

# **An innovative method to determine elastic structural instability of frames**

## **Abstract**

This technical paper proposes an innovative general method which can determine elastic structural instability of every frame by applying a simple rule written in form of hypothesis. As such it is very useful in educational purposes, which is not the case with currently known methods such as Kennedy Theorem or method of Instant Centre of Rotation which are usually complex to understand by Undergraduate students. Furthermore, the proposed method is simpler and faster than existing methods when applied to complex structural system, which is shown by several examples drawn in the paper.

## **Introduction**

There are currently existing numerous mathematical or geometrical criteria to determine elastic stability of a structure which are all easy to apply to simpler structural systems but none of them are easy to apply to complex structural systems in order to determine its stable equilibrium. Furthermore, none of them are simple to be used in educational purpose towards Undergraduate students who are not yet familiar with basic theories of mechanics.

Purpose of our technical paper is to propose an innovative general method which can determine elastic structural stability of every frame. Objective of the paper is to describe the method on the way to be simpler and faster to use for Undergraduate students than currently existing methods. We do not aim to replace currently existing methods in practical applications but we aim to replace them for educational purposes by discussing advantages of our method compared to existing ones.

## **Method**

Following the hypothesis below and applying it as a rule, instability of every structural frame can be easily and quickly determined: "A two dimensional structural frame is unstable if there is not existing at least one way how... + 75 more words".

