gift for my Finnish grandmother and now, the whereabouts of the very low detailed piece of work is unknown.

As the Revell-model was released in 1989, I bought one, took it with me to the vacation in Finland and assembled it partially. But honestly, the design of the model was a disappointment for me due to the lack of detail and I began to think about an own-designed 1:200 scale model and what I will need for it.

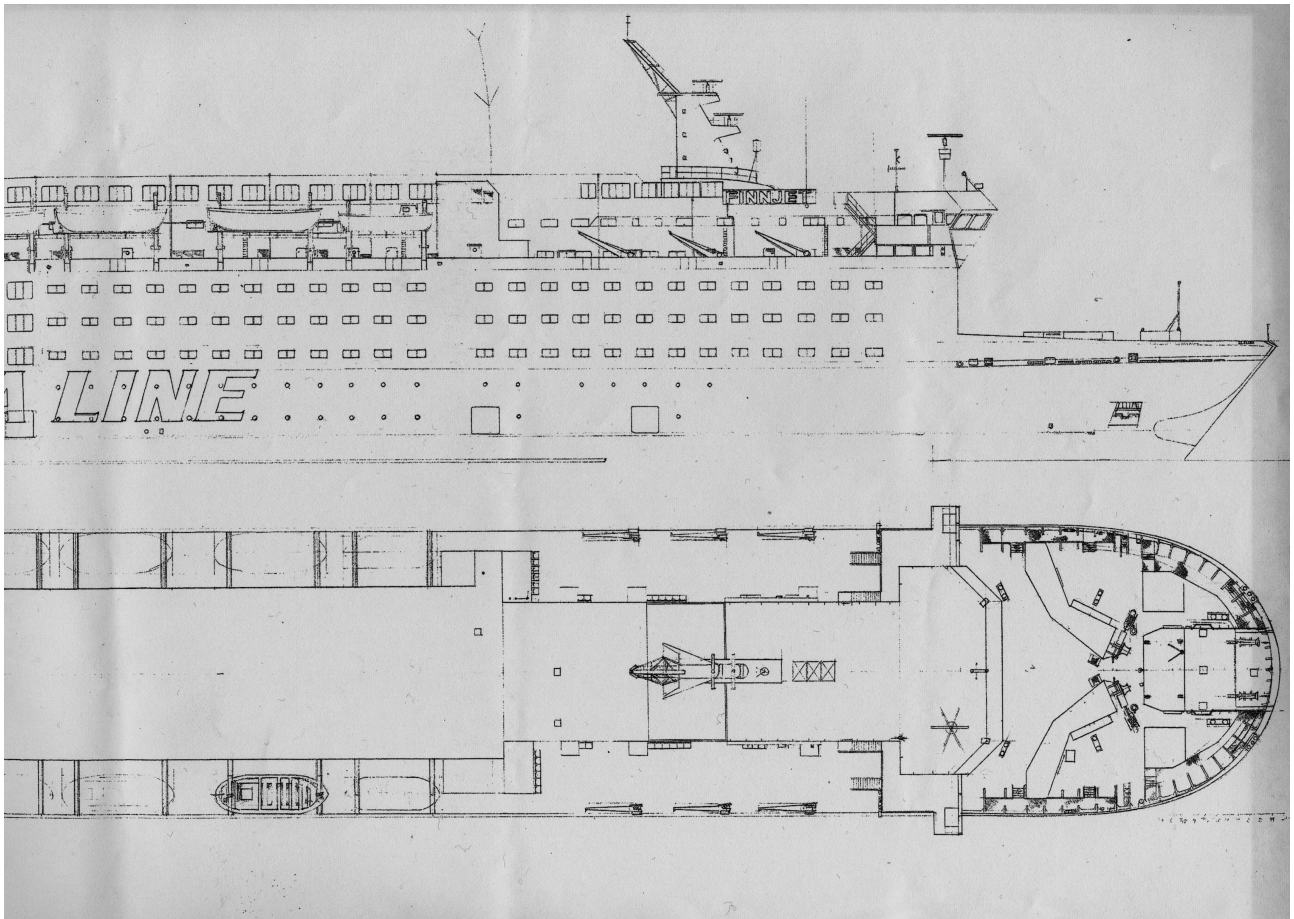
First: a good plan, at least a top and the longitudinal view.

There was no plan available for me.

So, homeward bound, I stood for many hours in front of the only plan in my reach: The safety plan of the Finnjet, displayed on deck 7.

With me was a piece of paper with a hand-drawn ruler on an edge and I made several hundred measures of the foremost parts of the drawing under the plexiglass-shield, hoping that the inevitable measurement errors would be small. After returning home, I made an attempt to draw a plan, but I failed due to these errors.

