Design Patterns and Frameworks	**Exercise Sheet No. 1**
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Variability Patterns I

Task 1: Template Method vs Template Class

Suppose you have to write a tool for architects that visualizes buildings of different types. Usually, a building is structured from levels, levels are structured from corridors, and corridors from rooms.

There are different classes of buildings: skyscrapers, bungalows, 1- and 2-family houses.

1a)

Create a hierarchy of building types and another hierarchy defining the building's structure. Use TemplateMethod to make sure structural constraints (for example, only corridors may contain rooms) are maintained for the building parts of a concrete building.

Hint: Apply Composite to define the building's structure.

1b)

Design an iterator algorithm that walks over all types of buildings and draws them room by room on the screen (we assume that only rooms draw themselves). Apply TemplateMethod.

1c)

Now, change the TemplateMethod into a TemplateClass pattern (or Strategy). Zip out all hook methods from the concrete template class and put them into a separate hierarchy. Which advantages and disadvantages has your new design?

1d)

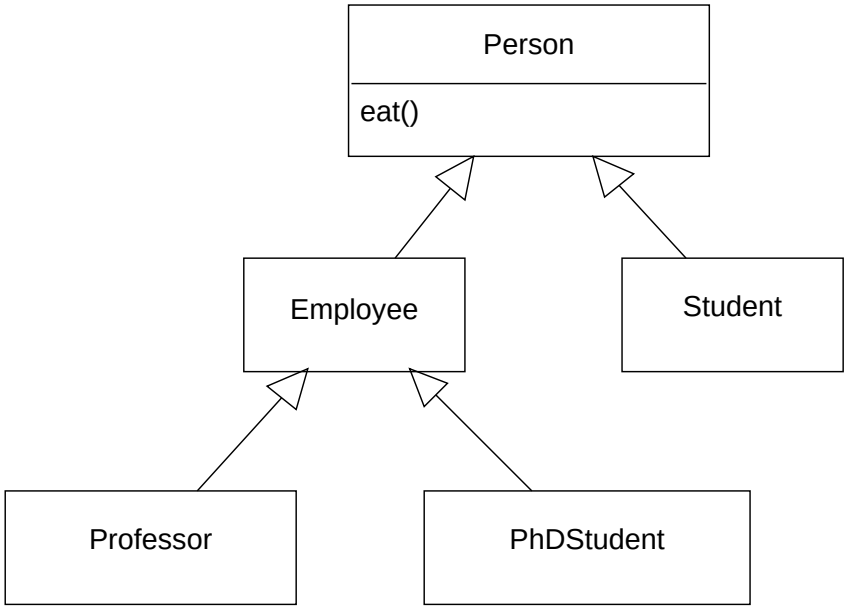
So far, only rooms are drawn. Now, draw all elements of a building (building, level, corridor, room) on the screen. Note that for every class of building and every building element you have to vary the behaviour separately; that is, different buildings require different ways of drawing their individual elements. Tip: Again use TemplateClass.

Why is it impossible to use TemplateMethod?

Task 2: Objectifier, Reifying Methods

2a)

Consider the following simple class hierarchy.



Reify the method `eat` to the pattern Objectifier (or Strategy). Distinguish standard eaters, vegetarians, gourmets, and gourmands.

2b)

Which linguistic process corresponds to the reification of methods, i.e., to the Objectifier?

2c)

What is the problem if you group all 4 classes of eaters into one class hierarchy?

2d)

Split the eater hierarchy with a simple DimensionalClassHierarchies (Bridge) pattern.

2e)

Now split all facades of `Person` (including the `Eater` hierarchy) into Bridges, using `Person` as the central class.

Task 3: Comparison of Variability Patterns

3a)

Compare Bridge and TemplateMethod. What are commonalities, what are differences?

3b)

Compare TemplateMethod and Strategy. What are commonalities, what are differences?

3c)

Compare TemplateClass and GenericTemplateClass.