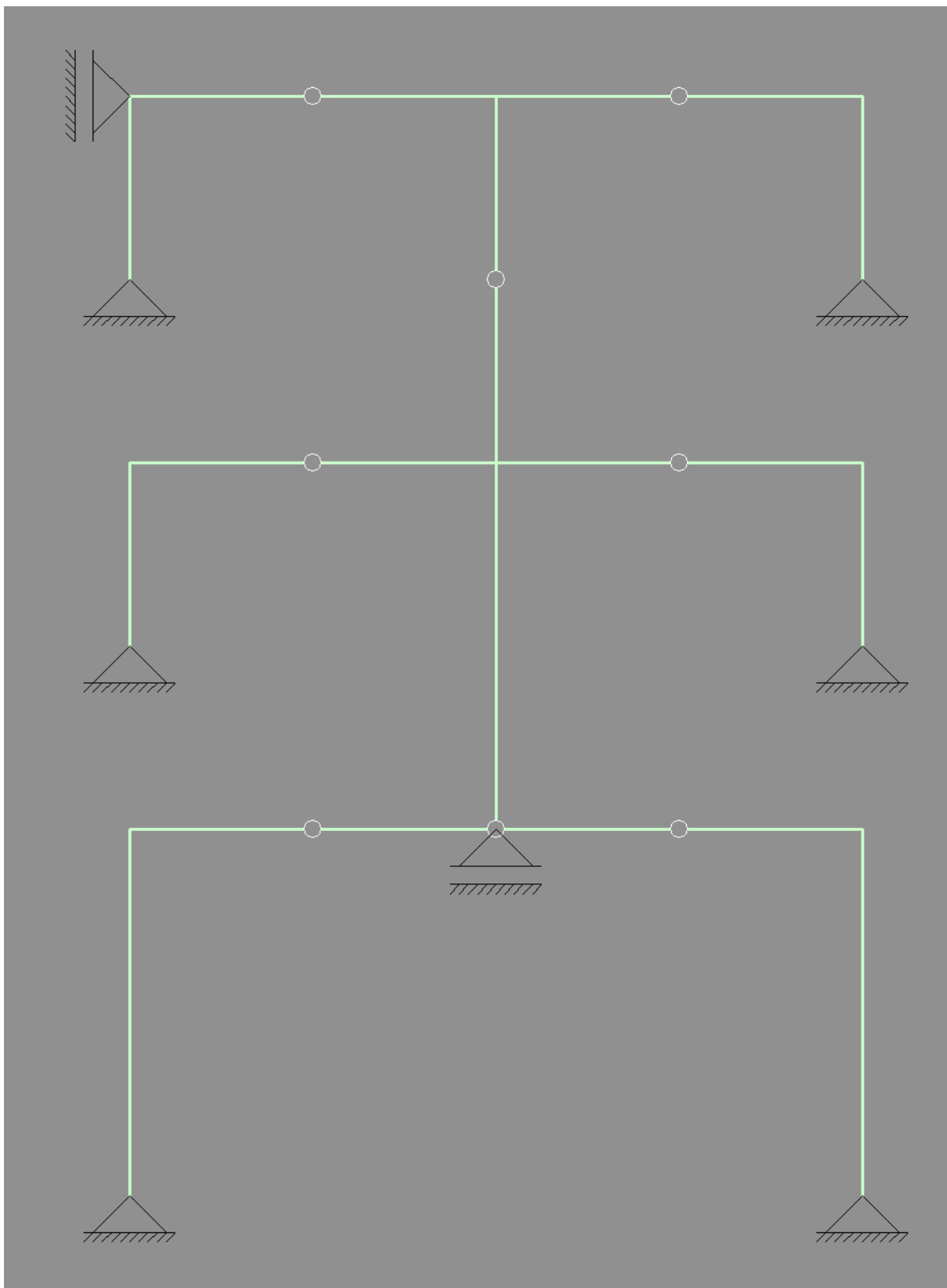
## **Results**

In following are solved examples (*comment: not solved at this moment but will be solved in the paper using our method*) to confirm that our method is simpler and faster to use for Undergraduate students than currently existing methods.

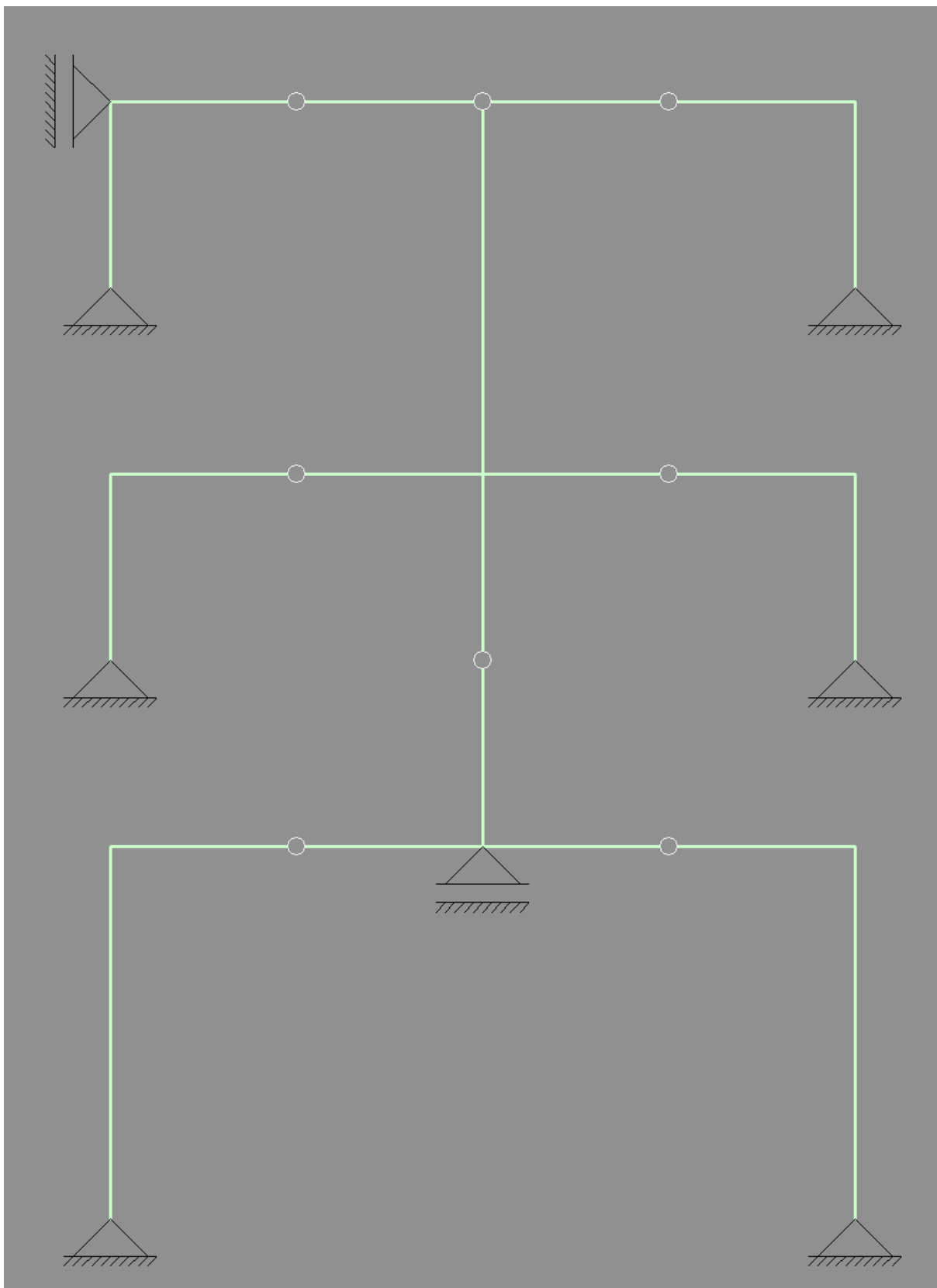
## **Looking for collaboration**

As my background is not from theoretical structural mechanics, I am looking for experts from that field who know how to apply currently existing methods to determine elastic structural stability from the literature and who are willing to collaborate with me in advisory role. As a test, I wrote down four complex structural systems and if you know how to determine their stability then we may collaborate.

