TDAP III Functions

Analysis
Static analysis
Stage construction analysis
Forced displacement analysis
Eigen value analysis
Complex eigen value analysis
Response spectrum method (SRSS, CQC)
Mode superposition
Direct integration method
Continuous analysis from static to dynamic

Solver
Direct method (Skyline method)
Iteration method
(Pre-processing of diagonal scaling CG method)

Analysis Models
2-dimensional model
3-dimensional model
Axisymmetric model (Fourier 0- and 1-order)
Above models can be combined.

Mass
Consistent mass
Lumped mass
User-defined mass matrix

Damping
Modal damping
Strain energy proportional damping
Kinetic energy proportional damping
Equivalent damping matrix
Rigidity proportional damping
Global Rayleigh Damping
Group Rayleigh Damping
Stiffness proportional damping options
(Proportional type, Hysteresis type)
User-defined damping matrix

Constraint
Fixed support
Forced displacement
Multipoint constraint (MPC)
Rigid spring connection
Rigid beam connection
Rigid floor assumption

Loads
■Static loads
Nodal force
Static seismic intensity
■Acceleration response spectrum
(Conforming to the Highway Bridge
Specifications of 1996 and 2002)
Arbitrary shape spectrum
■Dynamic loads
Nodal vibrating force
Seismic acceleration
Multi-seismic input

Element Library
■Solid and shell elements
Hexahedral element
Plane stress
Plane strain
Mindlin shell
Mindlin plate

■Beam elements
2-dimensional beam※
3-dimensional beam※
Truss
Chord
Cable
2-dimensional fiber※
3-dimensional fiber※
※P-δ effect can be applied.

■Spring elements
Spring
Directional spring
Multi-spring
Nodal spring
Viscous damper
Directional translation viscous damper
User-defined element matrix

■Ground modeling elements
Viscous damper for bottom boundary
Viscous damper for side boundary
Viscous damper for out-of-plane boundary
2-dimensional side boundary, with notch effect
2-dimensional joint element

■Axisymmetric elements
Axisymmetric thin shell
Axisymmetric solid
Axisymmetric spring
Axisymmetric viscous damper

■Fluid elements (2-dimensional, 3-dimensional and axisymmetric)
Fluid element
Fluid-structure interaction element
Fluid surface element
Buoy effect element
Note: Eigen value analysis for fluid only, and structural-fluid analysis by direct integration method

■Elasto-plastic elements for architectural structures
Beam elements with rigid/plastic end points
Multi spring beam
Brace
Wall
Shear panel

Miscellaneous
Summation function of response
Output of multi-wave averaging
Minimization of matrix bandwidth
SI unit system (conventional unit system also available)

Material Nonlinear Models
■Solid
MC-DP model
User-defined nonlinear model
■Plane strain
Ground nonlinear models
User-defined nonlinear model
■Spring, beam and fiber elements
Nonlinear elasticity (symmetric and asymmetric)※
Bilinear (symmetric and asymmetric)※
Trilinear (symmetric and asymmetric)
Maximum point directional trilinear (symmetric and asymmetric)※
Origin directional trilinear (symmetric and asymmetric)※
Degrading trilinear (Muto model)※
Asymmetrical degrading trilinear (Eto model)※
Asymmetrical degrading trilinear (JR Soken model)※
Asymmetrical degrading tetralinear (Takeda model)※
Maximum point directional bilinear (Takeda model, symmetric and asymmetric)※
Maximum point directional bilinear (Clough model, symmetric and asymmetric)※
Axial force dependent bilinear※
Axial force dependent bilinear (modified Clough model)※
Axial force dependent trilinear
Axial force dependent trilinear (Eto model)※
Axial force dependent trilinear (JR Soken model)※
Axial force dependent tetralinear (Takeda model)※
Slip type
Bilinear sliding model
Bilinear concrete model
Quadratic concrete model※
Exponential concrete model※
User-defined nonlinear model※
※Negative slope can be specified.
■Spring/multi-spring
Nonlinear elasticity (symmetric and asymmetric)※
Hardin Drnevich, Ramberg Osgood
High damping rubber bearing
Lead rubber bearing
FDR model
Lead-plug rubber bearing
Various rubber bearing models
Wooden basic pattern nonlinear model
Tin-plug laminated rubber bearing model
User-defined nonlinear model※
※Negative slope can be specified for viscous damper.
■Viscous damper
Nonlinear elasticity (symmetric and asymmetric)
Velocity to α-th power nonlinear model
User-defined nonlinear model
■Ground modeling elements
Joint model
τ-γ curve model (bilinear)
τ-γ curve model (Hardin Drnevich)
τ-γ curve model (Ramberg Osgood)
Mohr-Coulomb nonlinear elasticity
Mohr-Coulomb perfect elasto-plasticity
Modified GHE model
■Elasto-plastic elements for architectural structures
Column/beam : Axial strength, bending strength M-N interaction
Brace : Axial strength
Wall : Axial strength, bending strength and shearing strength
Panel : Shearing strength

