

# Towards Seamless Semantic Zooming Techniques for UML Diagrams

Mathias Frisch, Raimund Dachzelt, Tobias Brückmann

## Motivation and Approach

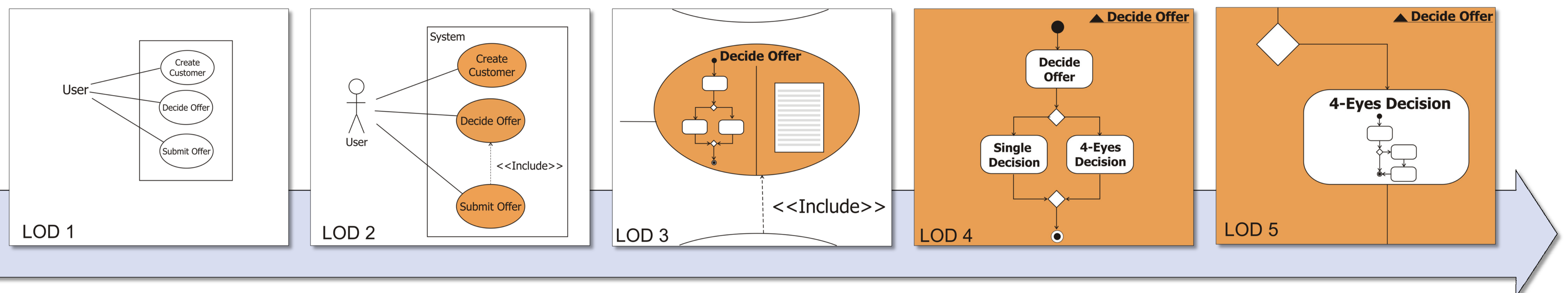
The main requirements concerning the visualization of and interaction with UML models are

- Getting a reasonable overview and a detailed view of certain diagram elements
- Understanding logical relationships not expressed by UML between diagrams

UML modeling tools do not satisfy these needs:

- Elements become very small through simple geometric zooming
- Context information is not available when zoomed in
- Navigation between visually isolated diagrams is cumbersome

**Our approach** To solve these problems we suggest *semantic zooming* with different levels of detail to interact with UML diagrams and we present intuitive interaction techniques for zoomable user interfaces (ZUI) to improve the navigation in huge software models.



## Visualizing Nested Diagrams

ZUIs can be used to visualize diagrams which are nested into each other by smooth animated transitions. The figures above illustrate this approach.

### Navigation Support

- Links at the side of the diagram allow a quick navigation to higher or lower levels.
- Color coding: e.g., an orange background indicates that the diagram is nested in a use case.

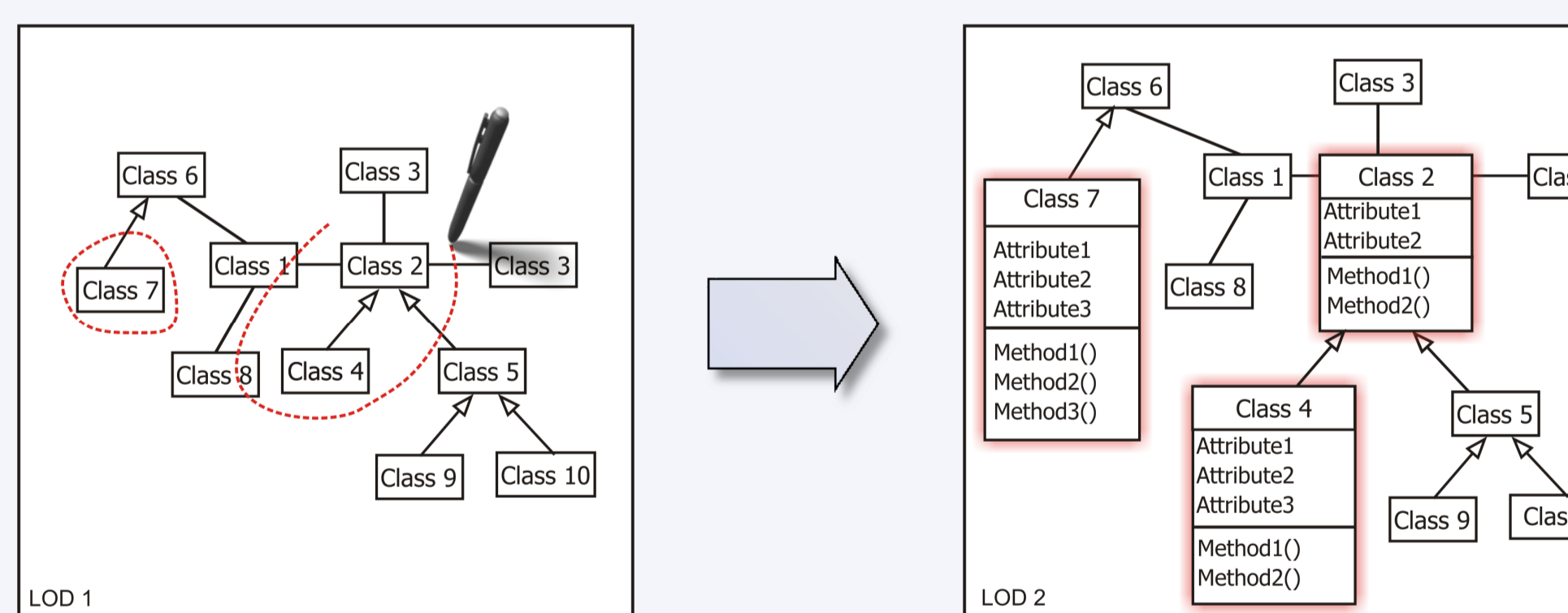
### Further possibilities of refinements

