Geometry Simplification Method for the Simulation
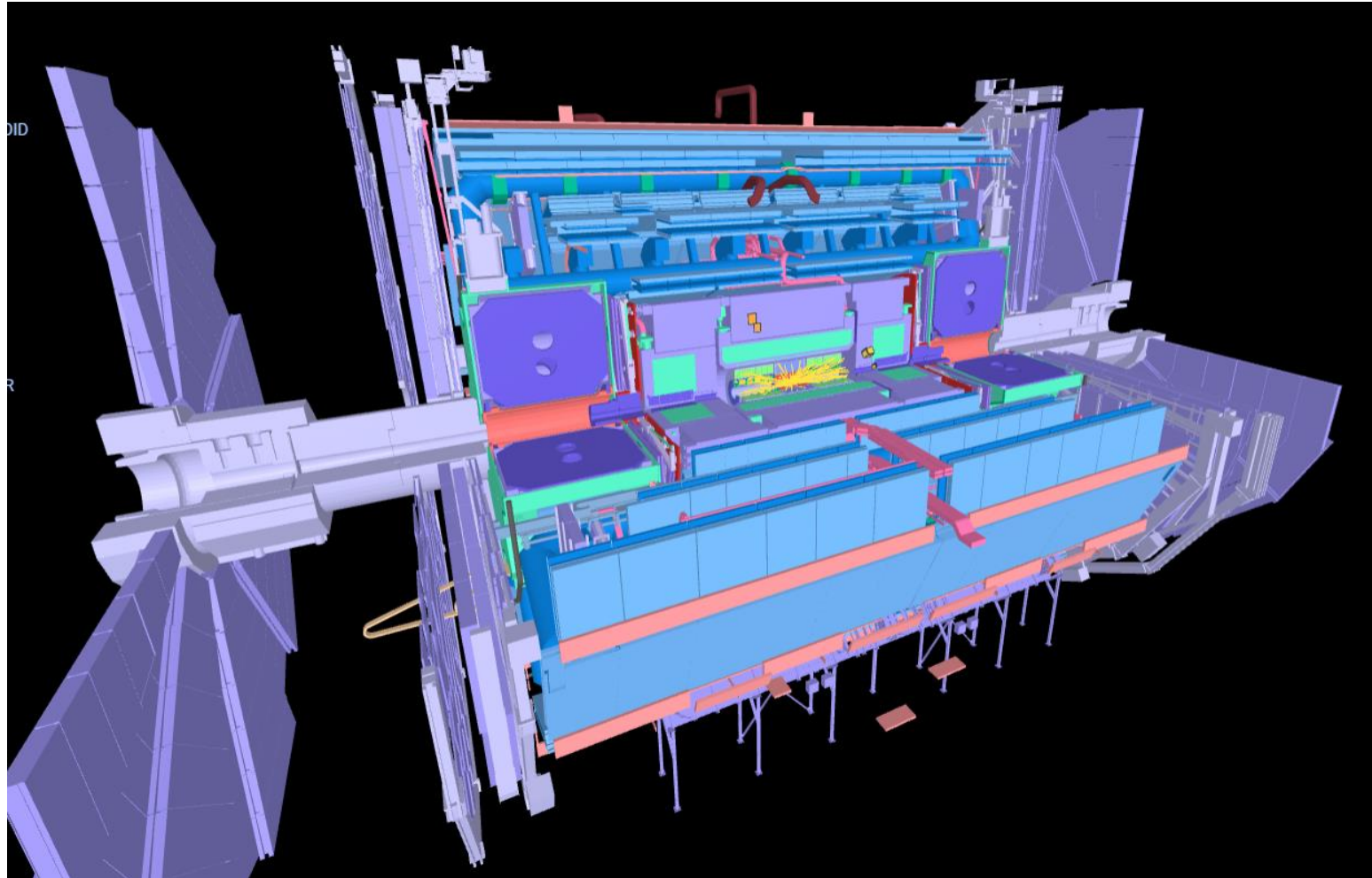
Vashakidze Salome