1998, nine years later and stuffed with a whole bunch of photos and by far more experience in drafting, I drew a top and a longitudinal view of the Finnjet in 1:200 scale, in her Silja-outfit. In comparison to the publicity arrangement, my work has a lot of small errors, but, with the exception of one or two greater mistakes, it's accurate enough for a convincing model.



Top and longitudinal view in 1:200 scale, drawn in 1998

My plan was to build a cardboard model, for the reason of cheapness of the material and the system of necessary frames and stiffeners is coming close to real steel shipbuilding. The next idea was to use a CAD-system to construct the model and print it directly on the cardboard sheets. And, why not to use a 3D CAD-system for faster construction?

So I made my first attempts and constructed one of Finnjets funnels in 3D, unfold the surface (mostly by hand), enhanced it and printed it out. After the assembling, I had a nice little Finnjet-funnel in my hand...

Making a funnel model is one thing, but constructing a whole ship in 3D out of a plan with rather vague measurements is another. CAD mostly awaits precision and it was a horrible work to enter all these measures, based on a lot of guesswork. In the same time, I began working with a 3D-modelling tool, where you can model also by eye, with a more intuitive approach. I imported the funnel model and rendered my first scene.

Then I decided to model the Finnjet in 3D for building scenes and animation, with a modelling tool named Blender 3D.

The software

There are many of software packages for modelling, some are cheap, some are very expensive and some are for free. I tried some of them, Milkshape, Amapi 3D, Anim8or... and Blender 3D. I did my choice.

Blender is a modelling, animating and rendering tool which is relatively hard to learn, but has a very fast workflow. It's Open Source and you can get it for free, so you have never to worry about expensive upgrades. You can model by eye and by measurement entries, so accuracy is easily achieved. With the best print of the publicity arrangement underneath the window, the accuracy achievable is about ± 20 cm, but with good photos and some experience, correcting by eye will bring in more accuracy.

Rendering is done by the internal renderer, scanline or raytracing, or by an external renderer like Yafray or Indigo. The internal raytracing renderer is not so accurate as these external ones, but it is fast and therefore really good for animations. Of course, the rendering time depends from the calculating power of the computer used, but you can use as much threads as your computer can handle.

The preparations

Before I started the modelling of Finnjet, I had only one year experience with this program (but modelling a ship like Finnjet, with a lot of boxy structures should not be so difficult, I thought).

So it happened, that I started modelling three times again from scratch, due to improved modelling skills and the result is a much greater accuracy combined with lesser poly-count.

The greatest advantage of a virtual model is the possibility to go into a level of detail you can hardly achieve with a real built model. Theoretically, it is possible to model the Finnjet with its length of 212.8 m with an accuracy of one-thousandth of a millimetre!

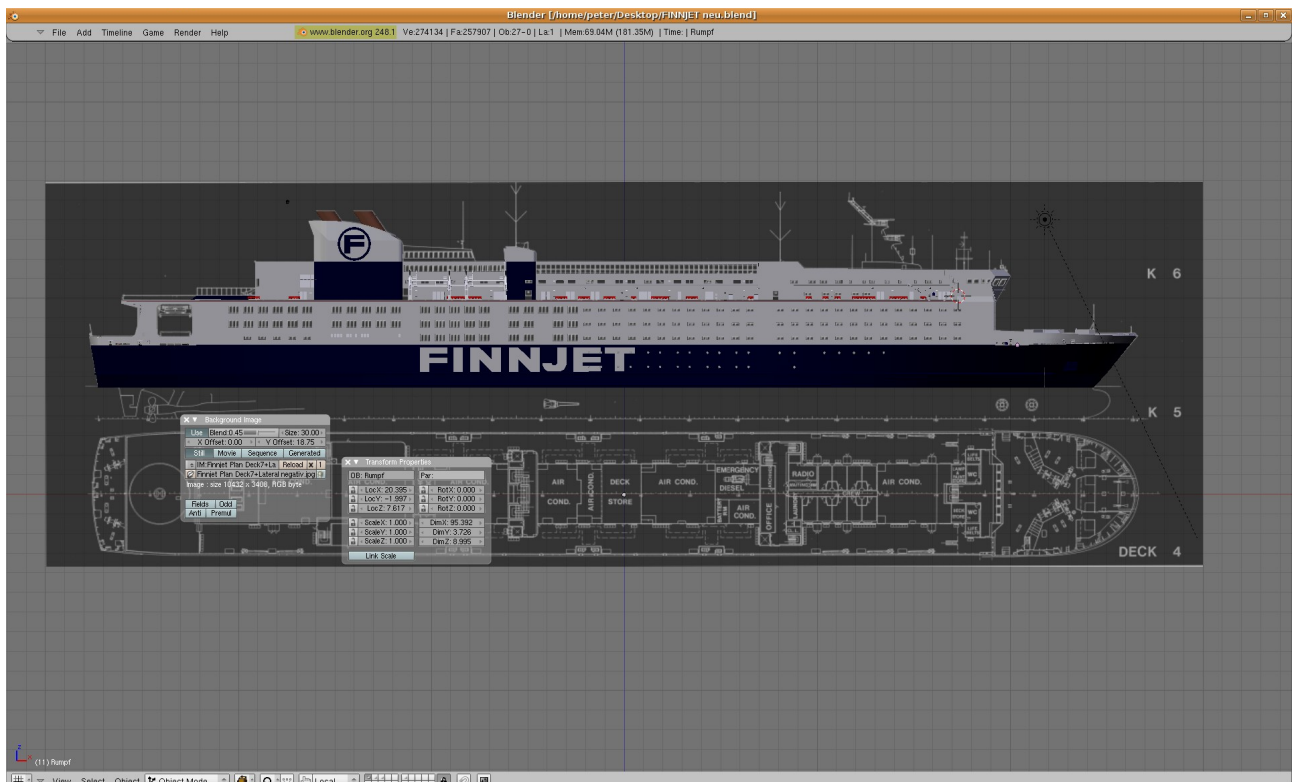
But, of course, you have to decide how far you can go into detail, depending on the detailness of the plans, amount of modelling time and computational power and that means always a lot of compromises. Also, there are parts of the ship from which I have no exact plans and only a few blurred photographs (top of the funnels, anchor winch, parts of the container area), so therefore my model will be in a steady progress of improvement with new informations and photos available.

