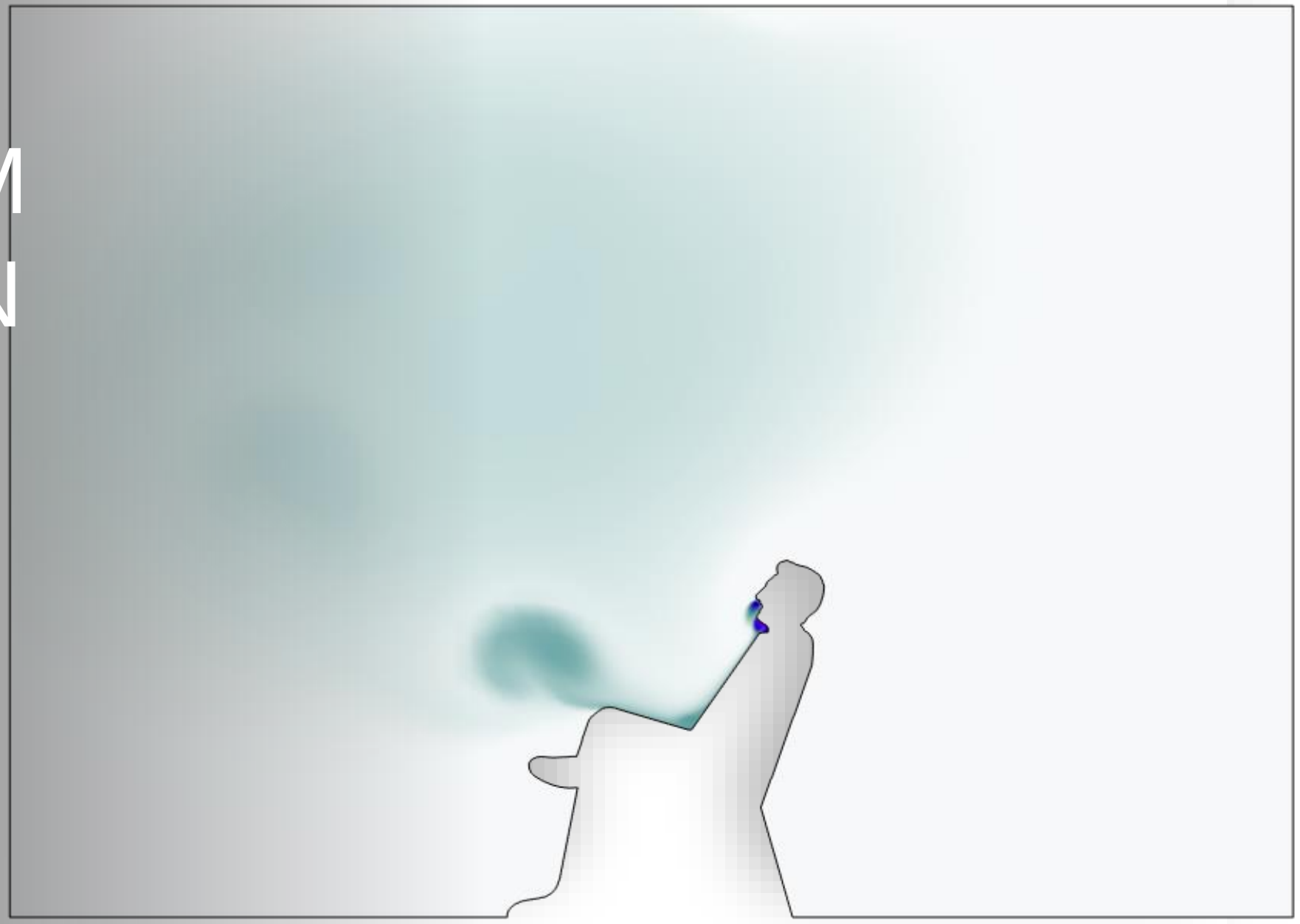
# CO2 ROOM DIFFUSION

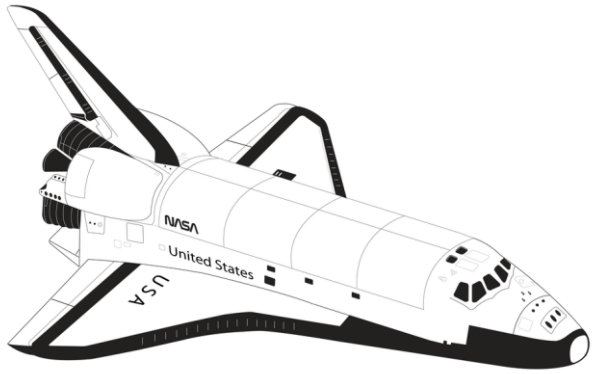


# GOALS & USES

Determination of critical $CO_2$ concentration in a closed space

App with variable parametres for room size, number of people, breath frequency etc.

