Simo

Simulation of Marine Operations

Non-linear motions and station keeping analysis of multibody systems

SIMO is a time domain simulation program for study of motions and station keeping of multibody systems. Flexible modelling of station keeping forces and connecting force mechanisms (anchor lines, ropes, thrusters, fenders, bumpers, docking guide piles) is included.
The results from the program are presented as time traces, statistics and spectral analysis of all forces and motions of all bodies in the analysed system.

SIMO is a modular and interactive computer program with batch processing options, and is also available as part of SESAM's DeepC package for coupled analysis of floating vessels including station keeping systems.

Typical applications

Surface Vessels

- Mono-hull vessels
- Semi-submersibles
- Tension leg platforms (TLP)
- SPAR-buoys

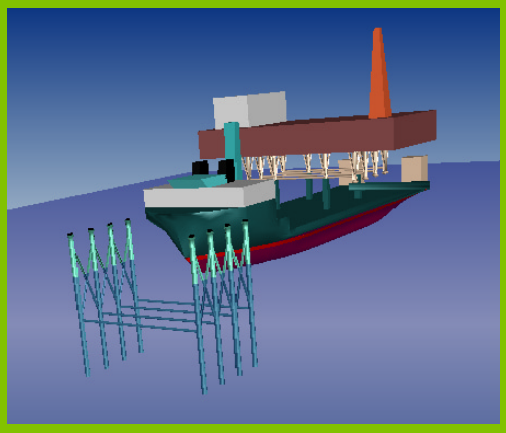
Positioning

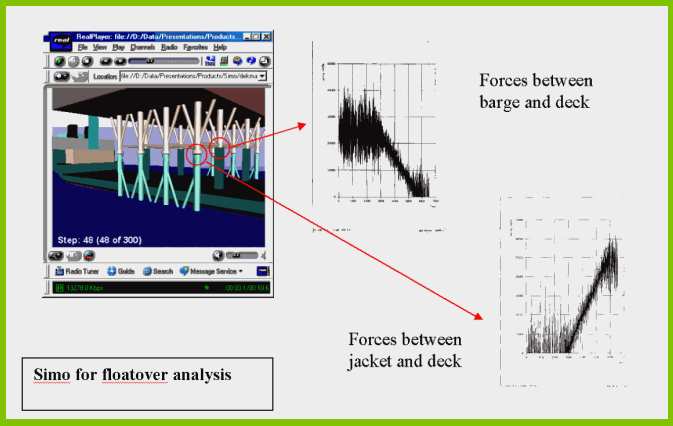
- Turret mooring
- Spread mooring
- Dynamic positioning
- Tension Legs

Complex Marine Operations

- Offloading (tankers in tandem or side-by-side)
- Offshore crane operations
- Subsea installation (e.g. subsea templates)
- Jacket / deck installation and removal (floatover)
- Installation of TLP and GBS by e.g. tugs
- Up-ending of SPAR

DNV SOFTWARE





Main features:

Environment

- Waves: regular and irregular. (Several model spectra.)
- Wind: constant and with gust
- Current speed and direction: either constant or varying with time. It may be specified by velocity and direction at a set of water levels.

Three Body Types

An arbitrary number of bodies can be analysed. Three different types can be defined:

- Large volume body, total motion in 6 dof
- Large volume body, separated motion in wave frequency (RAOs) and low frequency range, 6 dof
- Small volume body, total 3 dof motion

Flexible Modelling of Body Forces

Several force models are available, that give the user able to simulate a wide range of effects, e.g.

- Hydrostatic stiffness
- Damping (linear and quadratic)
- Wind forces
- Current forces (linear and quadratic)
- 1st order wave excitation forces
- Forces due to frequency depended added mass and damping (modelled as retardation functions)
- Slow-drift forces (Newman approximation)
- Full second-order wave force (QTF)
- Wave drift damping forces
- Ringing forces
- Slender element forces (Morison model)
- Small body hydrodynamic forces including slamming and soil penetration
- Specified forces (sinusoidal, constant, ramp)

Wave kinematics are generated, either by Fast Fourier Transform (FFT) or by cosine series. Hydrodynamic coefficients from source programs as WADAM and WAMIT can be imported directly.

Positioning System Models

- Several components are available for mooring or for coupling between bodies:
  - a general tension elongation relationship
  - anchor line by any number of segments, branches, buoys and clump-weights
  - a cursor system
  - fenders
- Thrusters models:
  - constant force (fixed direction or azimuth)
  - force controlled by a dynamic positioning (DP) module (Kalman filtering or PID regulator)

SIMO is owned, developed and maintained by Marintek.

MARINTEK SINTEF

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