بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / منى مغربي أحمد

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

SEMI-AUTOMATED SOFTWARE TOOL FOR SEISMIC PERFORMANCE-BASED ASSESSMENT OF BUILDINGS

By

Mohamed Mohy Eldeen Hasan Ahmed Ali

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Structural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

Semi-Automated Software Tool for Seismic Performance based Assessment of Building

Key Words:

Seismic Performance-based Assessment; FEMA P-58; PACT Engine; SPO2IDA; Fragility Functions

Summary:
The goal of this thesis is to develop a user-friendly software tool for seismic performance-based assessment of buildings. The tool is mainly written in python and utilizes FEMA P-58 as the methodology for the assessment. The developed tool is based on PACT (a classical tool provided by FEMA P-58), but is much more advanced and simpler manner. In this thesis the fragility specifications provided by FEMA P-58 is categorized in a nicely manner that fits into conventional structural design. The categorized fragility specifications are mainly based on SI unit system with no need for fragility unit of measurement as previously required by FEMA P-58. This categorized version is implemented into the developed tool. The results of conventional structural dynamic and pushover analyses are used as input for the developed tool. Afterwards, it automatically transforms input pushover curve into incremental dynamic analysis using the SPO2IDA tool and utilizes such results in the seismic performance assessment procedures. Eventually, the developed tool runs PACT engine through a command-line using xml-format file generated by the tool. The developed tool was designed to fit its' usage of seismic performance assessment in conventional structural design as it does not require a user to be fully aware of FEMA P-58 methodology.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Mohamed Mohy Eldeen Hasan Ahmed Date: .../.../2022

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List of Symbols and abbreviations

Symbol	**Description**
F	inertia force
M	mass of structure
ü	acceleration of structure
W	weight of structure
C	seismic coefficient
F_{be}	elastic base shear
δ_e	elastic deflection
F_{by}	hypothetical yielding base shear
δ_{max}	ultimate deflection
V_y	lateral yielding strength of structure
S	Strength ratio
$S_a(T_1)$	pseudo spectral acceleration at fundamental period of structure in the direction under consideration.
R	response modification factor
I	importance factor
Ω_0	overstrength factor
C_1	an adjustment factor for inelastic deformation
C_2	an adjustment factor for cyclic degradation
C_m	effective mass factor to account for higher modal mass participation effects
C_{vx}	Vertical distribution factor
W_i	lumped floor weight at each story
W_x	lumped floor weight at required story
h_i	floor height at each story