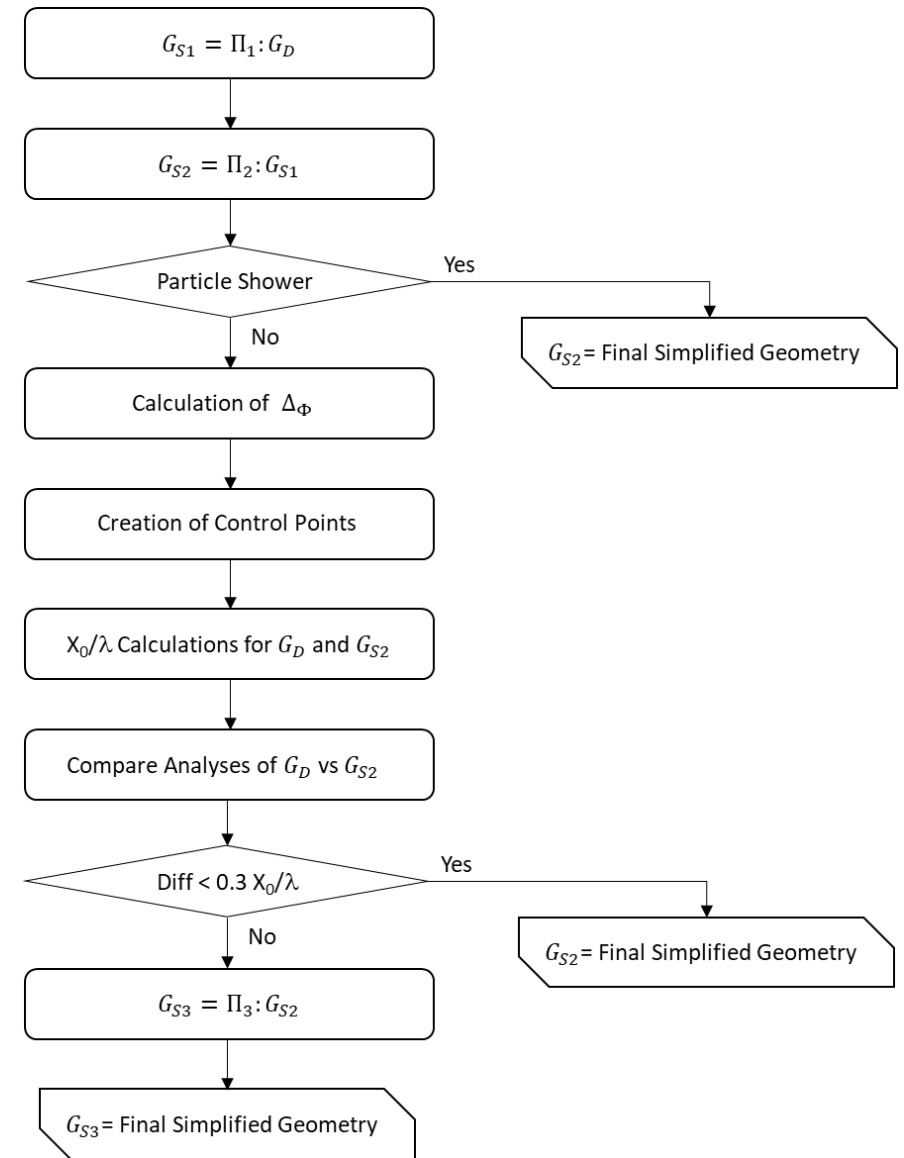Supervisor: Alexander Sharmazanashvili

Georgian Technical University

Simplification of Geometry

it is necessary to develop unique methods and tools for the early study of the detector geometry, to ensure that simplified geometry brings high performance and precision to the simulation.