Useful for office and learning spaces




Applicable to space shutles and planes

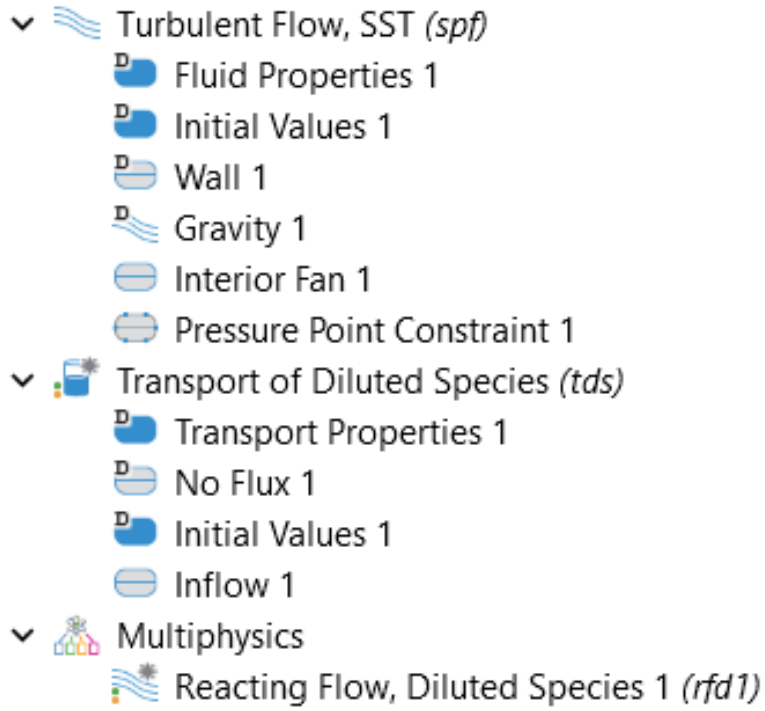
# 2D

Figuring out how to model human breathing

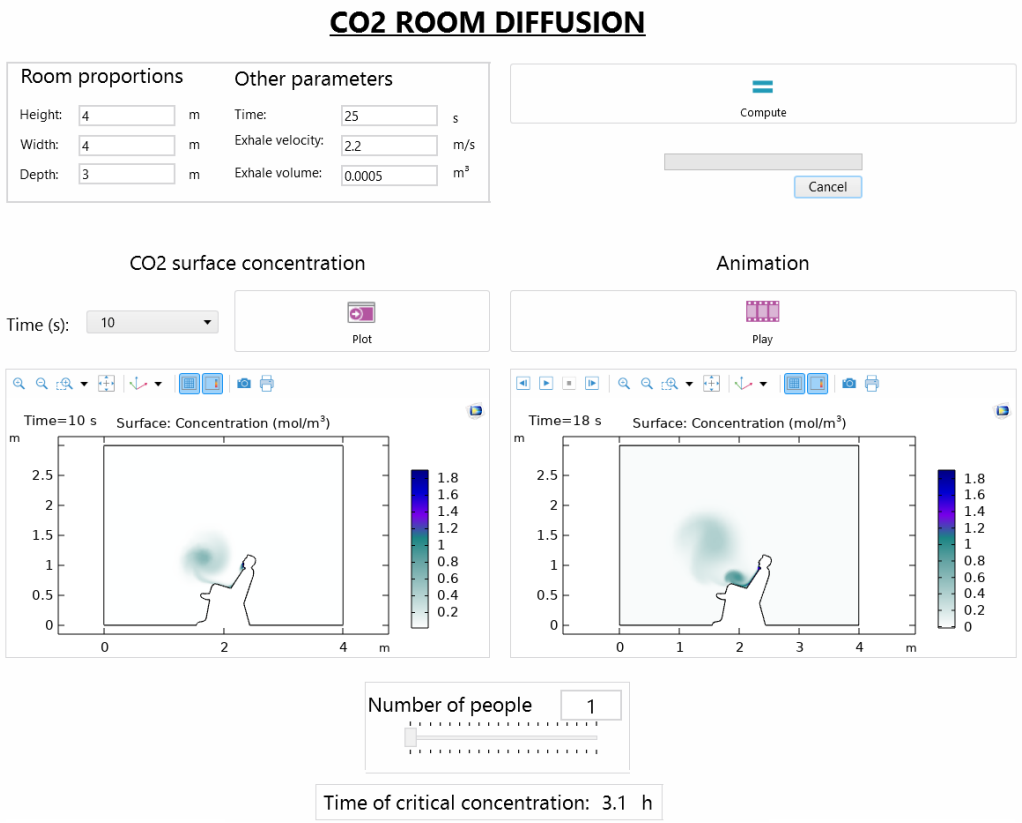
Passive approach with interior fan (no chemical reaction

