Package Documentation for `csthm`

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1 Introduction

The `csthm` package provides customized theorem-like environments specifically designed for computer science documents. It offers a set of pre-defined theorem styles and environments to streamline the creation of theorems, definitions, remarks, and other common structures in computer science papers and documents.

2 Installation

To install the `csthm` package:

1. Run `tex csthm.ins` to generate `csthm.sty`

2. Move `csthm.sty` to your TeX tree or project directory
3. Use `\usepackage{csthm}` in your LaTeX documents

3 Usage

3.1 Loading the Package

To use the package, include it in your LaTeX document's preamble:

```
\usepackage{csthm}
```

If you want to use the package with `cleveref` support:

```
\usepackage[cleveref]{csthm}
```

Note that the `cleveref` option requires the `hyperref` package to be loaded.

3.2 Theorem Environments

The `csthm` package provides several theorem-like environments commonly used in computer science literature:

THEOREM 3.1. Let G be a graph with n vertices. Then, the minimum number of colours needed to colour G such that no two adjacent vertices share the same colour is known as the chromatic number of G. ⋆

LEMMA 3.2. For every natural number n, the sum of the first n odd numbers is n^2. ⋆

COROLLARY 3.3. The sum of the first n positive integers is given by $\frac{n(n+1)}{2}$. ⋆

PROPOSITION 3.4. If a and b are two even integers, then their sum is also even. ⋆

CONJECTURE 3.5. Every even integer greater than 2 can be expressed as the sum of two primes. (Goldbach's Conjecture) ⋆

3.3 Definition Environments

To introduce key definitions and illustrative examples:

Definition 3.6. A *tree* is a connected, undirected graph with no cycles. ✠

Example 3.7. Consider the binary tree with nodes labelled from 1 to 7. This tree has 3 levels, and each parent node has at most 2 children. ✠

3.4 Remark Environments

To include remarks and notes that highlight important observations:

REMARK 3.8. While all trees are graphs, not all graphs are trees. A graph must be acyclic and connected to be classified as a tree. ✠

NOTE 3.9. Keep in mind that proofs of conjectures, like Goldbach's Conjecture, often remain unproven for centuries despite numerous verified instances. ✠

3.5 Highlight Environments

To emphasize crucial points within the document:

IMPORTANT 3.1. Algorithm efficiency is critical; always consider time complexity when designing algorithms. ✠

HIGHLIGHT 3.1. Understanding the P vs NP problem is fundamental in computational complexity theory. ✠

3.6 Case Environment

Used to present distinct cases in an argument or proof:

Case 1: When $n = 0$, the factorial of n is defined as 1.

Case 2: When $n > 0$, the factorial is computed as $n \times (n-1) \times \ldots \times 1$.

3.7 Axiom Environment

To enumerate foundational axioms in formal proofs:

Axiom A: For any sets A and B, $A \cup B = B \cup A$ (Commutative Law of Union).

Axiom B: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (Distributive Law).

4 Customization

You can customize the accent colour used in the package to suit your document's design preferences:

```
\setaccentcolor{blue}
```

5 License

This package is released under the LaTeX Project Public License (LPPL) version 1.3c or later.

6 Contact

For bug reports or feature requests, please contact the package maintainer:

