THE CSTHM PACKAGE
A COMPREHENSIVE SET OF THEOREM ENVIRONMENTS FOR COMPUTER SCIENCE

AGNI DATTA

Abstract. The csthm package provides a comprehensive collection of theorem-like environments specifically designed for use in computer science documentation. It features a range of customizable theorem styles, distinct visual markers for different types of content, integrated support for cross-referencing, and extensive customization options. This documentation provides detailed examples, usage guidelines, and a complete overview of all available environments and features in the package.

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1. Package Overview

The csthm package offers a robust and flexible solution for typesetting theorems, definitions, proofs, and related content typically found in computer science literature. The package provides a variety of specialized environments, each with distinct visual markers and formatting styles suited to different types of content.

Key features include:

- Distinct visual styles for different content types, including theorems, definitions, proofs, and more.
- Customizable theorem headers and QED symbols.
- Optional integration with the cleveref package for enhanced cross-referencing.
- Specialized environments tailored for theoretical computer science content.
- Support for both numbered and unnumbered variants of all environments.

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1.1. **Installation.** The csthm package can be installed via your TeX distribution's package manager or downloaded directly from CTAN:

- https://ctan.org/pkg/csthm

1.2. **Basic Usage.** To use the package, simply include it in the preamble of your document:

```
\usepackage{csthm}
```

If you require integration with the cleveref package for enhanced cross-referencing, load the package as follows:

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

2. Environments

The csthm package provides a wide range of theorem-like environments. Each environment is associated with a distinct visual style, marked by a specific bullet symbol. The package supports both numbered and unnumbered versions of each environment, with the unnumbered variants achieved by appending an asterisk (`*`) to the environment name (e.g., `theorem*`).

2.1. **Complete List of Environments.** Table 1 outlines the available environments in the csthm package, including their respective styles and descriptions.

2.2. **Mathematical Theorems.** These environments are used to represent core theoretical results and are marked with a black triangle (▶) bullet. Here are some examples:

▶ Theorem 2.1. This is a sample theorem environment. ⌟
▶ Assumption 2.2. This is a sample assumption environment. ⌟
▶ Axiom 2.3. This is a sample axiom environment. ⌟
▶ Claim 2.4. This is a sample claim environment. ⌟
▶ Conjecture 2.5. This is a sample conjecture environment. ⌟
▶ Corollary 2.6. This is a sample corollary environment. ⌟
▶ Fact 2.7. This is a sample fact environment. ⌟
▶ Hypothesis 2.8. This is a sample hypothesis environment. ⌟
▶ Lemma 2.9. This is a sample lemma environment. ⌟
▶ Property 2.10. This is a sample property environment. ⌟
▶ Proposition 2.11. This is a sample proposition environment. ⌟

2.3. **Definitions and Protocols.** These environments are used for definitions, notations, problems, and protocols. They are marked with a black square (■) bullet:

■ Definition 2.12. This is a sample definition environment. ⌟
■ Notation 2.13. This is a sample notation environment. ⌟
■ Problem 2.14. This is a sample problem environment. ⌟
■ Protocol 2.15. This is a sample protocol environment. ⌟

2.4. **Remarks and Examples.** These environments provide additional explanations and clarifications, marked with a hollow triangle (▷) bullet:

▷ Example 2.16. This is a sample example environment. ⌟
▷ Note 2.17. This is a sample note environment. ⌟
▷ Remark 2.18. This is a sample remark environment. ⌟

Environment	Style	Description
Mathematical Theorems — Marked with black triangle (▶)		
`theorem`	`thmstyle`	Main theoretical results
`assumption`	`thmstyle`	Assumptions and prerequisites
`axiom`	`thmstyle`	Fundamental statements accepted without proof
`claim`	`thmstyle`	Minor results within proofs
`conjecture`	`thmstyle`	Unproven mathematical statements
`corollary`	`thmstyle`	Results that follow from theorems
`fact`	`thmstyle`	Well-known or established results
`hypothesis`	`thmstyle`	Proposed explanations or predictions
`lemma`	`thmstyle`	Supporting theoretical results
`property`	`thmstyle`	Characteristic attributes or features
`proposition`	`thmstyle`	Minor theoretical results
Definitions and Protocols — Marked with black square (■)		
`definition`	`defstyle`	Formal definitions of terms
`notation`	`defstyle`	Explanation of mathematical notation
`problem`	`defstyle`	Problem statements or tasks
`protocol`	`defstyle`	Step-by-step procedures or algorithms
Remarks and Examples — Marked with hollow triangle (▷)		
`example`	`remarkstyle`	Illustrative examples
`note`	`remarkstyle`	Additional information or clarifications
`remark`	`remarkstyle`	Observations or comments
Highlights — Marked with hollow square (□)		
`exercise`	`hltstyle`	Practice problems or exercises
`highlight`	`hltstyle`	Emphasized content
`important`	`hltstyle`	Critical information
`keypoint`	`hltstyle`	Essential concepts or takeaways
Special Environments		
`proof`	`proofstyle`	Proofs with custom QED symbol
`case`	`(list)`	Enumerated case analysis

Note: All environments (except proof and case) have unnumbered versions available by adding an asterisk (*) to the environment name (e.g., theorem*).

TABLE 1. Complete List of Environments Provided by the csthm Package

2.5. **Highlights and Important Content.** These environments emphasize key concepts, tasks, or points, marked with a hollow square (□) bullet:

□ Exercise 2.19. This is a sample exercise environment. ⌟

□ Highlight 2.20. This is a sample highlight environment. ⌟

□ Important 2.21. This is a sample important environment. ⌟

□ Keypoint 2.22. This is a sample keypoint environment. ⌟

2.6. **Special Environments.** The proof environment provides a custom QED symbol, and the case environment allows for enumerated cases:

Proof. This is a sample proof environment with a custom QED symbol. ◂

2.6.1. *Case Analysis.* The `case` environment provides an enumerated list for case analysis:

Case 1: Case 1: This is the first case.

Case 2: Case 2: This is the second case.
Case 3: Case 3: This is the third case.

2.7. **Customization.** The csthm package offers extensive customization options. Below are examples of common customizations.

2.7.1. *Accent Color.* To change the accent color used for theorem headers and symbols, you can use the following commands:

```
\setaccentcolor{darkblue}  % or
\renewcommand{\accentcolor}{darkblue}
```

2.7.2. *QED Symbols.* You can customize the QED symbol used in proof environments with the following command:

```
\renewcommand\qedsymbol{$\scriptstyle\color{\accentcolor}\blacksquare$}
```

3. Implementation Notes

3.1. **Dependencies.** The following packages are required for the correct functionality of the csthm package:

- amsmath - Provides advanced mathematical typesetting features.
- amssymb - Adds additional mathematical symbols.
- amsthm - Basic theorem functionality.
- enumitem - Customizes list environments.
- thmtools - Provides advanced theorem tools.

Optional dependencies include:

- hyperref - Enables hyperlinked cross-references.
- cleveref - Provides enhanced cross-referencing features.

4. Version History

```
v1.0 (2024/01/01): Initial release.
v1.1 (2024/05/15): Added support for cleveref.
v1.2 (2024/08/31): Released on CTAN.
v1.3 (2025/01/16): Current version:
        • Added starred versions of all environments.
        • Enhanced theorem styling.
        • Added new environments.
        • Improved customization options.
```

5. License

6. Contact and Support

For bug reports, feature requests, or general feedback, please contact:

- **Email:** agnidatta.org@gmail.com
- **GitHub:** https://github.com/agnidatta/csthm
- **CTAN:** https://ctan.org/pkg/csthm