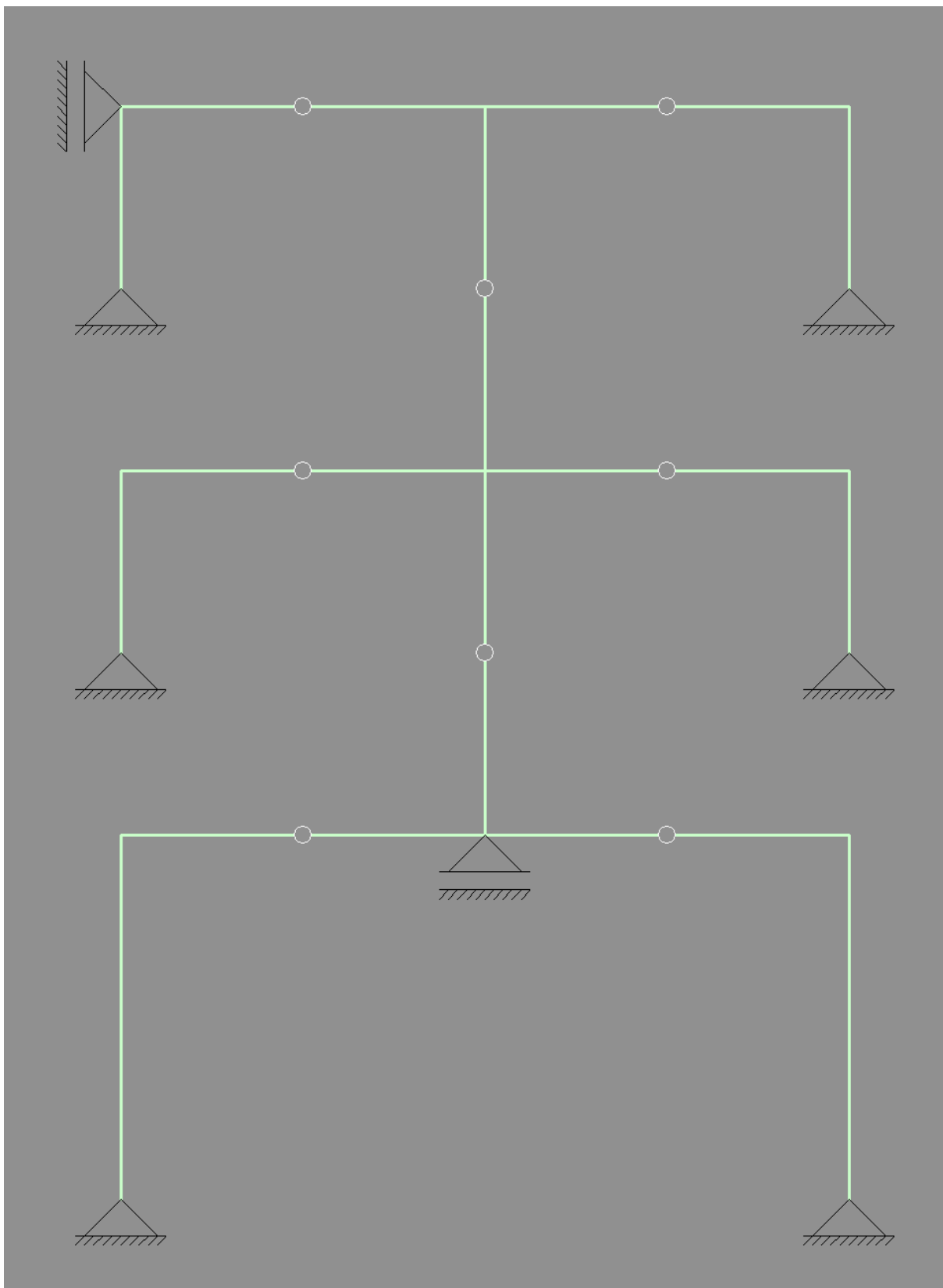
Example 1) Two degrees indeterminate system



Example 2) Two degrees indeterminate system



Example 3) Three degrees indeterminate system



Example 4) Four degrees indeterminate system

