Module Interface Specification for Pot-pulator

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1 Revision History

Date	Version	Notes
2023-01-18	Juan Moncada, Aaron Billones, Steven Ramundi, Gillian Ford	Initial release

2 Symbols, Abbreviations and Acronyms

See SRS Documentation at https://github.com/aaronbilly22/The_Nursery_Project/blob/main/docs/SRS/SRS.pdf

Contents

3 Introduction

The following document details the Module Interface Specifications for The Nursery Project. Complementary documents include the System Requirement Specifications and Module Guide. The full documentation and implementation can be found at https://github.com/aaronbilly22/The_Nursery_Project/blob/main/docs/SRS/SRS.pdf.

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 ProgName.

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 ProgName 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, ProgName 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	Pot Dropping Input Module Pot Dropping Stepper Module Pot Dropping Output Module Conveyor Input Module Conveyor Movement Module Tray Dispenser Input Module Tray Dispenser Gantry Module Tray Dispenser Raising Module Tray Dispenser Output Module Verification Output Module
Software Decision Module	Pot dropping Position Module Verifications Analysis Module Communication Module Front End Module

Table 1: Module Hierarchy

6 MIS of Pot Dropping Input Module

6.1 Module

pot_droppingIn.ino

6.2 Uses

Pot Dropping Position Module (M4)

6.3 Syntax

N/A

6.3.1 Exported Constants

N/A

6.3.2 Exported Access Programs

N/A

6.4 Semantics

6.4.1 State Variables

N/A

6.4.2 Environment Variables

trigPin, echoPin

6.4.3 Assumptions

N/A

6.4.4 Access Routine Semantics

N/A

6.4.5 Local Functions

loop, setup

7 MIS of Pot Dropping Stepper Module

7.1 Module

steppertestpd.ino

7.2 Uses

Pot Dropping Output Module (M6)

7.3 Syntax

7.3.1 Exported Constants

N/A

7.3.2 Exported Access Programs

N/A

7.4 Semantics

7.4.1 State Variables

N/A

7.4.2 Environment Variables

stepper_position, coil_1a, coil_1b, coil_2a, coil_2b

7.4.3 Assumptions

N/A

7.4.4 Access Routine Semantics

N/A

7.4.5 Local Functions

stepper_speed, stepper_position, delay

8 MIS of Pot Dropping Output Module

8.1 Module

pot_droppingOut.ino

8.2 Uses

Communication (section 18)