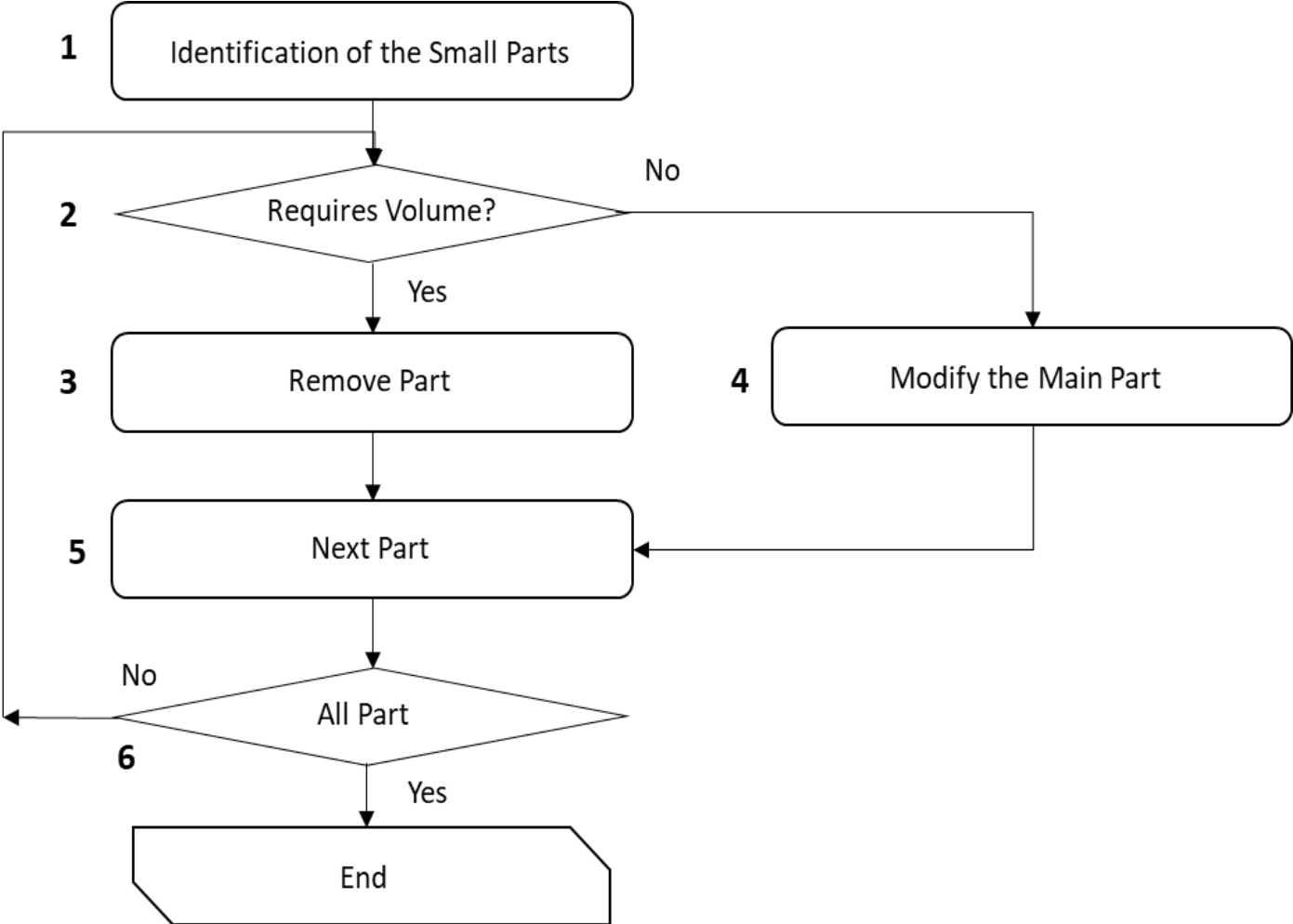
Geometry Simplification Algorithm for the Simulation

- Simplification is Π transformation of detailed geometry into simplified geometry.
- geometry contains minimum details to ensure the high performance of the simulation

