ViennaDoc:
An Animatable and Testable Specification Documentation Tool

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outline

● background
● demo
● ViennaDoc: overview
● html
● discussions
● summary
background
Who cares functional specifications?

- formal specification engineers
- architects/designers/implementors
- test enginners
- document (manuals, references,...) writers
- UI designers
- development managers
- product owners
- end user representatives
ViennaTalk is an environment for exploratory specification

- **communication media**
  - with UI designers ... Lively Walk-Through
  - with web frontend engineers ... Webly Walk-Through
  - **to fill gaps** between formal engineers and **stakeholders** with less formal engineering background

- **powered by animation**
  - using VDMJ
  - using Smalltalk transpiler
  - provides web API for animation
demo
ViennaDoc: overview
formal specification and specification document should be **engaged**

operations

\[
\text{inc : () }\rightarrow\text{ nat -- increments}  \\
\text{inc()} \rightarrow (\text{count := count }+ 1;  \\
\text{return count);}
\]

The **inc** operation increments the count and returns it.
ViennaDoc = HTML + VDM animation

- **counter.html**
  - (specification document)

- **ViennaDoc.js**
  - (animation states, DOM manipulations)

- **counter.js**
  - (spec source)

- **ViennaClient.js**

- **JavaScript engine**

- **Web Browser**

- **VDMPad or ViennaServer**
  - https://vdmpad.viennatalk.org/
  - /eval
ViennaDoc

JavaScript library enables HTML documents

● to include specification source,

● to insert buttons to evaluate quoted expressions, and

● to test assertions on the browser.
ViennaDoc

JavaScript library enables HTML documents

● to include specification source,
  → to keep the document up-to-date
● to insert buttons to evaluate quoted expressions, and
● to test assertions on the browser.
ViennaDoc

JavaScript library enables HTML documents

- to include specification source,
- to insert buttons to evaluate quoted expressions, and
  → to explain by animating the formal spec
- to test assertions on the browser.
ViennaDoc

JavaScript library enables HTML documents

- to include specification source,
- to insert buttons to evaluate quoted expressions, and
- to test assertions on the browser.

→ to confirm consistency with the formal spec
html
load

<script src="ViennaClient.js"></script>
<script src="ViennaDoc.js"></script>
<script src="Counter.js"></script>
source inclusion

```html
<code vienna="source" src="Counter\'inc">
</code>
```
evaluation

<code vienna="eval"
    prestates="count"
    poststates="count"
    module="Counter">
  inc()
</code>
watch expression

<code vienna="watch" module="Counter">
  counter
</code>
assertion

<code vienna="assert"
    module="Counter"
    prestates="count=6"
    eval="mk_(reset(), count).#2">
    0
</code>
discussions
ViennaDoc vs LaTeX literate styles

- VDM spec and html managed separately
- best for online browsing
- processed on a browser (testing/animating)

- one can choose either monolithic or modular
- best for printing
- processed at build-time (e.g. testing a doc)
<table>
<thead>
<tr>
<th>Feature</th>
<th>Overture w/ LaTeX</th>
<th>ViennaTalk w/ ViennaDoc</th>
<th>VDMPad</th>
</tr>
</thead>
<tbody>
<tr>
<td>read VDM source</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>read informal text</td>
<td>○</td>
<td>○</td>
<td>△</td>
</tr>
<tr>
<td>eval a given exp</td>
<td>○/×</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>eval a free exp</td>
<td>○/×</td>
<td>○/×</td>
<td>○</td>
</tr>
<tr>
<td>test a document</td>
<td>×</td>
<td>○</td>
<td>×</td>
</tr>
<tr>
<td>test a spec</td>
<td>○/×</td>
<td>○/×</td>
<td>△</td>
</tr>
<tr>
<td>large spec</td>
<td>○</td>
<td>○</td>
<td>×</td>
</tr>
<tr>
<td>VDM++/VDM-RT</td>
<td>○</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>
Specification document in the "programming-as-common-literacy" era

Hypothetical assumption:

- In near future, **most stakeholders will have** a certain level of **programming skills**.
- We don't have to **hide** formal specifications. We can simply **explain** them in a **plain specification language** and a **plain natural language**.
Summary

Formal Specifications and Specification Documents
Summary

ViennaDoc provides specification documents

- to include VDM source for the constructs of concern,
- to exemplify behaviors of a particular functionality, and
- to validate the document by assertions

for readers with programming literacy skills

demo page:
https://viennatalk.org/ViennaDoc/counter.html
We need more!

- diagram notation like VDMPad
- previews on ViennaTalk
- in-browser authoring
- testing infrastructure on CI
- support for handy notations, e.g. markdown, pillar
- export to static documents, e.g. epub, LaTeX, pdf
- integration / collaboration with Paul's HTML generator
- VDM-SL language tutorial