8.3 Syntax

8.3.1 Exported Constants

N/A

8.3.2 Exported Access Programs

N/A

8.4 Semantics

8.4.1 State Variables

N/A

8.4.2 Environment Variables

N/A

8.4.3 Assumptions

N/A

8.4.4 Access Routine Semantics

N/A

8.4.5 Local Functions

N/A

9 MIS of Conveyor Input Module

9.1 Module

conveyor_control.ino

9.2 Uses

Conveyor Movement 10

9.3 Syntax

9.3.1 Exported Constants

N/A

9.3.2 Exported Access Programs

N/A

9.4 Semantics

9.4.1 State Variables

conveyor_speed, conveyor_direction

9.4.2 Environment Variables

N/A

9.4.3 Assumptions

N/A

9.4.4 Access Routine Semantics

N/A

9.4.5 Local Functions

conveyor_go

10 MIS of Conveyor Movement Module

10.1 Module

conveyor_shmove.ino

10.2 Uses

Communication 18

10.3 Syntax

10.3.1 Exported Constants

N/A

10.3.2 Exported Access Programs

N/A

10.4 Semantics

10.4.1 State Variables

N/A

10.4.2 Environment Variables

conveyor_speed, conveyor_direction

10.4.3 Assumptions

N/A

10.4.4 Access Routine Semantics

N/A

10.4.5 Local Functions

N/A

11 MIS of Tray Dispenser Input Module

11.1 Module

tray_DispenserInput.ino

11.2 Uses

Tray Dispenser Gantry 12

11.3 Syntax

11.3.1 Exported Constants

N/A

11.3.2 Exported Access Programs

N/A

11.4 Semantics

11.4.1 State Variables

N/A

11.4.2 Environment Variables

N/A

11.4.3 Assumptions

N/A

11.4.4 Access Routine Semantics

N/A

11.4.5 Local Functions

setup, loop

12 MIS of Tray Dispenser Gantry Module

12.1 Module

tray_gantry.ino

12.2 Uses

Tray Dispenser Raising 13

12.3 Syntax

12.3.1 Exported Constants

N/A

12.3.2 Exported Access Programs

N/A

12.4 Semantics

12.4.1 State Variables

N/A

12.4.2 Environment Variables

stepper1, stepper2, xPos, yPos

12.4.3 Assumptions

N/A

12.4.4 Access Routine Semantics

N/A

12.4.5 Local Functions

N/A

13 MIS of Tray Dispenser Raising Module

13.1 Module

tray_dispensingRaising.ino

13.2 Uses

Tray Dispenser Output 14

13.3 Syntax

13.3.1 Exported Constants

N/A

13.3.2 Exported Access Programs

N/A

13.4 Semantics

13.4.1 State Variables

N/A

13.4.2 Environment Variables

direction, yPositionCounter

13.4.3 Assumptions

N/A

13.4.4 Access Routine Semantics

N/A

13.4.5 Local Functions

N/A

14 MIS of Tray Dispenser Output Module

14.1 Module

trayDispenserOutput.ino

14.2 Uses

Communication 18

14.3 Syntax

14.3.1 Exported Constants

N/A

14.3.2 Exported Access Programs

N/A

14.4 Semantics

14.4.1 State Variables

N/A

14.4.2 Environment Variables

N/A

14.4.3 Assumptions

N/A

14.4.4 Access Routine Semantics

N/A

14.4.5 Local Functions

N/A

15 MIS of Verification Output Module

15.1 Module

verifyOut.ino

15.2 Uses

Communication 18

15.3 Syntax

15.3.1 Exported Constants

N/A

15.3.2 Exported Access Programs

N/A

15.4 Semantics

15.4.1 State Variables

N/A

15.4.2 Environment Variables

N/A

15.4.3 Assumptions

N/A

15.4.4 Access Routine Semantics

N/A

15.4.5 Local Functions

N/A

16 MIS of Pot Dropping Position Module

16.1 Module

pot_position.ino

16.2 Uses

Pot Dropping Stepper 7

16.3 Syntax

16.3.1 Exported Constants

N/A

16.3.2 Exported Access Programs

N/A

16.4 Semantics

16.4.1 State Variables

N/A

16.4.2 Environment Variables

N/A

16.4.3 Assumptions

N/A

16.4.4 Access Routine Semantics

N/A

16.4.5 Local Functions

N/A

17 MIS of Verification Analysis Module

17.1 Module

verifyAnalysis.ino

17.2 Uses

Verification Output 15

17.3 Syntax

17.3.1 Exported Constants

N/A

17.3.2 Exported Access Programs

N/A

17.4 Semantics

17.4.1 State Variables

N/A

17.4.2 Environment Variables

N/A

17.4.3 Assumptions

N/A

17.4.4 Access Routine Semantics

N/A

17.4.5 Local Functions

N/A

18 MIS of Communication Module

18.1 Module

communication.ino

18.2 Uses

N/A

18.3 Syntax

18.3.1 Exported Constants

N/A

18.3.2 Exported Access Programs

N/A

18.4 Semantics

18.4.1 State Variables

N/A

18.4.2 Environment Variables

N/A

18.4.3 Assumptions

N/A

18.4.4 Access Routine Semantics

N/A

18.4.5 Local Functions

N/A

19 MIS of Front End Module

19.1 Module

fronEnd.ino

19.2 Uses

Communication 18

19.3 Syntax

19.3.1 Exported Constants

N/A

19.3.2 Exported Access Programs

N/A

19.4 Semantics

19.4.1 State Variables

N/A

19.4.2 Environment Variables

N/A

19.4.3 Assumptions

N/A

19.4.4 Access Routine Semantics

N/A

19.4.5 Local Functions

N/A

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.