$$G_{S1} = \Pi_1 : G_D$$

$$G_{S2} = \Pi_2 : G_{S1}$$

Particle Shower — Yes → G_{S2} = Final Simplified Geometry

No ↓

Calculation of Δ_Φ

Creation of Control Points

X_0/λ Calculations for G_D and G_{S2}

Compare Analyses of G_D vs G_{S2}

Diff < 0.3 X_0/λ — Yes → G_{S2} = Final Simplified Geometry

No ↓

$$G_{S3} = \Pi_3 : G_{S2}$$
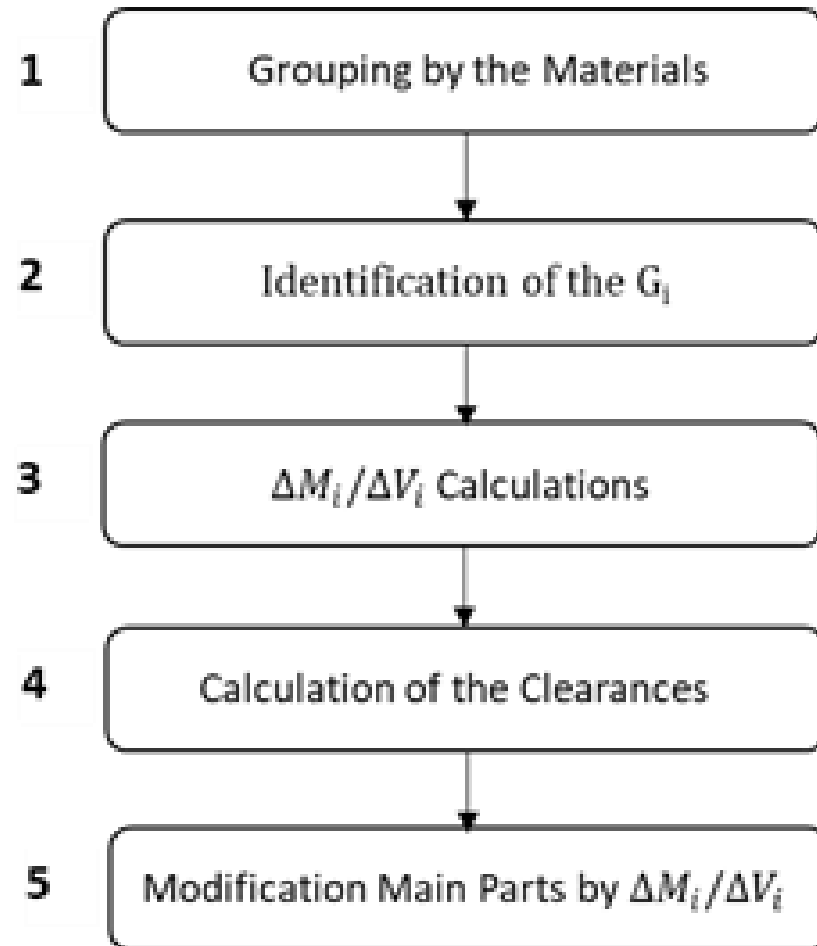
G_{S3} = Final Simplified Geometry
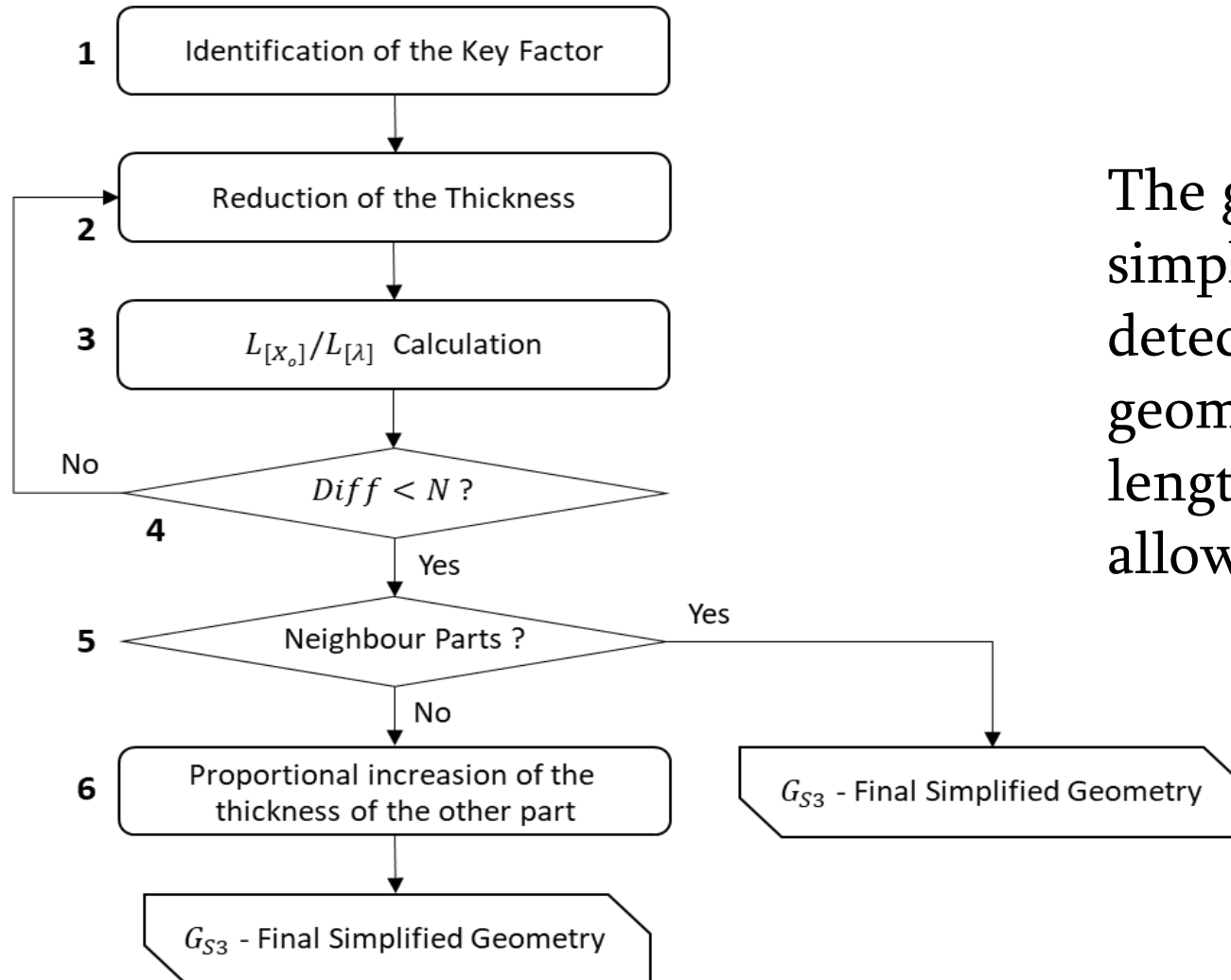
REMOVAL OF THE COMPONENTS

