



Sensitivity Module



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Sensitivity Module

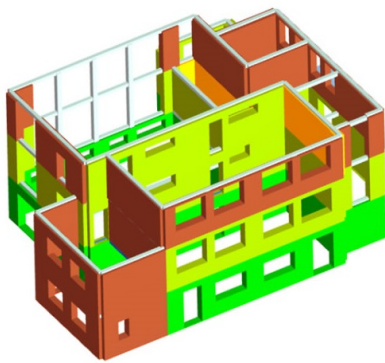
1 Introduction

The Sensitivity analysis is a calculation method aimed to obtain better understanding of the structural functioning and accurate planning of the site investigation plan.

As known, doubts during modeling directly affect the evaluation of seismic safety. A specific example is materials mechanical properties, usually defined on the basis of reference values and for which, through investigation, it aims to limit the inescapable uncertainty.

The sensitivity analysis methodology includes the identification of parameters groups that express the uncertainty degree, through the execution of multiple different non-linear analysis it identifies a level of sensitivity for each parameter in order to furnish a weight in terms of importance.

As for designing proposes, the result is the acquisition of a better knowledge of the structure's characteristics and the single elements contribution to the global behavior.



2 Applications

The main sensitivity analysis' implementation areas are two: on-site analysis planning and the improving measures' relevance and impact.

On-site analysis planning

The actual required tests quantity can be calibrated by knowing the structures reaction to the materials' resistance parameters changes thus avoiding performing tests in insignificant points and extending the greatest impact knowledge areas instead.

Improving measures' relevance and impact

The sensitivity analysis allows optimizing the overall work cost, revealing itself a powerful aid for designers by finding more effective structure's reinforcing interventions, thus improving the interventions planning and maximizing the return in terms of structural improvement.

3 Calculation

The calculation window opens by clicking on "Sensitivity calculation".

Sensitivity analysis

Control node

Level: [3] Livello 3 ☐ Use Control node displacement
☒ Use average displacement
☐ Use weighted average displacement

Node:

Analysis: No.12 | +X | First mode | -95.5

Parameters to be monitored | **Analysis to be examined**

Parameters group

Name: Muro in pietra

Parameter definition

Category:

Parameters to be examined

- [G1] Muro in pietra
 - E(870.00 - 1,740.00)
 - G(290.00 - 580.00)
 - fm(100.00 - 260.00)
 - T0(2.00 - 5.60)
- [G2] cls
 - E(27,085.00 - 29,962.00)
 - G(11,285.00 - 12,484.00)
 - fm(20.0 - 37.8)
- [G3] solaio
 - Thickness(4.0 - 5.0) {ID:6}
 - Ex(0.00 - 35,983.33) {ID:6}
 - Ey(0.00 - 28,000.00) {ID:6}

General data

Land level: [cm]
 Maximum iteration no:
 Self weight precision:

Computation parameters

Substeps:
 Precision:
 Maximum displacement: [cm]

The input of analysis and parameters groups to be checked is required through sensitivity analyzes. A new parameters group can be created by clicking on "Add". For each group is required to enter the parameters to be examined and its minimum and maximum values within which can vary each parameter.

Parameters group

Name: Muro in pietra

Parameter definition

Materials:

Masonry:

Muro in pietra:

G:

Minimum - maximum:

Minimum: [N/mm²]
 Maximum: [N/mm²]

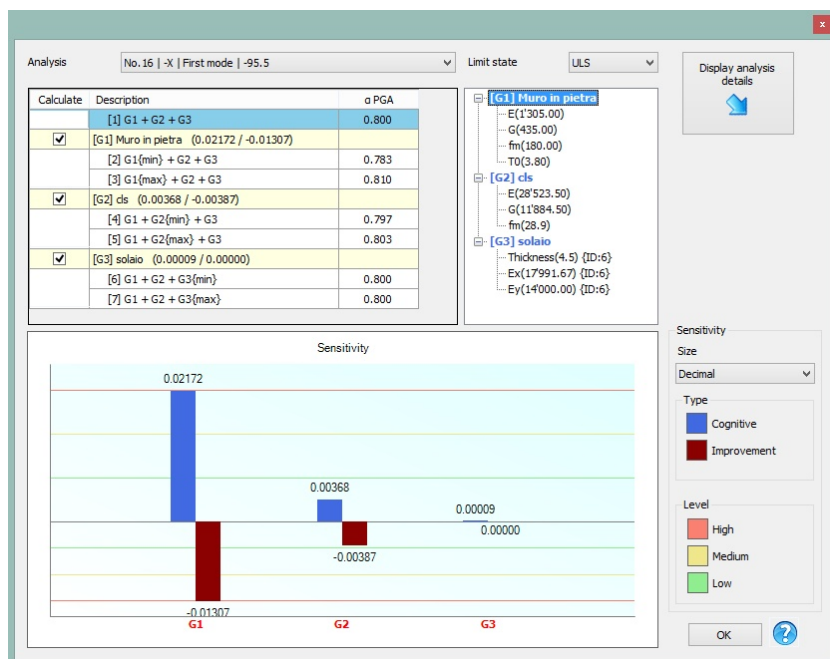
Parameters to be examined

- [G1] Muro in pietra
 - E(870.00 - 1,740.00)
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Three groups of parameters, relative to stone walls, concrete and slabs characteristics were inserted in the shown example.

4 Results

The analysis results window opens by clicking on "Sensitivity results" .



The window shows the sensitivity index diagram for each set of examined parameters. Both cognitive sensitivity (in blue) and improving sensitivity (in red) are shown in the graph. Colored reference lines show the corresponding sensitivity levels (high, medium, low).

A detailed window equivalent to that of a pushover analysis with all the analysis details is uploaded by selecting the analysis line and by clicking on "Show details".



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