# Writing Effective Use Cases for the Declarative 3D for the Web Architecture

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## ABSTRACT

In this paper we present a guide for writing use cases for the Declarative 3D for the Web Architecture, use cases where embedding 3D data in HTML using declarative approach provides significant benefit. We list components of a use case which we believe are essential when writing use cases and then we walk through a simple use case example. We believe that thanks to properly described use cases, it will be much easier to deduce different required dimensions for the Dec3D specification.

## Categories and Subject Descriptors

H.5 [**Information Interfaces and Presentation**]: Hypertext and Hypermedia; I.3.7 [**Computer Graphics**]: Three-Dimensional Graphics and Realism

## Keywords

Declarative 3D, Use Cases

## 1. INTRODUCTION

The Declarative 3D for the Web Architecture W3C Community Group[1] has been formed to explore and suggest options for new declarative ways of incorporating 3D graphics directly into HTML to enable its use on any Web page. The core mission of the Declarative 3D Community Group is to determine the requirements, options, and use cases for the declarative integration of interactive 3D graphics capabilities into the Web technology stack which will provide a foundation for future standardization.

Therefore, in this paper we aim to create a guide for writing effective use cases for the Declarative 3D [2, 3], use cases where embedding 3D data in HTML using declarative approach provides significant benefit. We list components of a use case which we believe are essential when writing use cases and then we walk through a simple use case example. We believe that thanks to properly described use cases, it will be much easier to deduce different required dimensions for the Dec3D specification.

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[1]Declarative 3D homepage: http://declarative3d.org

## 2. USE CASE STRUCTURE

There are several components of a use case which we believe are essential when writing use cases for the Declarative 3D. In the following we will describe these components [2, 3].

**ID**: Unique identifier to represent a use case

**Title**: Short and informative name of a use case

**Priority**: 1-Very Important, 2-Important, 3-Optional

**Actors**: In this document, we consider Publishers and Users. For simplicity, we give our fictitious users first names whose first letter matches their role: Paul, Peter, Patrick and Penny are publishers; Ula and Ulrich are users.

- Paul - math teacher running MathBlog - a blog dedicated to promoting the beauty of Mathematics; knows basic HTML;
- Peter - scientist who writes web-based articles on his website BioScienceSite, where he discusses proteins, genes, etc; knows HTML and is experienced in using 3D modeling software (Blender, 3DS Max);
- Patrick - professional web developer working for DevMasters; he has good knowledge of HTML, JavaScript, CSS; currently working on VirtualMuseum and CarConfigurator projects;
- Penny - museum curator, working with Patrick on a virtual museum exhibition called VirtualMuseum; she has good knowledge of 3D scanning technologies;
- Ula and Ulrich are typical Internet users; they have good understanding of hypertext-based Web interaction; Ula is an accountant and has little experience with 3D graphics; Ulrich is a math and biology student, who occasionally plays 3D games.

We believe that such short user stories can help to set the stage for use cases by building up the context.

**Description**: Short and simple (plain English) description of a use case. The purpose is to effectively transfer knowledge from the domain expert to the software developer.

**Starting code**: Starting sudo-HTML code

**Complete code**: Sudo-HTML, after declaring 3D scene.

**Using the web site**: Description of end-user interaction with a web site (support for Web and 3D tasks [4]).

**Derived requirements**: Functional and non-functional requirements derived from a use case.

**Screenshot/Demo**: Depiction of expected design, screenshot, or a link to a working demo (created in e.g. [1, 5]).

## 3. USE CASE EXAMPLE

In the following we describe a very simple use case for Declarative 3D. We hope that such description can be leveraged to create more complex use cases in future.

**ID**: Use Case UC101

**Title**: MathBlog - Adding basic 3D geometry to a post

**Priority**: 1

**Actors**: Paul, Ulrich

**Description**: Paul, who maintains a MathBlog, wishes to enrich his new post about geometric figures with 3D representations of those figures. For this purpose, he chooses to use shape nodes and declare them in the HTML.

**Starting code**: Paul's starting HTML (before declaring 3D) is presented on the Listing 1.

```
1  <html>
2      <head><title>Pauls Blog</title></head>
3      <body>
4      ...
5      <div id="Post2011-07-21">
6          <h2>Geometric Figures</h2>
7          <p>
8              The cube is a 3D solid object bounded
9              by six square faces, facets or sides,
10             with three meeting at each vertex.
11         </p>
12     ...
13     </div>
14     </body>
15 </html>
```

**Listing 1: Starting Code**

**Complete code**: Paul's HTML, after declaring 3D scene, is presented on the Listing 2.

```
1  <html>
2      <head><title>Paul's Blog</title></head>
3      <body>
4      ...
5      <div id="Post2011-07-21">
6          <h2>Geometric Figures</h2>
7          <p>
8              The cube is a 3D solid object bounded
9              by six square faces, facets or sides,
10             with three meeting at each vertex.
11         </p>
12         <dec3d width="400px" height="400px">
13           <scene>
14             <viewpoint position="0 0 10"/>
15             <shape>
16               <appearance>
17                 <material diffuseColor="0 0 1"/>
18               </appearance>
19               <box DEF="box" size="1 1 1"/>
20             </shape>
21           </scene>
22         </dec3d>
23     ...
24     </div>
25     </body>
26 </html>
```

**Listing 2: Complete Code**

**Using the web site**: Ulrich can see the post with the static 3D box geometry. No interaction is possible.

**Derived requirements**: This use case leads to the following requirements: Requirement SR01: Simple D3D Syntax.

**Screenshot/Demo**: See Figure 1.



**Geometric Figures**

The cube is a 3D solid object bounded by six square faces, facets or sides, with three meeting at each vertex.
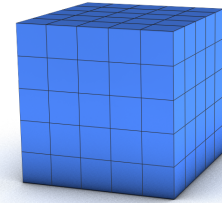
**Figure 1: Screenshot of MathBlog with basic 3D geometry.**

## 4. CONCLUSIONS AND FUTURE WORK

In this paper we presented a guide for writing use cases for the Declarative 3D for the Web, use cases where embedding 3D data in HTML using declarative approach provides significant benefit. We believe that thanks to properly described use cases, it will be much easier to deduce different required dimensions for the Dec3D specification.

Having a use case catalog, such as at Declarative 3D Community Group Wiki is beneficial, however, a certain problem remain: the size and variety of the use case space and its lack of graphical representations limit its usefulness in the use case discovery, exploration and understanding process. In order to address this issue we propose to employ interactive, visual aids to assist users, allowing finding relevant use cases both efficiently and effectively. As the human brain enables us to see, explore, and understand large amounts of visual information at once, we want to focus on the creation of an interactive (possibly 3D) use case diagram and elements to visualise information about different characteristics of use cases. Data visualisation techniques (e.g., graphs, trees, etc.) in tandem with graphical capabilities of modern browsers, can be used to present use cases in innovative ways. We believe that, as a result, users will be able to easily identify relevant use cases, unearth previously unseen correlations between them, or learn about related requirements.

\* Visit http://declarative3d.org and contribute with your use cases for the Declarative 3D for the Web.

## 5. REFERENCES

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