Associated Software

FDAPIII
■Analysis functions
Complex response analysis※
Steady frequency response analysis
■Analysis model, restraint conditions, etc.
Same as TDAP III

■FDAP III exclusive functions
Transmitting boundary elements
(2-dimensional, axisymmetric)※
Ground impedance input function
Equivalent linear analysis function※
Frequency-dependent spring

※Supported by Windows version TDAP III

ArkLisa
Generation of added mass matrix for fluid-structure interaction
2- dimensional, 3-dimensional and axisymmetric
Fluid-structure analysis (dynamic and eigen value analysis) can be done, using TDAP III and FDAP III.

For more information, visit our homepage.　http://www.ark-info-sys.co.jp/

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TDAP® III

General-purpose 3-Dimensional Dynamic Analysis Program for Civil Engineering and Architectural Use

●High-rise buildings ●Seismic isolation structures
●Expressways ●Bridges and Piers ●Tunnels
●Underground structures ●Dams ●Breakwater
●Liquid storage tanks ●Floating structures
●Nuclear power plant
●Soil-structure interaction model ●Etc

ARK Information Systems, Inc.

Excellent versatility for modeling a wide range of applications, including 2- and 3-dimensional, and axisymmetrical models, structural elements such as frames and shells, soil elements including various boundaries, and fluid elements.

Exclusive elements for civil engineering and architectural fields, including a variety of material nonlinear models

High-quality pre-posts integrated with TDAP III are applicable to wave processing and visualization. Also, available as an independent general-purpose tool.

High-speed Processing
For a 2-dimensional bridge structure model (degree of freedom: 400), 15000 steps of nonlinear dynamic analysis can be processed within a mere 13 seconds, using 3.06 GHz Pentium4. For a 3-dimensional model (degree of freedom: 2600, ArkFemView shown below), 2500 steps of seismic isolated nonlinear dynamic analysis can be processed within about 87 seconds.

Widespread use among customers, including research institutes, universities, construction companies, design offices and consultants

High reliability and proven achievements

Windows Version

- Floating licence is available
- Frequently used functions are available and designed for ease of use.
- Complete integration of modeling, analyzing, printout and visualization.
- Only necessary functions can be purchased.

Batch Version

- Data in text file is processed from command line.
- All functions of TDAP III are available for higher flexible analysis.
- Windows version data is applicable.
- Applicable to different platforms, including PC, EWS and super-computer
- The solver of iteration method is available in the advanced and the unlimited version.
  The case of the unlimited version(1750MB)
  Applicable Nodal points
  2-Dimensional: about 300000
  3-Dimensional: about 110000

Windows Version Options

Functional Options

1. Basics (linear static analysis and eigen value analysis)
2. Response spectrum method
3. Mode superposition method
4. Nonlinear static analysis, including stage construction analysis
5. Nonlinear time history response analysis
6. Complex response analysis

Element Options

1. Frame elements (2- and 3-dimensional beams, spring, multi-spring, damper, truss, and chord.
2. FEM elements (hexahedral element, plane strain, plane stress, shell, plate bending, joint, bottom and side ground boundaries, axisymmtric solid, axisymmtric shell, and user-defined element)

Size Options

1. Standard version
2. Advanced version
3. Unlimited version (64-bit version included)

Language Options

1. Japanese
2. English

Applicable Models

○ : supported — : unsupported

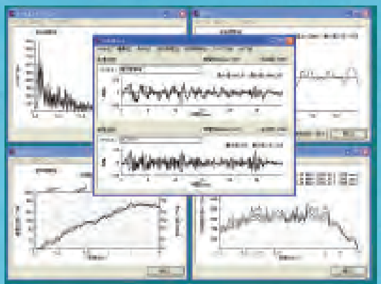
	Windows ※1 version TDAPⅢ	Batch version TDAPⅢ	ArkWave	ArkQuake	ArkPlotView	ArkFemView	ArkLisa
Windows XP or later	○	○	○	○	○	○	○
EWS	—	○	—	—	—	—	○

※1 Note: For Windows version, only machines with Pentium and compatible CPU are supported.

