A NEW AIRCRAFT FUSELAGE CONFIGURATION?
Easy with GEF4!

Ref. presentation : EclipseCon France 2017
AGENDA

1. User interactions
2. Main GEF4 components
3. Geometry 2D/3D calculation
4. Cabin simulator video
INTRO

• Main Airbus requirements
  • Easy to use
  • Allow unconventionnal aircraft configuration
  • Precise geometry calculation

• Graphical Editing Framework (GEF4)
  • Provide components to create graphical application
  • Rendered in JAVA FX Scene

• Project started mid 2015
  • GEF4 was only in its first snapshot V0.1.0 (Mars release)
  • Currently using GEF4 V1.0.0 (Neon release)
DECK VIEWS

- Passenger deck
- Cargo deck
USER INTERACTIONS
ZOOM IN/OUT - PAN

- Easy moves
- Line thickness adapted to zoom level

Can I navigate easily on my layouts?
HOVER

- Selection hover

- Hover menu

How can I interact with elements?
CLICKABLE AREA

- Increase hover trigger area
PALETTE

- Focusable palette

How can I interact with the view?
JAVA FX COMPONENT INTEGRATION

- Viewer overlay or underlay

- Right click palette – JAVA FX Popup
Can I have cabin info on the view?

- JAVA FX TableView

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<tr>
<td>Seats per CAS</td>
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</tbody>
</table>

Individual Zone Capacity: 168 (220)

Total Capacity: 168 (220)
It should be very fast to create seats
Front View

- Height element positioning check

I’d like to see aircraft section at location I want
MEASUREMENTS

- Measure spacing between every element
MAIN GEF4 COMPONENTS
MVC ARCHITECTURE

MvcModule (Configuration)

Configure Bindings

Viewer (View)

Policy

Behavior

Bound to

VisualPart (Controller)

Create

PartFactory

* Create

Create Refresh

Visual

Content (Model)
VISUALPART

- Manage visual to be rendered in the viewer
- Created by PartFactory with its associated content
- IContentPart
- IFeedbackPart
- IHandlePart
MODULE

- Base class MvcModule

- MvcFxModule provided for JAVA FX with default bindings for
  - Hover
  - Feedback
  - Selection
  - Mouse scroll
  - ...

- MvcFxModule can be overridden to Add/Change/Remove default bindings
VIEWER

- Default implementation provided as FXViewer (JAVA FX)
- Populated by VisualParts
- State represented with internal models
  - ContentModel
  - SelectionModel
  - FocusModel
  - HoverModel
- ContentModel and SelectionModel can be manipulated after an user interaction
POLICY

- Bound to a IVisualPart

- 2 different Policy types
  - Interaction
  - Transaction

- Usage examples
  - IVisualPart creation
  - Change geometry element thickness on zoom in/out
  - Drag & Drop elements
  - Right click palette creation
  - Hover menu click
BEHAVIOR

• Bound to a IVisualPart

• Actively listens to Viewer model changes

• Selection behavior provided is responsible to create/delete feedback and handle parts

• Usage examples
  • Selection behavior overriden to remove handle parts creation
  • Clickable area default size change
  • Palette focus feedback change
GEOMETRY 2D/3D CALCULATION
GEF4 GEOMETRY

• Provided by geometry plug-in

• Define 3 main geometry interfaces for visual elements
  • ICurve
  • IShape
  • IMultishape

• Provide geometry relationship utilites
  • Touches
  • Intersect
  • Get intersection points
  • Contains
FUSELAGE 3D DEFINITION

- Discretized with multiple cross section

- A cross section is a fuselage cut at a given position
FUSELAGE 3D DEFINITION

• User has the possibility to create cross section shape

• Then other cross section are automatically computed
AIRCRAFT ENVELOPE DEFINITION

- 360 segments connect each user defined cross sections

- Interpolated with splines
CROSS SECTION COMPUTATION

- Intersections between a plan and all segments

- Cross section saved as a Polygon
AIRCRAFT GEOMETRY EXAMPLE

- With 3 cross sections defined by user
GEOMETRY ELEMENT COMPUTATION EXAMPLE

- Deck floor geometry top view computation

- Intersection between Polygon and Line on every cross section
GEOMETRY ELEMENT COMPUTATION EXAMPLE

- Floor geometry result saved in a Polygon

- Floor top view representation
COLLISION CHECK ENGINE

- Check 2D/3D clash
- Help user to validate his aircraft and cabin layouts
- Heavy usage of touches() and contains() method
CABIN SIMULATOR

Graphical rendering demo
CABIN SIMULATOR

- Multi agent simulation
  - Simulate boarding and deplaning
  - Multiple parameterizations
    - Passenger physical characteristics
    - Passenger behaviors
    - Doors, seats affectation

- Based on passenger deck view
  - Reuse graphical code
  - Removal of user interaction
  - Only addition: Passenger and luggage drawings
CABIN SIMULATOR DEMO
CONCLUSION

• Hard Start
  • Long learning curve
  • Bindings and injections are complicated to understand
  • Best way to learn: Analyze logo example and other small examples

• Good results
  • Good feedback from users
  • Nice graphical rendering
  • Good performance

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CONTACTS

CIMPA PLM Services

4 Avenue Didier Daurat,
31700 Blagnac

www.cimpa.com

Xavier JACQUES
Solution Architect

T. + 33 (0)5 32 11 04 42
xavier.jacques@cimpa.com