PIERRE©: an interactive software for computer-aided rock fall analyses

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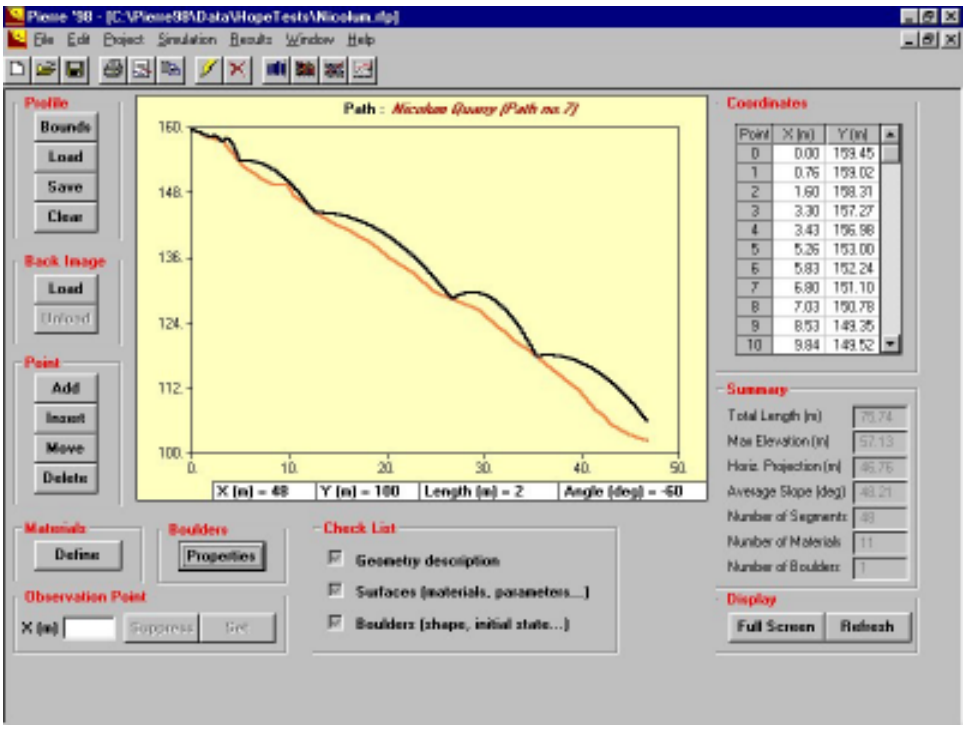


SUMMARY:

PIERRE© is an advanced software for the prediction of rock fall trajectories. The numerical model is based on rigorous mechanical concepts and field observations.

