The Bicycle Challenge

The following description represents different levels of abstraction that can be used to describe the configuration of bicycles. It is not comprehensive and may include ambiguities.

Description

A configuration is a physical artefact that is composed of components. A component may be composed of other components or of basic parts. There is a difference between the type of a component and its instances. A component has a weight. A bicycle is built of components like frame, a handle bar, two wheels … A bicycle component has a weight. Frames and forks exist in various colors. Every frame has a unique serial number. Front wheel and rear wheel must have the same size. Each bicycle has a purchase price and a sales price. There are different types of bicycles for different purposes such as race, mountains, city .. A racing fork does not have a suspension. A racing bike is not suited for tough terrains. A racing bike is suited for races. Racing frames are specified by top tube, down tube, and seat tube length. A racing bike can be certified by the UCI. A racing frame is made of steel, aluminum, or carbon. A pro race bike is certified by the UCI. A pro race frame is made of aluminum or carbon. A pro racing bike has a minimum weight of 5200 gr. A carbon frame type allows for carbon or aluminum wheel types only. „Challenger A2-XL" is a pro racer for tall cyclists. The regular sales price is 4999.00 It is equipped with a Rocket-A1-XL pro race frame. The Rocket-A1XL has a weight of 920.0 gr.

Assignment

The above description of the bicycle domain is to be represented with a multilevel model. Lack of information or ambiguities in the description should be identified and removed by making explicit assumptions. The model should account for the following requirements. It is not mandatory that a solution satisfies all requirements. Further requirements may be added.

Req. 1: Knowledge about the domain, which may include particular aspects, should be represented at the highest level possible.

Req. 2: It should be possible to use the model (or parts of it) as a foundation for a software system that is suited for a wide range of general bicycle stores. At the same time, it should allow for this software to be refined into more specific systems like one for a specialized dealer of professional racing bikes.

Req. 3: It should be possible to define associations between elements on different levels. Alternatively, it can be shown that cross-levels associations are not required.

Req. 4: As a consequence of req. 3, it should be possible to specify cross-level constraints.

Req. 5: There should be mechanisms that protect the integrity of lower levels of the model from changes that occur on higher levels.

Req. 6: There should be mechanisms to preserve the model semantics and foster the synchronization of MLM-based models with code.

The proposed solution should be presented in a paper that reflects the structure below. Papers are submitted like regular papers. Each paper should have the subtitle "A contribution to the MULTI 2017 challenge".

Each submission will be reviewed against the following criteria:

- Address the case study domain as given in the description above.
- Demonstrate the use of multi-level features.
- At least 3 of the requirements listed above.
- List the benefits and challenges of multi-level features in the context of the case study.

Papers that clearly address the issues listed above will be accepted for presentation at the workshop and for inclusion in the proceedings. Additional tool demonstrations that are suited to show the strength of the proposed solution are appreciated.

Structure

I. *Introduction* (Presentation of the approach that is used)
II. *Case Analysis* (Analysis, interpretation, completion of case description, additional requirements)
III. *Model Design* (step by step development of model, including comprehensive justifications for non-trivial design decisions)
IV. *Evaluation* (comparison against requirements and related work)
V. *Conclusions*