Monitoring CO2 concentration and diffusion

Optimizing volume flow



# APP




Variable parametres

Surface concentration

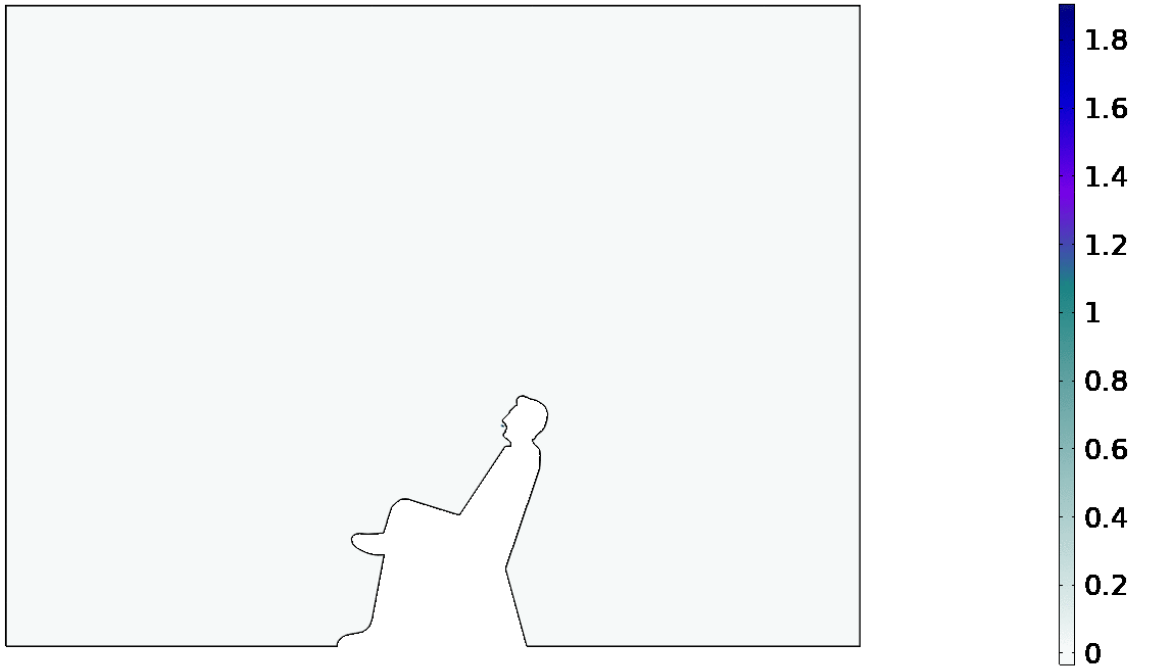
Numerical computation of critical concentration