The scan of the General Arrangement was inverted for better readability and was put underneath the modelling window, slightly transparent. Unfortunately, the GA used (the Publicity Arrangement of february 1977), shows a discrepancy between the lateral view and the deck views of about 75 cm in length, which leads to constant problems for correct measurement.

Research

For building a high-detailed model, good research is one of the most important things.

In comparison to many other ships, Finnjets appearance remains relatively unaltered over the years, so the use of photos from her late years is, with some care, fruitful. I use every photo available, my own pictures as also photos from the internet and from magazines and journals. Complicated details like mooring winches, davits and anchoring equipment has to be drawn in multiple views for better modelling. Therefore, the time used for research only is about 70% of the whole time used for the work on the model.



Screenshot of the Blender-GUI

Modelling

Modelling began with the surface of the hull, which was formed by a NURBS-surface. NURBS stands for Non Uniform Rational B-splines, a mathematical system to describe curves and curved surfaces. With NURBS, you achieve the desired smooth hull lines. Later, the hull surface was converted to a mesh for altering and detailing with the common mesh tools.

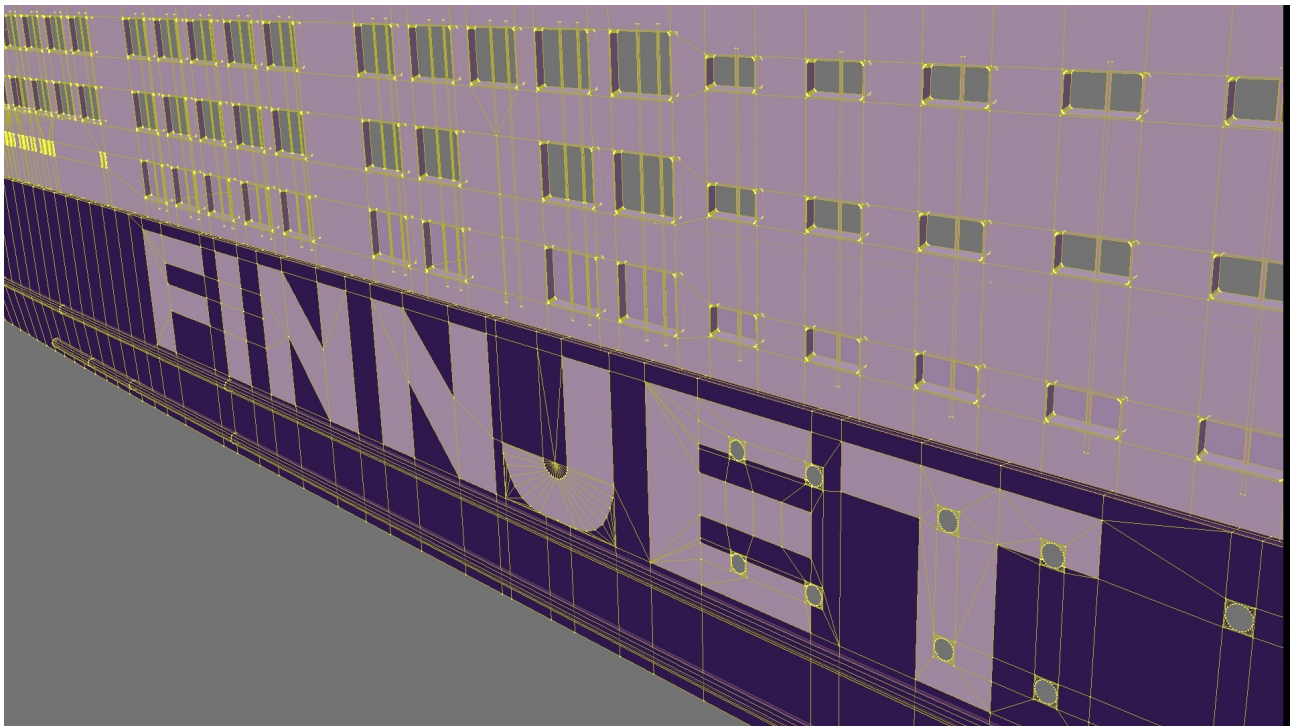
A mesh is defined by points in space (called vertices), connected with edges, forming faces. So, you can use a single plane defined by four vertices and by extruding edges you can form multiple faces out of it. This was the way the complete superstructure of the Finnjet was created. I modelled one window with the rounded corners, and by duplicating it, the complete array of windows was placed onto the underlying longitudinal view. Then, the gaps between the windows were filled with faces so that the outer wall of the superstructure was

