

## **HULL FORM & SEAKEEPING, 3D PRESENTATION**

### **Summary**

Ship's hull data base, used for calculation of hydrostatics was used as input data for a program module for modelling the hull in 3D. Program module that creates 3D files was developed in Fortran and 3D files itself are written in Virtual Reality Modelling Language (VRML). Program combines modelling of some additional parts of the hull and superstructure as well as modelling of some cargoes that will be transported. Results of ship dynamics are included as well, permitting visualisation of calculated motions in real time.

*Key words:*                    *seakeeping, 3D, hull form, VRML*

## **BRODSKA FORMA I POMORSTVENOST, 3D PREZENTACIJA**

### **Sažetak**

Baza podataka brodske forme, koja se koristi za proračun hidrostatskih podataka, je iskoristena kao baza ulaznih podataka za trodimenzionalno modeliranje trupa. Programski modul koji kreira 3D-fajle, razvijen je u Fortranu i same 3D fajle pisane su u jeziku za virtualno modeliranje (VRML). Progre sadrži modeliranje dodatnih dijelova trupa i nadgradnja jednako kao i modeliranje tereta koji će se transportirati. Rezultati proračuna dinamike broda također su uključeni i omogućuju vizualizaciju proračunatih gibanja u realnom vremenu.

*Ključne riječi:*    *pomorstvenost, 3D, brodska forma, VRML*

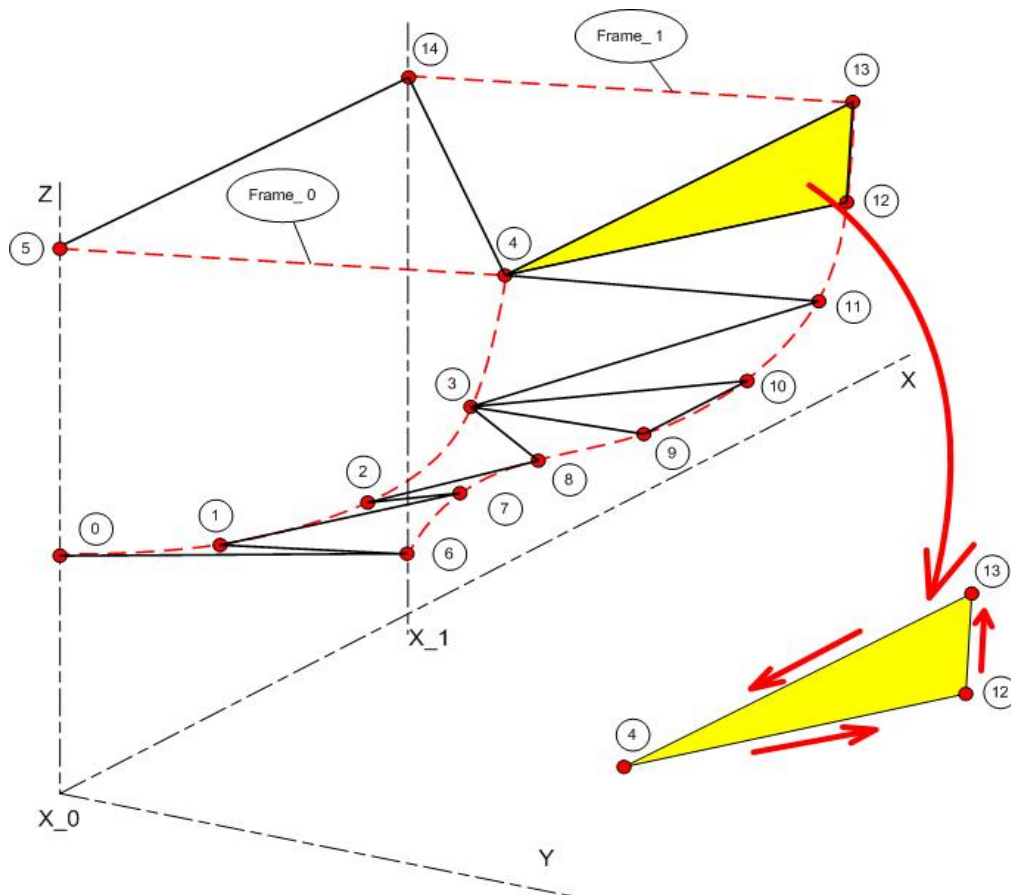
## 1. Program description

Results of the program presented in this paper and the attached program, are part of the program that calculates hydrostatic data, stability and seakeeping. Module, that automatically generates 3D models in VRML, was just added. The database used for hydrostatics, without of any modifications was used for 3D modelling. Modelling of superstructure as well as models of appendages and cargoes are included as well.

