Integrating sTeX into llncs.sty

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Abstract. This paper shows how to integrate sTeX stuff into regular papers, e.g. via the `llncs.cls` and get them through submission systems like EasyChair.

1 Introduction & Setup

One of the useful new features of sTeX is that we can mix in its semantic annotation functionality into arbitrary document classes. This paper is an example of how this can be done. Indeed it uses the llncs class as we would submit it to a conference with LNCS or LNAI proceedings.

In Section 2 show how we can use the sTeX functionality to write an sTeX module, reusing existing modules from a MathHub repository. This presupposes that the author has cloned the necessary MathHub archives from `https://gl.mathhub.info`, say under the local path `/Users/kohlhase/localmh/MathHub`.

To make sTeX aware of where to find the repositories, there are two options:

1. (Recommended and default:) Setting a `MATHHUB` system variable that points to the local path with the repositories. This is recommended, since it is a one-time, system specific action and the documents written thusly remain system independent.
2. Defining a macro `\mathhubpath` that points to the local path with the repository *before* loading the sTeX packages. This approach is taken with this demo paper.

One of the past hindrances was that it was virtually impossible to submit a paper that includes MathHub archives via a conference tool like EasyChair.org. Therefore the sTeX distribution contains a python script `mhlocalize` that copies a snapshot of the sTeX files from the MathHub archives into the current directory, so they can be zipped for submission with the paper sources. This is compatible with the second approach, using a relative path in `\mathhubpath`.

2 The Meat of the Matter: An sTeX module in a Paper

Here we make use of the sTeX functionality: We initialize the preamble with

```
\documentclass{llncs}
\def\mathhubpath{lmh}
\usepackage[mh]{smglom}
```

The first line contains the `llncs` document class. The second line tells SᴛEX where MathHub archives can be found. The third calls the `smglom` package from the SᴛEX distribution.

This is sufficient for solitary authoring. For collaborative authoring, the approach of supplying the respective SᴛEX packages with an *absolute* `mathhubpath`-macro will not work, since the path to the local MathHub home is system-dependent and can therefore not be committed. There are three ways of fixing this: One is to have an unversioned file `lmh.sty` with contents

```
\def\mathhubpath{/path/to/mathhub}
```

and add a `\usepackage{lmh}` before the `\usepackage[mh]{smglom}`. For the other see Section 3.

Either way, somewhere in the paper we can just write an SᴛEX module, here one about the expected utility of an action in a partially observable environment.

```
\begin{module}[id=exputil]
\importmhmodule[mhrepos=MiKoMH/AI,dir=rational-decisions/en]{Ramsey-thm}
\importmhmodule[mhrepos=MiKoMH/AI,dir=probabilistic-reasoning/en]{condprob}
\gimport[smglom/probability]{expectation}
\symdef{expectedUtilityOp}{EU}
\symdef{expectedUtility}[1]{\prefix\expectedUtilityOp{#1}}
\symdef{expectedUtilityGiven}[2]{\prefix\expectedUtilityOp{#1|#2}}
\symdef{agactres}[1]{R_{#1}}

\begin{definition}
The \trefii{expected}{utility} $\expectedUtilityGiven{a}{\mathbf{e}}$ of an
\trefi[agent-math]{action} $a$ (given evidence $\mathbf{e}$) is
\[\fundefeq{a,\mathbf{e}}{\expectedUtilityGiven{a}{\mathbf{e}}}
    {\SumInColl{s}\Omega
    {\realtimes[cdot]{\CondProb{\agactres{a}=s}{a,\mathbf{e}},\utilityof{s}}}}
\]
where $\agactres{a}$  is a \trefii[unconditional-prob]{random}{variable} whose
values are the results of performing $a$ in the current state.
\end{definition}
\end{module}
```

The first line introduces a module, the next three lines make available the semantic macros introduced by two modules in the SᴛEX-based AI lecture hosted at `https://gl.mathhub.info/MiKoMH/AI` and another from the SMGloM glossary archive at `https://gl.mathhub.info/smglom/probability`. The next three lines introduce semantic macros we use in the definition itself. With all the semantic macros (included and directly provided), we can mark up the formulae and technical terms in the usual SᴛEX way. This gives the following result:[1]

EdN:1

[1] EdNote: there is still a problem here, the `definition` environment does not produce a good label.

Definition 21 The expected utility $EU(a|\mathbf{e})$ of an action a (given evidence $\mathbf{e}$) is

$$EU(a|\mathbf{e}) := \sum_{s\in\Omega} P(R_a = s \mid a, \mathbf{e}) \cdot U(s)$$

where R_a is a random variable whose values are the results of performing a in the current state.

3 Localizing the Papers

To make the paper sources into a self-contained folder, the sTeX tools distribution at `https://github.com/sLaTeX/lmhtools` provides the python script `localize` that copies (the necessary parts) of MathHub archives into the `lmh` subdir in the current directory.

```
python3 localize --localmh /path/to/MathHub paper.tex
```

extracts all archive inclusions from the sTeX document with main file `paper.tex` and recursively copies (or updates) all used files into the local `lmh` directory respecting the archive structure. This has two applications:

1. **Collaborative Authoring in GIT**: Instead of requiring all co-authors have the MathHub archives cloned, you can commit the `localize`d snapshot and use that. This has the advantage that the late-binding problem inherent in using central archives is mitigated as all co-authors use the same `lmh` folder. And it is sufficient that one co-author has the MathHub archives cloned, and `localize`s it.
2. **Submission via a Conference or Journal Submission system**: For submission, we need a self-contained zip file which we can now create by `localize`ing and `zip`ping.

4 Conclusion

With the new functionality developed in 2020, mixing sTeX into generic LaTeX document classes is quite feasible. This considerably lowers the entry barrier to using sTeX from the state where you had to use the sTeX document classes.

One of the advantages of sTeX is the availability of well-thought out modules with semantic macros for many areas of mathematics, which can be included directly from a local clone of the archives. For collaborative authoring and paper submission we add a tool for localizing the MathHub archives.