created. Only the starboard side of the Finnjet was modelled until near-completion, then the mesh was mirrored and joined together. The outfittings are modelled separately, saved in different files and later appended to the hull and superstructure file.

The main task is to use as few faces as possible, for the reason that with every added face, the rendering time will increase. The completed model will have approximately 2 million faces, the red deck benches alone will have about 200.000 faces due to their rounded surface. Therefore, the model is divided into different „objects“, so I can put them onto different layers. Then it's possible to switch off the layers containing unnecessary objects for the particular rendering task. Also, it's possible to make a kind of LOD (Level Of Detail) by creating low-detailed parts of the model and put them onto layers which are switched on for more distant views.

From the beginning, the mesh is separately shaded. This means that the surfaces with different colours or materials are grouped separately and have different colours as placeholders, so it's easier to distinguish during modelling between e.g. the red deck shader and the catwalks and stands with the same colour, but with the grating texture.

At the Moment, I am working on the third and final version of the model. The first one was modelled in autumn 2005, but it was never completed, it was rather a test of my modelling skills. Only the bowdeck was really detailed and I did some rendering test, one of them had a rendering time of about 9.5 hours.



Hull and superstructure with vertices visible

A few month later, I begun the second version due to my increased modelling skills and it was by far more detailed, especially the boat deck. In summer 2008, I got a better version of the general arrangement. So, I decided to model the hull again and use the already modelled outfittings on this (last) version.

In late august 2008, I wrote an email to Johnny Sid of „ProFinnjet“ and offered him to make some illustrations of the Finnjet in the harbour of Turku. He agreed in a short answer and in one week, I converted hastily the 1977-model to her last appearance. But I got never the proposed photos of the mooring place and i used the model later for some animation tests.



Animation still of the "Turku"-version



Animations

Beside the modelling, I am working on a proper environment suitable for a convincingly realistic animation of the Finnjet plowing through the Baltic sea. Blender 3D has a fluid simulation engine which is very powerful, but for a good open sea surface simulation, there are some shortcuts. The main problem is to combine realistic waves with the wake of the ship, so I have to try some tricks, like displacement mapping, combined with particles in postproduction.

Upcoming tasks

Blender has the possibility of live interaction, so you can make a kind of an architectural walkthrough in real time, so my dream is the completely modelled interior of the Finnjet in the state of 1977 where you can visit every place and room on board. First tests were successful, but it needs a very reduced polycount to increase the framerate and heavy texturing. An A- and a B-cabin are already modelled, together with the main hallway, but for proper texturing, I have to make better research of Finnjets internal appearance in the first years. Additionally, my plan is to make some illustrations of the engine rooms and the control room with remarks on every machinery. This can easily be combined with the work on the walkthrough model and will be my next work on my 3D-Finnjet.

(Note: this following selection of renderings shows the unfinished model in various states. So there are sometimes differences in the details, some parts have to be rearranged and the colors and surfaces aren't correct in some images.)

