Module Interface Specification for Sun Catcher

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1 Revision History

Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

2 Symbols, Abbreviations and Acronyms

See SRS Documentation at

Contents

3 Introduction

The following document details the Module Interface Specifications for

Complementary documents include the System Requirement Specifications and Module Guide. The full documentation and implementation can be found at ....

4 Notation

The structure of the MIS for modules comes from Hoffman and Strooper (1995), with the addition that template modules have been adapted from Ghezzi et al. (2003). The mathematical notation comes from Chapter 3 of Hoffman and Strooper (1995). For instance, the symbol := is used for a multiple assignment statement and conditional rules follow the form $(c_1 \Rightarrow r_1|c_2 \Rightarrow r_2|...|c_n \Rightarrow r_n)$.

The following table summarizes the primitive data types used by Sun Catcher.

Data Type	Notation	Description
character	char	a single symbol or digit
integer	$\mathbb{Z}$	a number without a fractional component in (-∞, ∞)
natural number	$\mathbb{N}$	a number without a fractional component in [1, ∞)
real	$\mathbb{R}$	any number in (-∞, ∞)

The specification of Sun Catcher uses some derived data types: sequences, strings, and tuples. Sequences are lists filled with elements of the same data type. Strings are sequences of characters. Tuples contain a list of values, potentially of different types. In addition, Sun Catcher uses functions, which are defined by the data types of their inputs and outputs. Local functions are described by giving their type signature followed by their specification.

5 Module Decomposition

The following table is taken directly from the Module Guide document for this project.

Level 1	**Level 2**
Hardware-Hiding Module	
Behaviour-Hiding Module	Input Parameters Module Output Parameters Module Solar Energy Absorption Module7 Optimum Tilt Angle Module6
Software Decision Module	Sun Intensity Equation Module Optimum Sun Intensity Equation Module13 Zenith Angle Equation Module9 Maximum Sun Intensity's Angle Module12 Sun Declination Equation Module Date Duration Module11 Plotting Module

Table 1: Module Hierarchy

6 MIS of Optimum Tilt Angle Module

6.1 Module

Optimum tile angle

6.2 Uses

Maximum Sun Intensity's Angle Module12

6.3 Syntax

6.3.1 Exported Constants

6.3.2 Exported Access Programs

Name	In	Out	Exceptions
$angle_{\text{out}}$	-	$\mathbb{R}$	-
	-	-	-

6.4 Semantics

6.4.1 State Variables

None

6.4.2 Environment Variables

None

6.4.3 Assumptions

6.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

6.4.5 Local Functions

7 MIS of Solar Energy Absorption Module

7.1 Module

Max sun internsity

7.2 Uses

Optimum Sun Intensity Equation Module13, Plotting Module

7.3 Syntax

7.3.1 Exported Constants

7.3.2 Exported Access Programs

Name	In	Out	Exceptions
$energy_{\text{out}}$	$\mathbb{R}$	$\mathbb{R}$	-
plot	$(\mathbb{R} \to \mathbb{R})$	-	-
	-	-	-

7.4 Semantics

7.4.1 State Variables

None

7.4.2 Environment Variables

None

7.4.3 Assumptions

7.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

7.4.5 Local Functions

8 MIS of Sun Intensity Equation Module

8.1 Module

Sun Intensity

8.2 Uses

Zenith Angle Equation Module9

8.3 Syntax

8.3.1 Exported Constants

8.3.2 Exported Access Programs

Name	In	Out	Exceptions
sun_{in}	$\mathbb{R}$	$\mathbb{R}$	-
	-	-	-

8.4 Semantics

8.4.1 State Variables

None

8.4.2 Environment Variables

None

8.4.3 Assumptions

The default value of solar intensityI_S is 1.35

8.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

8.4.5 Local Functions

9 MIS of Zenith Angle Equation Module

9.1 Module

Zenith angle

9.2 Uses

Date Duration Module11

9.3 Syntax

9.3.1 Exported Constants

9.3.2 Exported Access Programs

Name	In	Out	Exceptions
date	$\mathbb{R}$	$\mathbb{R}$	-
	-	-	-

9.4 Semantics

9.4.1 State Variables

None

9.4.2 Environment Variables

None

9.4.3 Assumptions

9.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

9.4.5 Local Functions

10 MIS of Sun Declination Module

10.1 Module

Sun Declination

10.2 Uses

Sun Declination Equation Module

10.3 Syntax

10.3.1 Exported Constants

10.3.2 Exported Access Programs

Name	In	Out	Exceptions
$zenith_{\text{an}}$	$date$:$\mathbb{N}$,$month$:$\mathbb{N}$	$\mathbb{R}$	-
	-	-	-

10.4 Semantics

10.4.1 State Variables

None

10.4.2 Environment Variables

None

10.4.3 Assumptions

10.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

10.4.5 Local Functions

11 MIS of Date Duration Module

11.1 Module

Date Duration

11.2 Uses

11.3 Syntax

11.3.1 Exported Constants

11.3.2 Exported Access Programs

Name	In	Out	Exceptions
$data_{\mathrm{d}}$	d_s:$\mathbb{N}$,m_s:$\mathbb{N}$, d_e:$\mathbb{N}$,m_e:$\mathbb{N}$	$\mathbb{R}$	-
$data_{\mathrm{add}}$	d_s:$\mathbb{N}$,m_s:$\mathbb{N}$, d_e:$\mathbb{N}$,m_e:$\mathbb{N}$	d:$\mathbb{N}$,m:$\mathbb{N}$	-
	-	-	-

11.4 Semantics

11.4.1 State Variables

None

11.4.2 Environment Variables

None

11.4.3 Assumptions

11.4.4 Access Routine Semantics

$sun_{\mathrm{in}}()$:

- transition:
- output:
- exception:

11.4.5 Local Functions

12 MIS of Maximum Sun Intensity's Angle Module

12.1 Module

Tilt angle

12.2 Uses

12.3 Syntax

12.3.1 Exported Constants

12.3.2 Exported Access Programs

Name	In	Out	Exceptions
$angle_{\max}$	$\mathbb{R}$	$\mathbb{R}$	-
	-	-	-

12.4 Semantics

12.4.1 State Variables

None

12.4.2 Environment Variables

None

12.4.3 Assumptions

12.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

12.4.5 Local Functions

13 MIS of Optimum Sun Intensity Equation Module

13.1 Module

Max sun internsity

13.2 Uses

Zenith Angle Equation Module9, Maximum Sun Intensity's Angle Module12

13.3 Syntax

13.3.1 Exported Constants

13.3.2 Exported Access Programs

Name	In	Out	Exceptions
$angle_{\max}$	$\mathbb{R}$	$\mathbb{R}$	-
	-	-	-

13.4 Semantics

13.4.1 State Variables

None

13.4.2 Environment Variables

None

13.4.3 Assumptions

13.4.4 Access Routine Semantics

$sun_{\text{in}}()$:

- transition:
- output:
- exception:

13.4.5 Local Functions

References

Carlo Ghezzi, Mehdi Jazayeri, and Dino Mandrioli. *Fundamentals of Software Engineering*. Prentice Hall, Upper Saddle River, NJ, USA, 2nd edition, 2003.

Daniel M. Hoffman and Paul A. Strooper. *Software Design, Automated Testing, and Maintenance: A Practical Approach*. International Thomson Computer Press, New York, NY, USA, 1995. URL http://citeseer.ist.psu.edu/428727.html.

14 Appendix