VRML files are simple text files that can be created by any other program (in this case it is created by Fortran).

For simple models there are many ready to use objects (box, sphere, cone, etc.).

For any other irregular form special program module was developed. VRLM closes surface between 3 designated points if they are ordered anti clockwise. The sketch below shows example of connecting points to close surface between two frames, described by different number of points.



Program module that generates VRML file for hull presentation allows any number of frames and any number of points per frame, and it is prepared for asymmetric hull forms as well..

Once hull model is created, the hull appendages and superstructure are added. Model of cargo is added to the hull. Next step is to rotate a complete model according to trim and list calculation, and position it vertically on water line according to calculated draft.

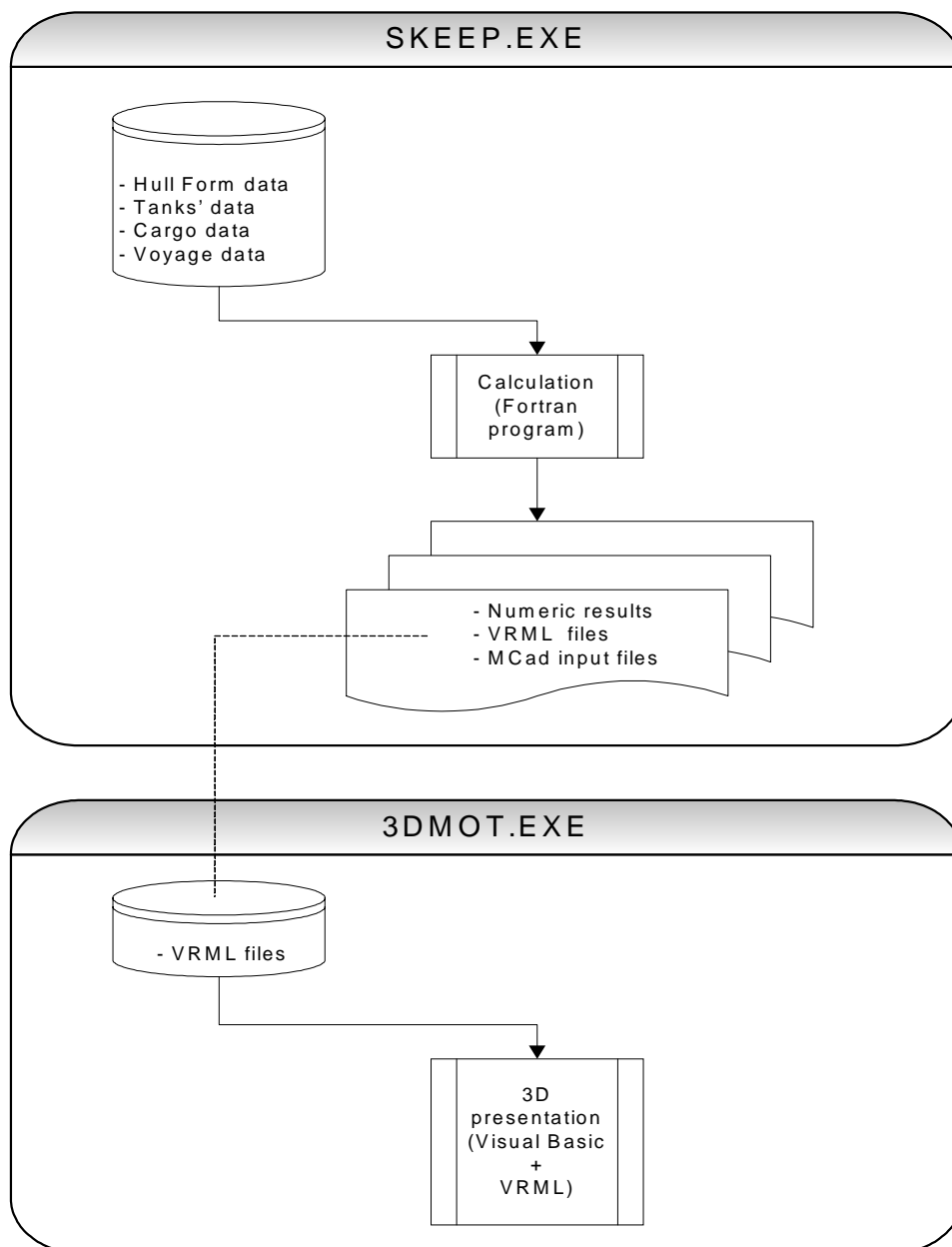
As program combines several methods of calculation accelerations and once heaving a model on water line it is easy to attach motions according to calculated amplitudes and periods.