- Deployment diagrams can be refined by component diagrams
- Component diagrams can be refined by package diagrams or class diagrams
- Class diagrams can be refined by state charts or source code.

## Interaction Techniques

### Selecting elements

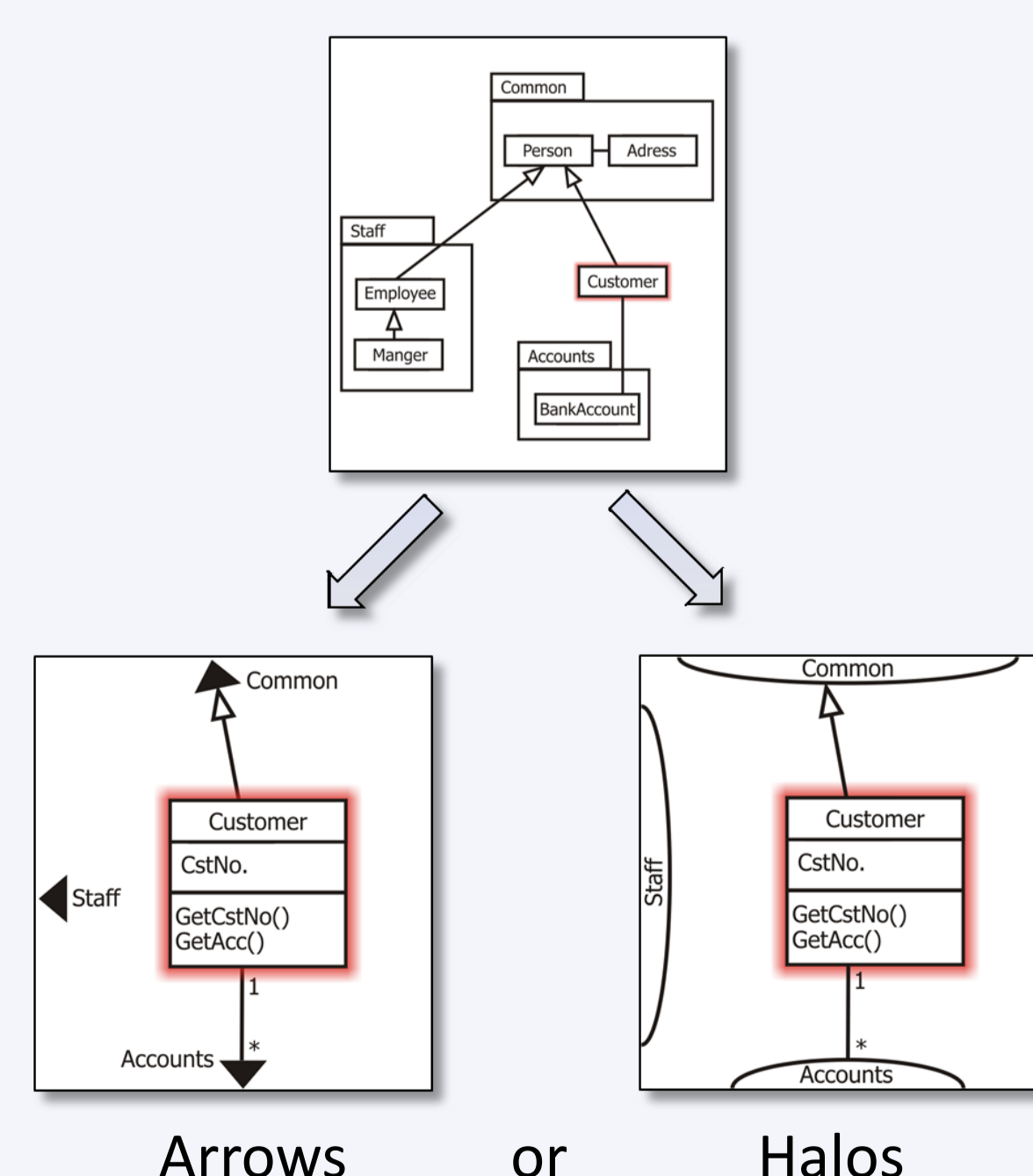
Circling the respective parts of a diagram can speed up the selection of many elements. Every circled area represents a focus and its Level of Detail is increased. Elements do not have to be selected and de-selected one by one.



