### Лабораторная работа №2

## Тема: Каркасная визуализация выпуклого многогранника. Удаление невидимых линий.

Черных Сергей М8О-305Б-20

Вариант: Правильный октаэдр

Разработать формат представления многогранника и процедуру его каркасной отрисовки в ортографической и изометрической проекциях. Обеспечить удаление невидимых линий и возможность пространственных поворотов и масштабирования многогранника. Обеспечить автоматическое центрирование и изменение размеров изображения при изменении размеров окна.

import plotly.graph\_objects as go  
import numpy as np  
from math import sqrt  
  
vertices = np.array([  
 ( 1, 0, 0),  
 ( 0, 1, 0),  
 ( 0, 0, 1/sqrt(2)),  
 (-1, 0, 0),  
 (0, -1, 0),  
 ( 0, 0, -1/sqrt(2))  
 ]  
)  
  
faces = np.array([  
 (0, 1, 2),  
 (1, 3, 2),  
 (3, 4, 2),  
 (4, 0, 2),  
 (0, 5, 1),  
 (1, 5, 3),  
 (3, 5, 4),  
 (4, 5, 0)  
 ]  
)  
  
def plot\_3d(a=1):  
 fig = go.Figure(data=[  
 go.Mesh3d(  
 x=a\*vertices[:,0],  
 y=a\*vertices[:,1],  
 z=a\*vertices[:,2],  
 colorbar\_title='z',  
  
 intensity=np.linalg.norm(vertices, axis=1),  
 colorscale=[(0.0, 'rgb(0, 0, 55)'), (1.0, 'rgb(0, 0, 175)'),],  
  
 i=faces[:,0],  
 j=faces[:,1],  
 k=faces[:,2],  
 name='y',  
 showscale=False,  
 flatshading=True,  
 )  
 ])  
  
 fig.update\_layout(  
 autosize=False,  
 width=600,  
 height=600,  
 margin=dict(  
 l=10,  
 r=10,  
 b=10,  
 t=80,  
 pad=5  
 ),  
 paper\_bgcolor="silver",  
 title\_text = "Октаэдр",  
 )  
  
 fig.show()  
  
def plot\_XOY(a=1):  
 x = a \* np.array([vertices[0, 0], vertices[1, 0], vertices[3, 0], vertices[4, 0], vertices[0, 0]])  
 y = a \* np.array([vertices[0, 1], vertices[1, 1], vertices[3, 1], vertices[4, 1], vertices[0, 1]])  
 fig = go.Figure(go.Scatter(x=x, y=y, fill="toself", fillcolor = 'rgba(0, 0, 175, 1)'))  
 fig.update\_layout(  
 autosize=False,  
 margin=dict(  
 l=10,  
 r=10,  
 b=10,  
 t=50,  
 pad=1  
 ),  
 paper\_bgcolor="silver",  
 title\_text='XOY'  
 )  
 fig.update\_yaxes(  
 scaleanchor = "x",  
 scaleratio = 1,  
 )  
 fig.show()  
  
def plot\_XOZ(a=1):  
 x = a \* np.array([vertices[0, 0], vertices[2, 0], vertices[3, 0], vertices[5, 0], vertices[0, 0]])  
 z = a \* np.array([vertices[0, 2], vertices[2, 2], vertices[3, 2], vertices[5, 2], vertices[0, 2]])  
 fig = go.Figure(go.Scatter(x=x, y=z, fill="toself", fillcolor = 'rgba(0, 0, 175, 1)'))  
 fig.update\_layout(  
 autosize=False,  
 margin=dict(  
 l=10,  
 r=10,  
 b=10,  
 t=50,  
 pad=1  
 ),  
 paper\_bgcolor="silver",  
 title\_text='XOZ'  
 )  
 fig.update\_yaxes(  
 scaleanchor = "x",  
 scaleratio = 1,  
 )  
 fig.show()  
  
def plot\_YOZ(a=1):  
 y = a \* np.array([vertices[1, 1], vertices[2, 1], vertices[4, 1], vertices[5, 1], vertices[1, 1]])  
 z = a \* np.array([vertices[1, 2], vertices[2, 2], vertices[4, 2], vertices[5, 2], vertices[1, 2]])  
 fig = go.Figure(go.Scatter(x=y, y=z, fill="toself", fillcolor = 'rgba(0, 0, 175, 1)'))  
 fig.update\_layout(  
 autosize=False,  
 margin=dict(  
 l=10,  
 r=10,  
 b=10,  
 t=50,  
 pad=1  
 ),  
 paper\_bgcolor="silver",  
 title\_text='YOZ'  
 )  
 fig.update\_yaxes(  
 scaleanchor = "x",  
 scaleratio = 1,  
 )  
 fig.show()  
  
def plot\_all(a=1):  
 plot\_3d(a)  
 plot\_XOY(a)  
 plot\_XOZ(a)  
 plot\_YOZ(a)

Введите длину стороны а

a = 1

plot\_all(a)

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