



ORTA DOĞU TEKNİK ÜNİVERSİTESİ
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DEVELOPMENT OF A WEB-BASED 2D FRAME ANALYSIS PROGRAM

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Outline

- Introduction
- Development of the program
- Testing
- Further developments
- Conclusion

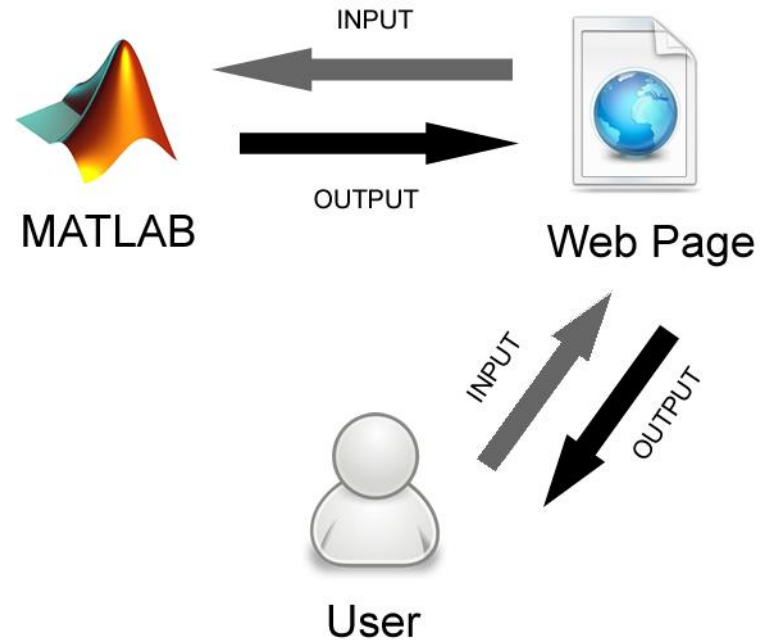


Introduction

- Online2DFrameAnalysis (www.2dframeanalysis.com)
- First web-based frame analysis program
- MATLAB & PHP & HTML & CSS & JQuery



Development of the program



Development of the program

Step 1: Define Nodal Points

To construct the model of the structure, firstly coordinates of nodal points should be defined in this step.

Step 2: Define Material Properties

Each member may have different material properties or some of them may have same property. Groups of material properties should be prepared in this step to assign members on the following step.

Step 3: Define Members

Structure members should be described here according to its starting node number, ending node number and material property type.



Development of the program

Step 4: Define Boundary Conditions

Supports location and restraint state for translation in global X direction, translation in global Y direction and rotation about global Z axis should be defined.

Step 5: Define Loads

In this step, if exists, external forces and moments should be assigned to the nodes.

Step 6: Run Analysis

Finally, all inputs are gathered by the program. By clicking Run Analysis button, the analysis should be started. After analysis completed. Results will be shown on the web page.



Development of the program

Online

2D Frame Analysis

Software

Step 1: Define Nodal Points

Step 2: Define Material Properties

Step 3: Define Members

Step 4: Define Boundary Conditions

Step 5: Define Loads

Step 6: Run Analysis

Define X and Y nodal point coordinates of the structure

X: m Y: m ✗

Add More

Next Step >

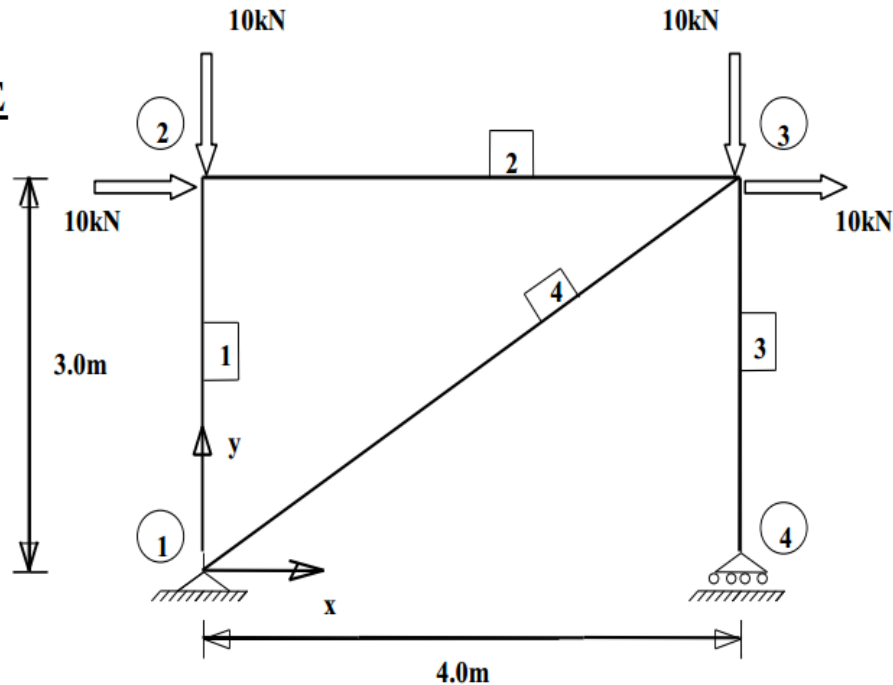
y
x



Testing

SAMPLE STRUCTURE

$E = 2.0 \times 10^5$ MPa for all members
 $A = 2 \times 10^{-2}$ m² for members 1 - 3
 $A = 1 \times 10^{-2}$ m² for member 4
 $I = 8 \times 10^{-2}$ m⁴ for member 1 - 3
 $I = 1 \times 10^{-2}$ m⁴ for member 4



Testing

Results

$$R = \begin{pmatrix} 1 & -20 & -5 & 0 \\ 4 & 0 & 25 & 0 \end{pmatrix}$$

$$D^T = \begin{pmatrix} -0.011 & 0.031 & 5.451 \times 10^{-4} & -8.036 \times 10^{-3} & 0.036 & -0.019 & -3.399 \times 10^{-3} & 0.026 & -3.399 \times 10^{-3} \end{pmatrix}$$



Further Developments

- Trusses
- Distributed Loads
- User-friendly interface



Conclusion

- Useful for civil engineering students
- Future of web-based programs



References

- PHP Manual <http://php.net>
- MATLAB Help <http://mathworks.co.uk/help/matlab/>
- HTML&Jquery&CSS <http://www.w3schools.com/>