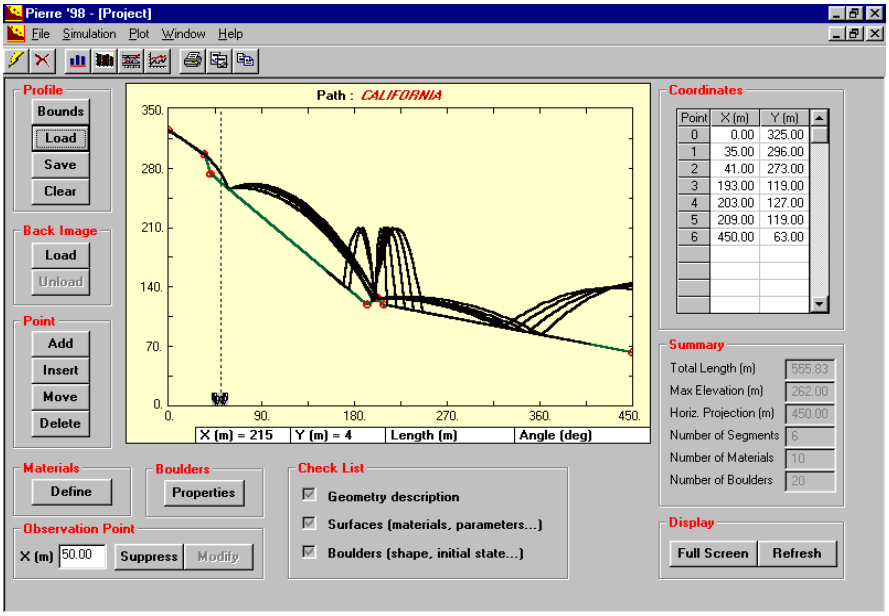
MODEL CHARACTERISTICS

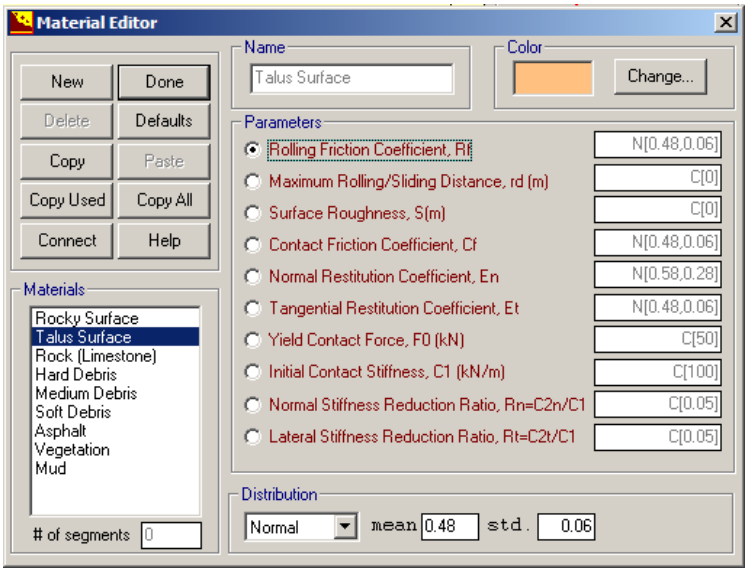
The following aspects are included:

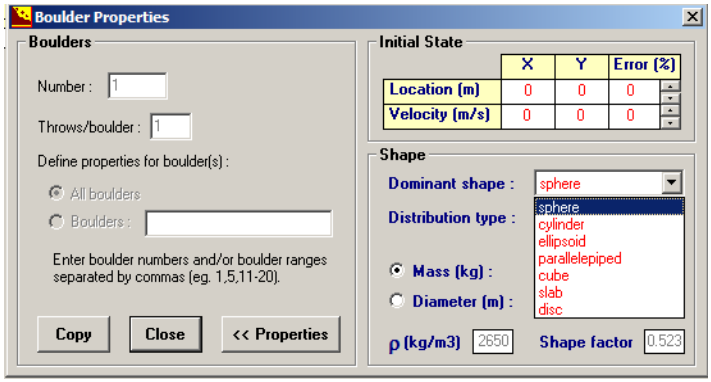
- 2-D analysis
- lumped mass assumption
- both linear and rotational momentum (i.e. shape/inertia of the blocs) are considered
- plasticity impact model applied to normal and tangential restitution coefficients
- surface roughness
- parameters defined with probability density functions, which allows for stochastic and deterministic analyses.