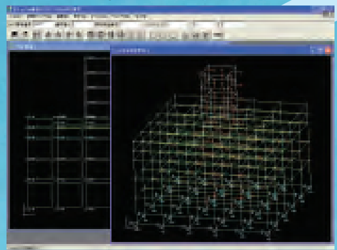
TDAP® Ⅲ

A Wide Range of Applications, from Modeling to Analysis to Visualization

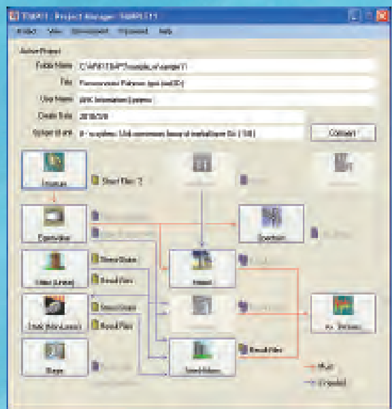
ArkWave: Generation of seismic waves, and processing of various waves



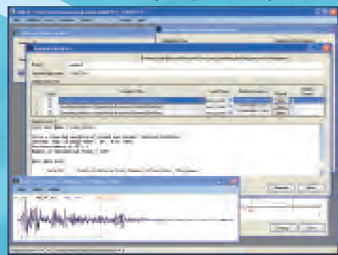
Visual modeling tool



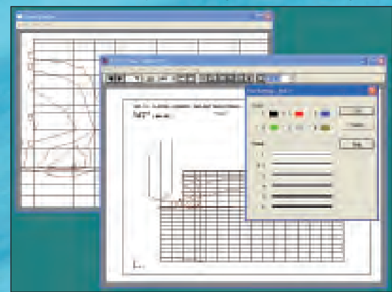
TDAP III
Main Window

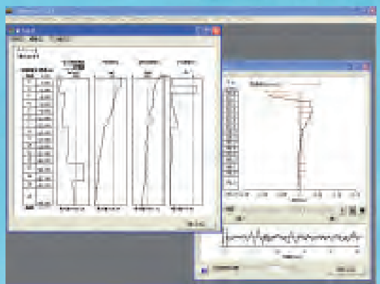


Nonlinear Time History Response Analysis

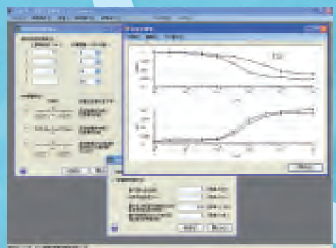


ArkPlotView: Display and editing of plotter drawings

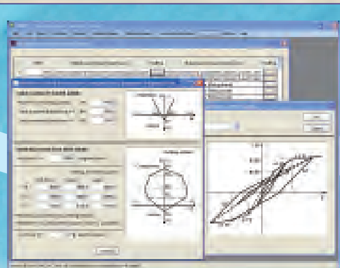




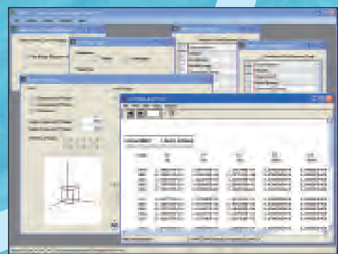
ArkQuake: Seismic response analysis of 1-dimensional stratified ground, including seismic wave regeneration and liquefaction judgment



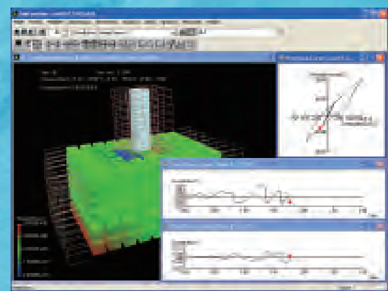
Complex Response Analysis



Nonlinear Model Window



Output of multi-wave averaging



ArkFemView: Quick comprehensive understanding of complicated dynamic behaviors through visualization and high-speed animation of analysis drived results