Agni Datta: agnidatta.org@gmail.com

7 Package Source Code

The following listing shows the source code of the `csthm.sty` file:

```
% csthm.sty
% Computer Science Theorem Environments
% Version: 1.2
% Date: 2024/08/31
% Author: Agni Datta
% Maintainer: Agni Datta
% Email: agnidatta.org@gmail.com
% License: MIT License
% Description: A LaTeX package providing customized theorem-like environments
% specifically designed for computer science documents.

\NeedsTeXFormat{LaTeX2e}[1994/06/01]
\ProvidesPackage{csthm}[2024/08/31 v1.2 Theorem Environments for Computer Science]

% Package options
\newif\if@csthm@loadcleveref
\DeclareOption{cleveref}{\@csthm@loadclevereftrue}
\ProcessOptions\relax

% Required packages
\RequirePackage{amsmath}
\RequirePackage{amssymb}
\RequirePackage{amsthm}
\RequirePackage{enumitem}
\RequirePackage{thmtools}

% Conditionally load cleveref if the option is set and hyperref is loaded
\if@csthm@loadcleveref
\AtBeginDocument{%
	\@ifpackageloaded{hyperref}{%
		\RequirePackage{cleveref}
		}{%
		\PackageWarning{csthm}{The 'cleveref' option was set, but 'hyperref' is not loaded. Skipping
		 'cleveref' loading.}
	}%
}
\fi

% Define theorem styles
\declaretheoremstyle[
	spaceabove=\topsep,
	spacebelow=\topsep,
	headfont=\scshape,
	notefont=\scshape,
	bodyfont=\normalfont,
	postheadspace=5pt,
	numberwithin=section,
	qed=$\scriptstyle\star$,
	headpunct={.}
]{thmstyle}

\declaretheoremstyle[
	spaceabove=\topsep,
	spacebelow=\topsep,
	headfont=\bfseries,
	notefont=\bfseries,
	bodyfont=\normalfont,
	postheadspace=5pt,
	numberwithin=section,
	qed=$\scriptstyle\maltese$,
```

```
        headpunct={.}
]{defstyle}

\declaretheoremstyle[
        spaceabove=\topsep,
        spacebelow=\topsep,
        headfont=\scshape,
        notefont=\scshape,
        bodyfont=\normalfont,
        postheadspace=5pt,
        numberwithin=section,
        qed=$\scriptstyle\maltese$,
        headpunct={.}
]{remarkstyle}

\declaretheoremstyle[
        spaceabove=\topsep,
        spacebelow=\topsep,
        headfont=\scshape,
        notefont=\scshape,
        bodyfont=\normalfont\sffamily,
        postheadspace=5pt,
        numberwithin=section,
        qed=$\scriptstyle\maltese$,
        headpunct={.}
]{hltstyle}

% Define theorem environments
\declaretheorem[style=thmstyle,name=Theorem]{theorem}
\declaretheorem[style=defstyle,sibling=theorem]{fact}
\declaretheorem[style=thmstyle,sibling=theorem]{assumption}
\declaretheorem[style=thmstyle,sibling=theorem]{claim}
\declaretheorem[style=thmstyle,sibling=theorem]{conjecture}
\declaretheorem[style=thmstyle,sibling=theorem]{corollary}
\declaretheorem[style=thmstyle,sibling=theorem]{lemma}
\declaretheorem[style=thmstyle,sibling=theorem]{property}
\declaretheorem[style=thmstyle,sibling=theorem]{proposition}

% Define definition environments
\declaretheorem[style=defstyle,sibling=theorem]{definition}
\declaretheorem[style=defstyle,sibling=theorem]{example}
\declaretheorem[style=defstyle,sibling=theorem]{exercise}
\declaretheorem[style=defstyle,sibling=theorem]{problem}
\declaretheorem[style=defstyle,sibling=theorem]{question}

% Define remark environments
\declaretheorem[style=remarkstyle,sibling=theorem]{note}
\declaretheorem[style=remarkstyle,sibling=theorem]{remark}
\declaretheorem[style=remarkstyle,sibling=theorem]{solution}

% Define highlight environments
\declaretheorem[style=hltstyle,name=Important]{important}
\declaretheorem[style=hltstyle]{highlight}
\declaretheorem[style=hltstyle]{keypoint}

% Define case environment
\newlist{caseList}{enumerate}{1}
\setlist[caseList]{label=\textbf{Case~\arabic*:},leftmargin=*}

\NewDocumentEnvironment{case}{O{}}{%
        \begin{caseList}[#1]%
                }{%
        \end{caseList}%
}
```

```
124
125 % Define axiom environment
126 \newlist{axiomList}{enumerate}{1}
127 \setlist[axiomList]{label=\textbf{Axiom~\Alph*:}, leftmargin=*}
128
129 \NewDocumentEnvironment{axiom}{O{}}{%
130         \begin{axiomList}[#1]%
131                 }{%
132         \end{axiomList}%
133 }
134
135 % Custom QED symbol
136 \renewcommand\qedsymbol{$\scriptstyle\blacksquare$}
137
138 % Define accent color (customizable by the user)
139 \providecommand{\accentcolor}{black}
140
141 % Package documentation commands
142 \providecommand{\csthmpkg}{\textsf{csthm}}
143 \providecommand{\email}[1]{\href{mailto:#1}{\texttt{#1}}}
144
145 % User-level commands for customization
146 \providecommand{\setaccentcolor}[1]{\renewcommand{\accentcolor}{#1}}
147
148 \endinput
149 % End of file `csthm.sty'
```