Comparison of Syntax formats

Ben Payne[1*]
[1] *Department of Fun, University Name & Town, city, State Zip*

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1 Introduction

Mathematical Markup Language (MathML)201 (2014), specifically Content MathML and Presentation MathML.

MathematicaWolfram Research (2014)

2 Test Cases

A set of test cases for flexing the capability of syntax, provided in Latex

2.1 Case 1: polynomial

$$ax^2 + bx + c = 0 \tag{1}$$

Latex:

```
a x^2 + b x + c = 0
```

Presentation MathML:

```
<mrow>
 <mrow>
  <msup>
   <mrow><mi> x </mi></mrow>
   <mrow><mi> n </mi></mrow>
  </msup>
  <mo>+</mo>
  <msup>
   <mrow><mi> y </mi></mrow>
   <mrow><mi> n </mi></mrow>
  </msup>
 </mrow>
 <mo>=</mo>
 <msup>
  <mrow><mi> z </mi></mrow>
  <mrow><mi> n </mi></mrow>
 </msup>
</mrow>
```

Content MathML:

```
<math xmlns=
"http://www.w3.org/1998/Math/MathML">
<apply>
 <eq/>
  <apply>
   <plus/>
    <apply>
     <ci>a</ci>
     <power/><ci> x </ci><ci> 2 </ci>
     </apply>
    <apply>
     <ci>b</ci> <ci> x </ci>
     </apply>
    <apply>
    <ci>c</ci>
    </apply>
   </apply>
   <apply>
    <cn>0</cn>
  </apply>
</apply>
</math>
```

2.2 Case 2: Stoke's theorem

$$\int \int_{\sum} \vec{\nabla} \times \vec{F} \dot{d} \sum = \oint_{\partial \sum} \vec{F} \dot{d} \vec{r} \tag{2}$$

Latex:

```
\int \int_{\sum} \vec{\nabla} \times
 \vec{F} \dot d\sum =
\oint_{\partial \sum} \vec{F}\dot d\vec{r}
```

2.3 Case 3: Tensor analysis

$$Y^i(X_j) = \Delta^i{}_j \tag{3}$$

Latex:

```
Y^i(X_j) = \Delta^i_{\ j}
```

Einstein notation: contravariant = superscript, covariant = subscript

*Corresponding author: ben.is.located@gmail.com

2.4 Case 4a: creation operator

$$\hat{a}^{+}|n\rangle = \sqrt{n+1}|n+1\rangle \tag{4}$$

```
\hat{a}^+ |n\rangle = \sqrt{n+1} |n+1\rangle
```

2.5 Case 4b: uncertainty principle

$$\sigma_x \sigma_p \geq \frac{\hbar}{2} \tag{5}$$

```
\sigma_x \sigma_p \geq \frac{\hbar}{2}
```

3 Comparison of Test Cases

Name	Cost	Open Source	keystroke count
Latex	Free	Yes	4

4 Bibliography

References

"Mathematical markup language (mathml) version 3.0 2nd edition," (2014).

I. Wolfram Research, *Mathematica*, Champaign, Illinois, version 10.0 ed. (2014).