All most important data related to dynamics, appears on the screen and in the same window it is possible to see ship's response on the waves for full range of incoming angles.

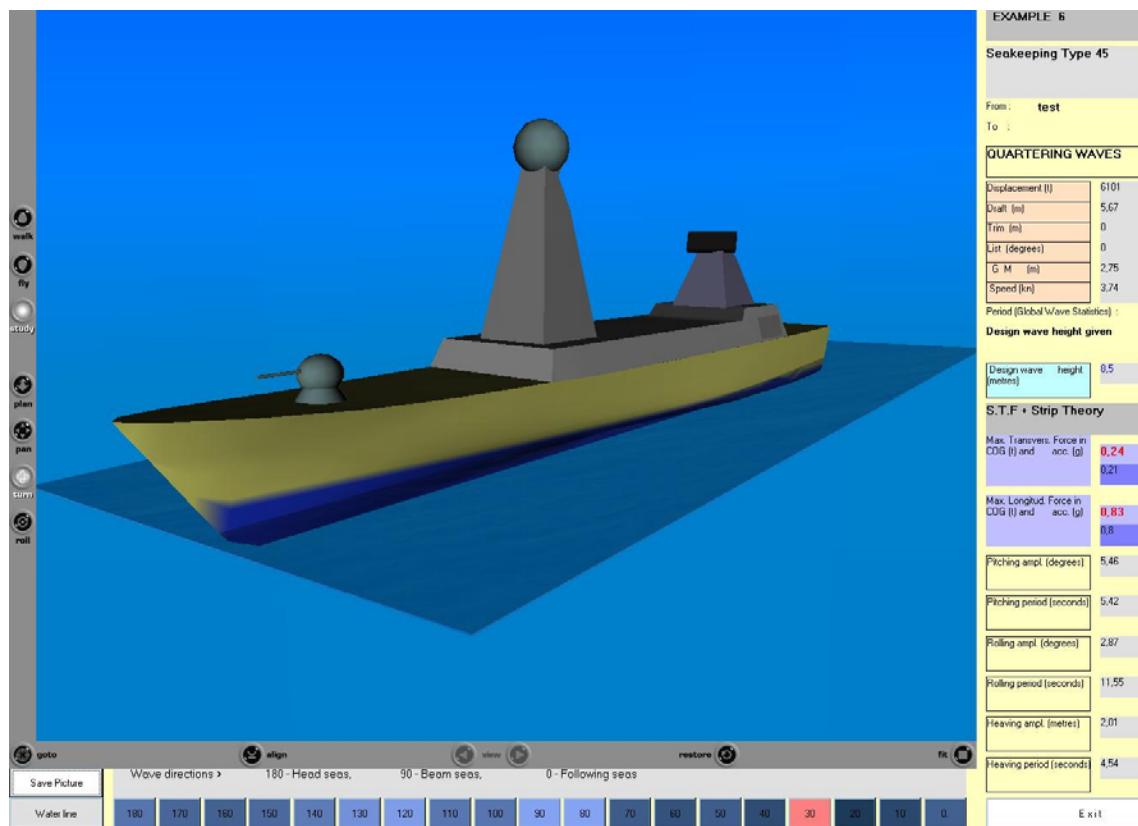
For every combination of three main motions (Rolling, Pitching and Heaving) of the ship were analysed and calculation of accelerations was carried out for wave incoming angles from 0 to 180 degrees with a step of 10 degrees.

Interface between VRML files and the user was programmed in Visual basic.

## 2. Program modules – principal flowcharts



### 3. Example of 3D model



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