# RESULTS & PROBLEMS

Visualization of breathing

Average concentration too high

Long computation time



# FUTURE IMPROVEMENTS

Better meshing (focused on nostrils)

Out of plane thickness in 2D

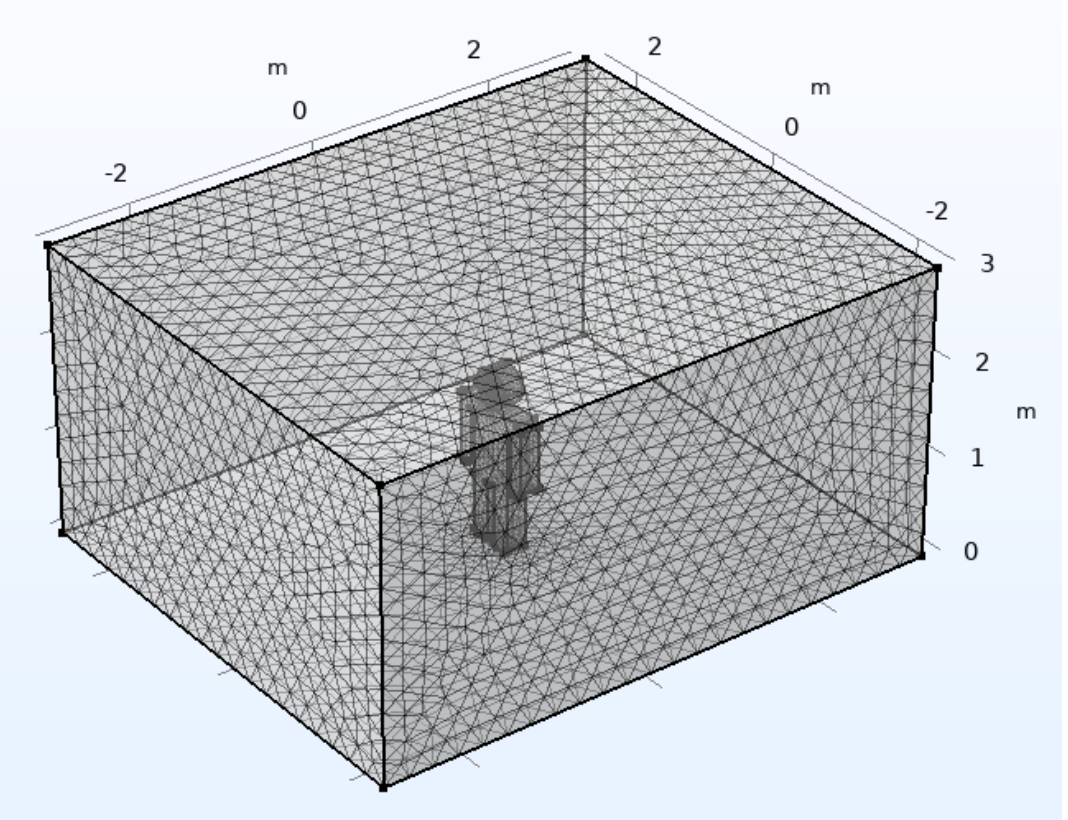
Full conversion to 3D

Neural network

Chemical reaction accounting for oxygen

Adaptability for larger number of people

Implementation of ventilation system

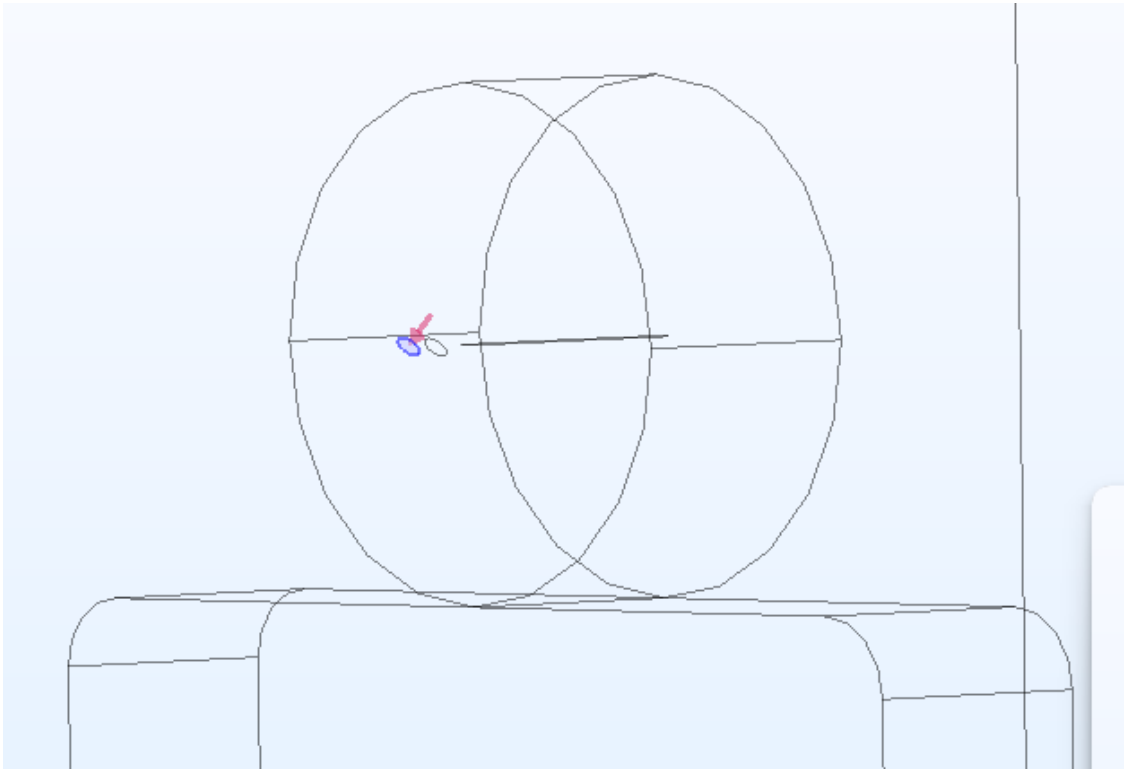


# 3D

Extremely long computation time

Problems with meshing

Piecewise function



# THAK YOU FOR YOUR ATTENTION

# Sources

*Jirka vysvětluje věci*. Online. Avalible at: https://www.youtube.com/watch?v=Y1PJQTnbQbI. [cit. 2024-05-23].

Pleil JD, Ariel Geer Wallace M, Davis MD, Matty CM. The physics of human breathing: flow, timing, volume, and pressure parameters for normal, on-demand, and ventilator respiration. J Breath Res. 2021 Sep 27;15(4):10.1088/1752-7163/ac2589. doi: 10.1088/1752-7163/ac2589. PMID: 34507310; PMCID: PMC8672270.

LINDSEY, REBECCA. Climate Change: Atmospheric Carbon Dioxide. Online. 2024. Avalible at: https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide. [cit. 2024-05-23].