### Panning

Halos or similar techniques can provide a quick navigation to off-screen elements when zoomed in. Clicking on one of these navigation aids starts an automatic panning to the associated elements. They can be displayed for

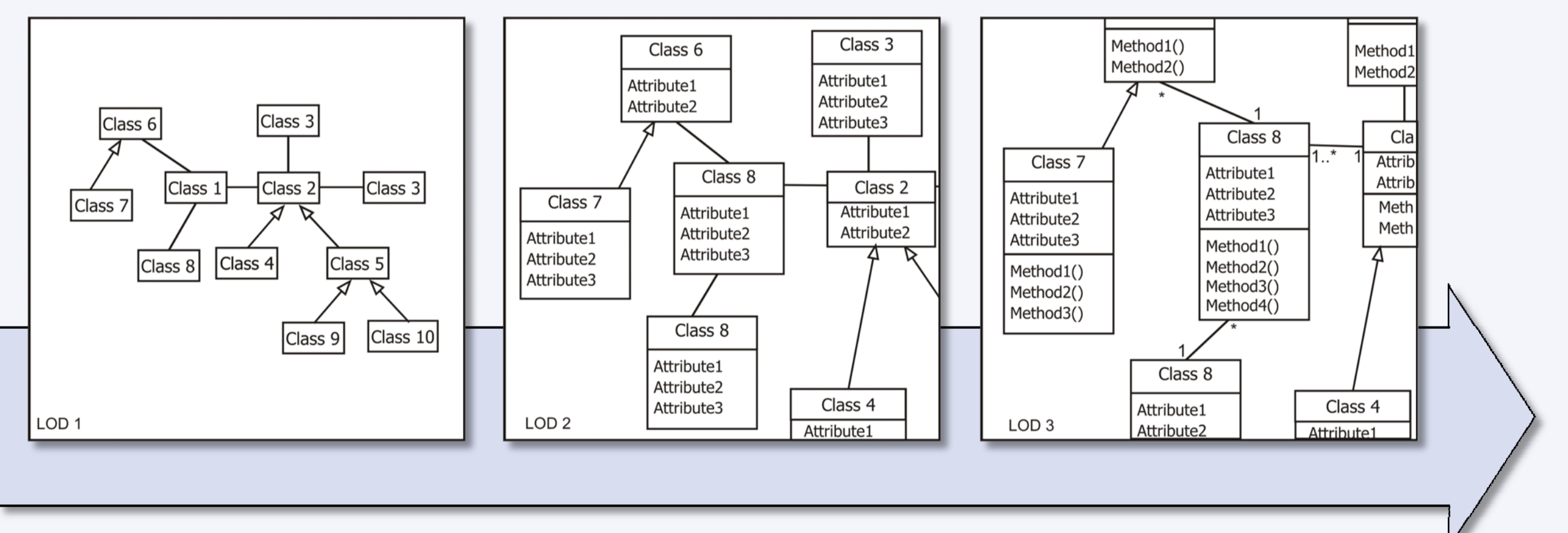
- Nearest neighboring elements
- Elements which are connected to the currently focused element
- Clusters of certain elements which are generated according to semantic criteria.



