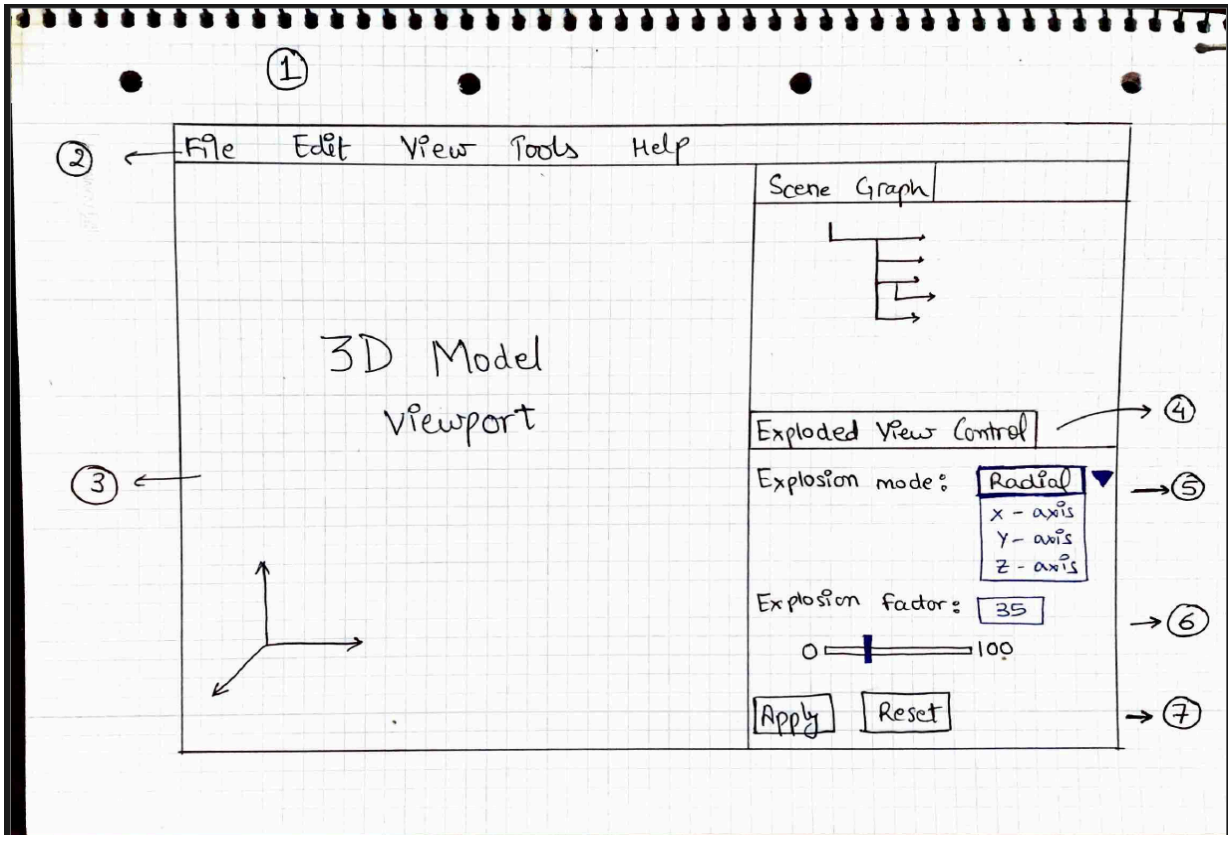
Date: 13.09.2025

Understanding the Assignment:

- Assumptions:
    - Existing app :
        - imports VRML (geometrical data)
        - shows scene graph tree
        - renders with OpenGL.
- Requirements:
    - Exploded view requested:
        - UI proposal to set up and steer the explosion view
        - A class diagram (mention only important methods)
        - Target language C++