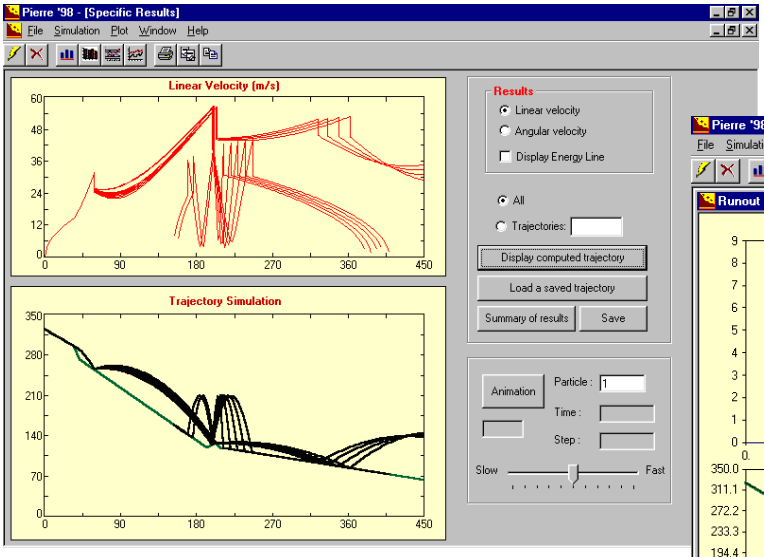
MOVEMENT MODES

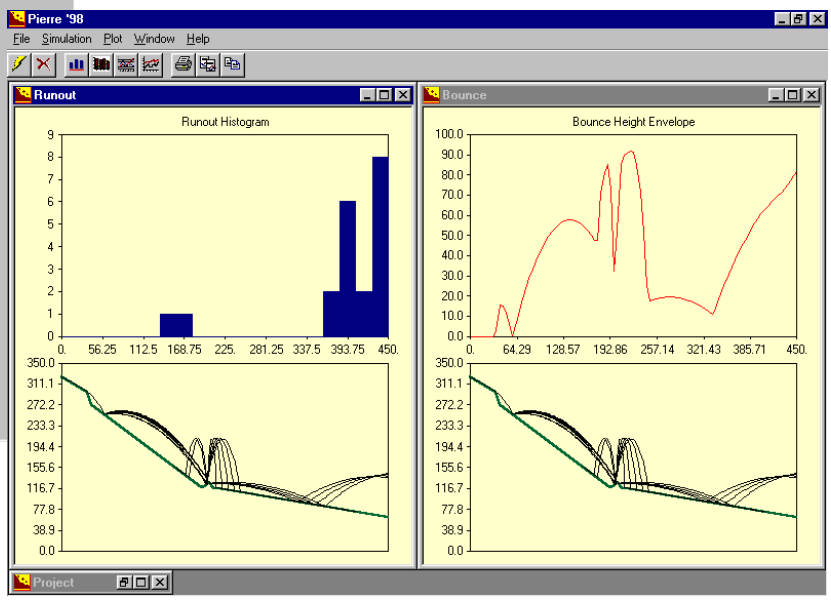
- free flight, no momentum losses: parabolic trajectory, air resistance neglected
- sliding/rolling, linear energy loss by friction: static/dynamic friction
- impact, energy partition: plastic deformation (Falcetta model)
- transition from bouncing mode to rolling mode
- transition from rolling/sliding mode to bouncing mode.


Pierre '98 - [Project]
File Simulation Plot Window Help
Profile
Bounds
Load
Save
Clear
Back Image
Load
Unload
Point
Add
Insert
Move
Delete
Path : CALIFORNIA
X (m) = 215
Y (m) = 4
Length (m)
Angle (deg)
Coordinates
Point X (m) Y (m)
0 0.00 325.00
1 35.00 296.00
2 41.00 273.00
3 193.00 119.00
4 203.00 127.00
5 209.00 119.00
6 450.00 63.00
Summary
Total Length (m) 555.83
Max Elevation (m) 262.00
Horiz. Projection (m) 450.00
Number of Segments 6
Number of Materials 10
Number of Boulders 20
Materials
Define
Boulders
Properties
Check List
Geometry description
Surfaces (materials, parameters...)
Boulders (shape, initial state...)
Observation Point
X (m) 50.00
Suppress
Modify
Display
Full Screen
Refresh