The number of volumes in the geometry is the key factor - as many volumes are described in the geometry, the simulation performance is less.

REPRODUCTION OF THE MASS PROPERTIES

```
1   ┌─────────────────────────────────┐
    │    Grouping by the Materials    │
    └─────────────────────────────────┘
                    │
                    ▼
2   ┌─────────────────────────────────┐
    │   Identification of the $G_i$   │
    └─────────────────────────────────┘
                    │
                    ▼
3   ┌─────────────────────────────────┐
    │   $\Delta M_i/\Delta V_i$ Calculations   │
    └─────────────────────────────────┘
                    │
                    ▼
4   ┌─────────────────────────────────┐
    │    Calculation of the Clearances │
    └─────────────────────────────────┘
                    │
                    ▼
5   ┌─────────────────────────────────┐
    │ Modification Main Parts by $\Delta M_i/\Delta V_i$ │
    └─────────────────────────────────┘
```

The purpose is to compensate for material loss after the Π_1 and keep mass properties and volume of the initial, non-simplified geometry

REPRODUCTION OF THE RADIATION PARAMETERS

1. Identification of the Key Factor
2. Reduction of the Thickness
3. $L_{[X_o]}/L_{[\lambda]}$ Calculation
4. $Diff < N$?
   - No
   - Yes
5. Neighbour Parts ?
   - Yes → G_{S3} - Final Simplified Geometry
   - No
6. Proportional increasion of the thickness of the other part

G_{S3} - Final Simplified Geometry

The general algorithm of simplification foresees the detection of regions in the geometry where the radiation length changes exceed the allowable value.

Conclusion

The CATIA platform can be considered a hub for the collection of geometry descriptions from various platforms and proceed with different studies of detector geometry for the best simulation.

Thank you for your attention!

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