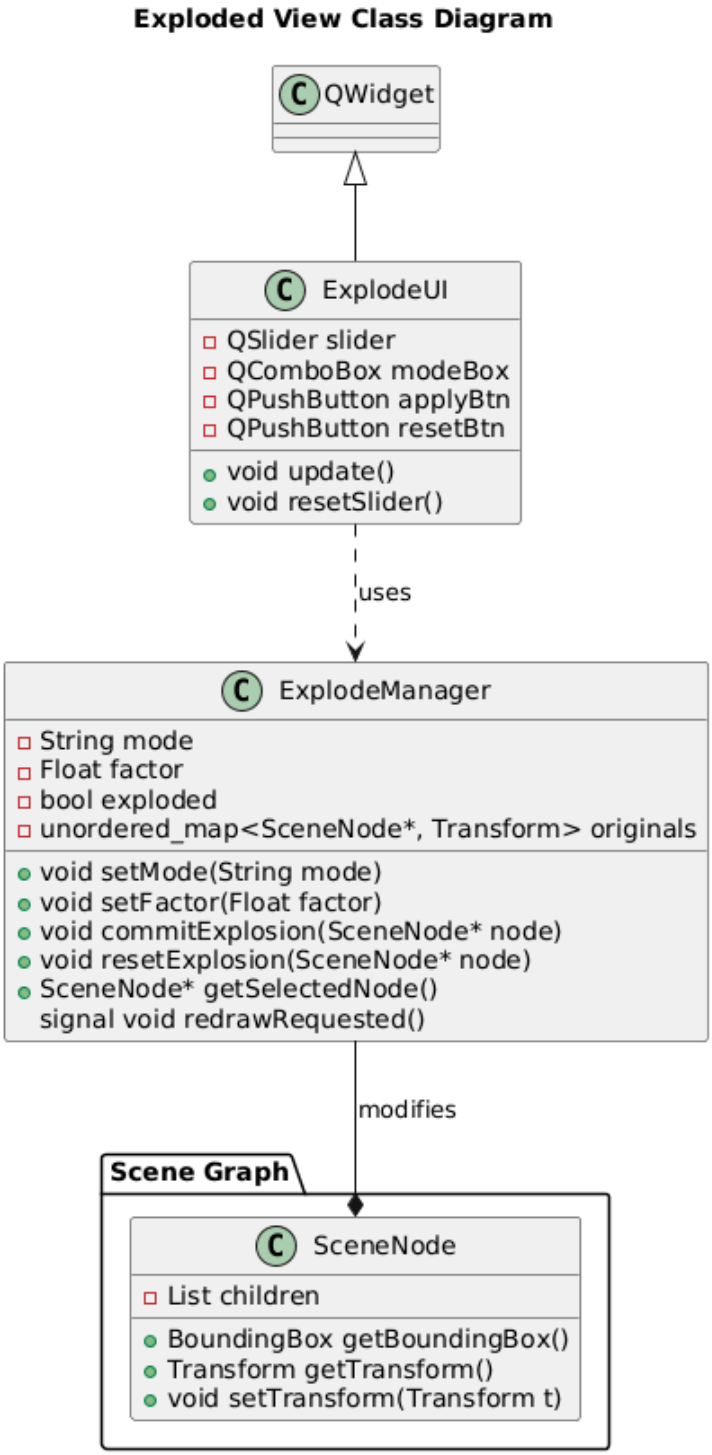
UI proposal:



(Keys in the diagram are mentioned below)

- A Dockable Window:
    - Existing Rendering app already has its main window (1)
    - Dock “Exploded View Controls” (4)
        - At Right bottom of main window
        - Using QDockWidget
    - Widgets (using Qt) :
        - Explosion Mode (QComboBox): (5)
            - Dropdown menu:
                - Radial: spreads parts from center
                - X/Y/Z-Axis: linear separation along axis
        - Explosion Factor (QSlider): (6)
            - Horizontal slider (0-100) sets separation distance (0=normal, 100=max).
            - On valueChanged -> updates transforms and triggers OpenGL redraw for interactive preview.
        - QPushButtons (Apply, Reset): (7)
            - Apply commits exploded transforms permanently (temporary transforms during sliding of QSlider gets cleared up)
            - Reset restores originals, reverting scene to unexploded and also resets the slider widget to zero value.
- Other widgets of main rendering application:
    - 2: Menu Bar
    - 3: Viewport for 3D elements

Class Diagram:



Class diagram explanation:

- SceneNode: Base class for VRML scene graph nodes.

    - getBoundingBox() returns geometry bounds for offset calcs;
    - getTransform()/setTransform() access/modify position/rotation;
    - children list enables recursion.
- ExplodeManager: Controls explosion logic.
    - setMode()/setFactor() store params
    - commitExplosion() applies offsets to node subtree (backup originals, mark exploded)
    - resetExplosion() restores from map/clears
    - getSelectedNode() fetches tree selection or root
    - originals map backups
    - redrawRequested() signals OpenGL update.
- ExplodeUI extends QWidget: Qt UI content for dock.
    - update() refreshes display
    - resetSlider() sets value to 0
    - slider/modeBox/applyBtn/resetBtn widgets connect to the manager for mode/factor/apply/reset.

Data handling (Non-Destructive):

- Explosion Mode logic: Chooses offset computation
    - radial: normalize(childCenter - parentCenter) * factor for spherical spread;
    - X/Y/Z-Axis: (axisVector * factor) for linear separation along chosen axis
    - Use in commitExplosion on selected nodes (or root if none).

- Explosion Factor Slider logic:
    - On valueChanged(int), normalize to float factor (0-1)
    - If exploded, call commitExplosion(node, factor) to mutate transforms in-place (add offsets recursively).
    - Emit redrawRequested() for OpenGL update.
    - Slider stays enabled for iterative tweaks.

- Apply button logic:
    - Calls ExplodeManager::commitExplosion(node) to backup originals if not done,
    - apply offsets via mode/factor
    - mark exploded=true,
    - clear temp backups.

- Reset button logic:
    - Calls ExplodeManager::resetExplosion(node) to :
        - recurse and restore Transform from original map,
        - clear map,
        - set exploded=false
        - set slider value to 0 via setValue(0)
        - trigger OpenGL redraw for unexploded view.