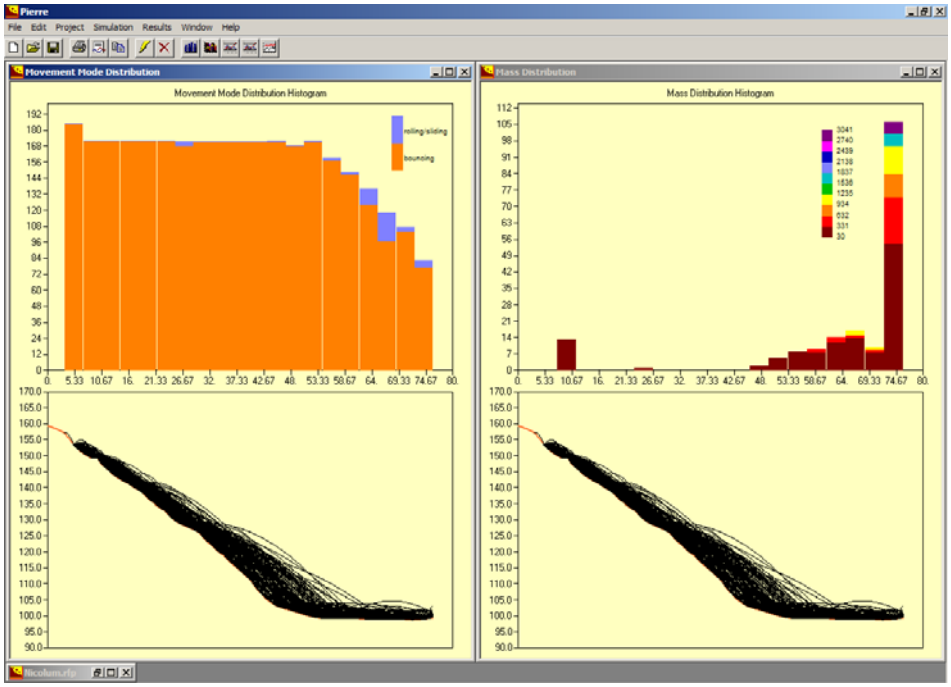

Material Editor
New
Done
Delete
Defaults
Copy
Paste
Copy Used
Copy All
Connect
Help
Name
Talus Surface
Color
Change...
Parameters
Rolling Friction Coefficient, Rf N[0.48,0.06]
Maximum Rolling/Sliding Distance, rd (m) C[0]
Surface Roughness, S(m) C[0]
Contact Friction Coefficient, Cf N[0.48,0.06]
Normal Restitution Coefficient, En N[0.58,0.28]
Tangential Restitution Coefficient, Et N[0.48,0.06]
Yield Contact Force, F0 (kN) C[50]
Initial Contact Stiffness, C1 (kN/m) C[100]
Normal Stiffness Reduction Ratio, Rn=C2n/C1 C[0.05]
Lateral Stiffness Reduction Ratio, Rt=C2t/C1 C[0.05]
Materials
Rocky Surface
Talus Surface
Rock (Limestone)
Hard Debris
Medium Debris
Soft Debris
Asphalt
Vegetation
Mud
# of segments 0
Distribution
Normal
mean 0.48
std. 0.06

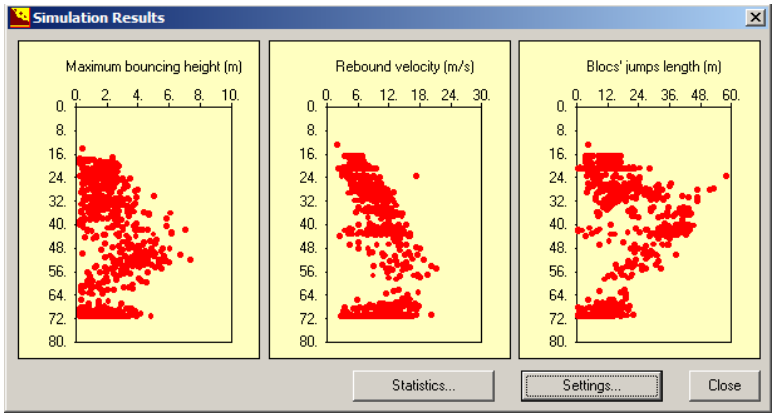

Boulder Properties
Boulders
Number : 1
Throws/boulder : 1
Define properties for boulder(s) :
All boulders
Boulders :
Enter boulder numbers and/or boulder ranges separated by commas (eg. 1,5,11-20).
Copy
Close
<< Properties
Initial State
X Y Error (%)
Location (m) 0 0 0
Velocity (m/s) 0 0 0
Shape
Dominant shape : sphere
Distribution type :
sphere
cylinder
ellipsoid
parallelepiped
cube
slab
disc
Mass (kg) :
Diameter (m) :
ρ (kg/m3) 2650
Shape factor 0.523

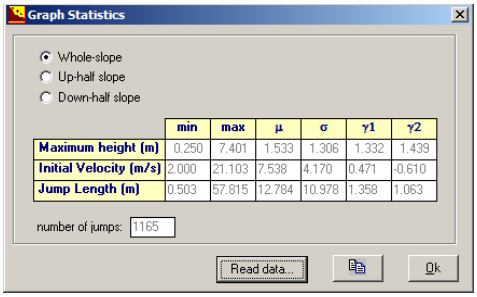

Pierre '98 - [Specific Results]
File Simulation Plot Window Help
Linear Velocity (m/s)
Trajectory Simulation
Results
Linear velocity
Angular velocity
Display Energy Line
All
Trajectories:
Display computed trajectory
Load a saved trajectory
Summary of results
Save
Animation
Particle : 1
Time :
Step :
Slow
Fast


Pierre '98
File Simulation Plot Window Help
Runout
Runout Histogram
Bounce
Bounce Height Envelope
Project


Pierre
File Edit Project Simulation Results Window Help
Runout
Runout Histogram
Bounce
Bounce Height Envelope [m]
Linear Velocity
Linear Velocity Envelope [m/s]
Energy
Energy Head Envelope [m]
Rotational Velocity
Rotational Velocity Envelope [rad/s]


Pierre
File Edit Project Simulation Results Window Help
Movement Mode Distribution
Movement Mode Distribution Histogram
rolling/sliding
bouncing
Mass Distribution
Mass Distribution Histogram


Simulation Results
Maximum bouncing height (m)
Rebound velocity (m/s)
Blocs' jumps length (m)
Statistics...
Settings...
Close


Graph Statistics
Whole-slope
Up-half slope
Down-half slope
min max μ σ γ1 γ2
Maximum height (m) 0.250 7.401 1.533 1.306 1.332 1.439
Initial Velocity (m/s) 2.000 21.103 7.538 4.170 0.471 -0.610
Jump Length (m) 0.503 57.815 12.784 10.978 1.358 1.063
number of jumps: 1165
Read data...
Ok