## Visualizing Overview and Detail

### Semantic Zooming with different Levels of Detail

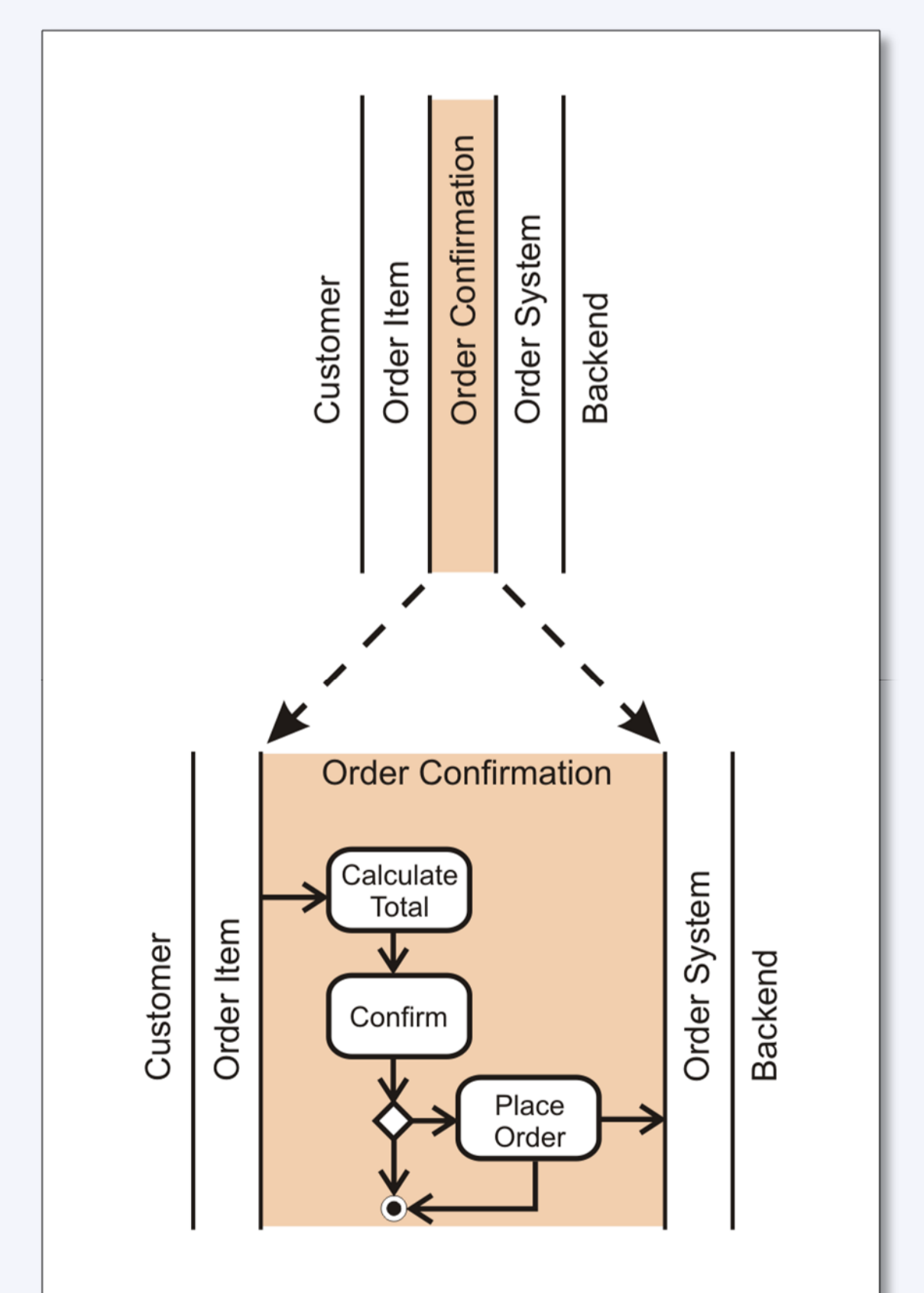
Using different Levels of Detail provides an overview with important parts still visible. For example, on an overview level of class diagrams, classes are drawn as simple rectangles and just their labels and relationships are shown. No internal attributes, methods or cardinalities are visible. By zooming in, classes are expanded and methods, attributes and cardinalities appear.



### Focus and context techniques

In this case *semantic zooming* is not performed on the whole diagram at once, but just on a certain selected element. Elements not in focus do not change their Level of Detail. The figure on the right hand side illustrates this approach for swim lanes of an activity diagram.

- On the coarsest level, just the titles of the lanes are visible.
- By clicking on a certain swim lane, the lines move apart and the associated activities and transitions are displayed.



## Future Work

- Implementations of these visualization and interaction techniques as high-level prototypes
- User studies to compare state-of-the-art tools to our approach concerning accuracy, speed and comprehension.