Robocafe

Programming Manual

Abstract

This is the programming manual for reviewing or manipulating the code for the Robocafe

June 2022
Version 1.0

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Reliable ROBOTICS

Document Revisions

Date	Version Number	Document Changes
18/06/2022	1.0	Initial Draft

Approvals

This document requires following approvals:

Date	Version Number	Document Changes

Distribution

This document has been distributed to:

Date	Version Number	Document Changes

Introduction

This manual describes the Robocafe program commands and related information for using the Dobot CR5 manipulator arm and the SAECO coffee machine.

Be sure to read this manual carefully as well as related manuals and comply with their instructions for programming the Robocafe safely and correctly.

For details on how to operate the Robocafe, refer to the separate Robocafe User Manual that comes with the Robocafe.

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1. Preface

1.1 Description of the User

This manual is intended for the skilled technician who is to install, repair, or service the Robocafe. The intended user must have a general knowledge of scratch programming; it would benefit the user to have knowledge of a programming language prior to manipulating the code.

1.2 Explanation of Safety Warnings

Be sure to read before using

Before using the Robocafe, be sure to read this manual and related manual, and follow their instructions to use the Robocafe safely and correctly.

Warning and caution items listed in this manual relate to the Dobot CR5 controller.

When this robot controller is used system, please take appropriate safety measures as required by the user's individual system.

This manual classifies safety caution items and operating points into the following levels, along with symbols for signal words "CAUTION" and "NOTE".

⚠ CAUTION

"CAUTION" indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or damage to the equipment or software.

NOTE

Primarily explains function differences, etc., between software versions.

MEMO

Explains robot operation procedures in a simple and clear manner.

Note that the items classified into "CAUTION" might result in serious injury depending on the situation or environmental conditions. So always comply with CAUTION instructions since these are essential to maintain safety.

Keep this manual carefully so that the operator can refer to it when needed. Also make sure that this manual reaches the end user.

1.3 Obtaining Documentation and Information

1.3.1 Internet

The latest version of the documentation is available at the following address:

https://reliablerobotics.ai/Robocafe

1.3.2 Documentation Feedback

If you are reading the Reliable Robotics Robocafe product documentation on the internet, any comments can be submitted on the support website.

We appreciate your comments.

2. Description of the Product

2.1 Purpose of the product

The Robocafe was created to demonstrate a level of autonomy in creating and serving coffee. Its ideal use is at events to capture the attention and engage the attendees, and as a standalone stall for customers to order coffee on the go.

Its purpose is to automate the process of making and serving coffee while reducing the amount of labour and production cost and time associated with the overall process to streamline the experience for customers to order a cup of coffee.

2.2 Product Compliance

The Robocafe is compliant with the Dubai Municipality Food Code 2020 (Food Safety Department, 2020). The requirements for the compliance of the Robocafe has been met fully with the regulations set by the Municipality of Dubai

2.3 Product elements

Figure 1.1 - Dobot CR5 Arm

Figure 3 - SAECO Coffee Machine

Figure 2 - Dobot CR5 Controller

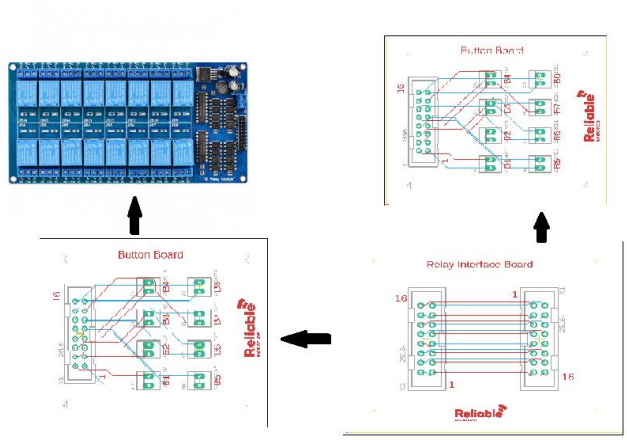


Figure 4 - Robocafe Interfacing Pack

2.4 Understanding the user interface

Figure 5 - Robocafe App User Interface

1. Connect to the TCP/IP Server
2. Beverage Menu
3. Disconnect from the TCP/IP Server
4. Display of messages received from the TCP/IP Server
5. Status (Connected / Disconnected)
6. Progress bar to show connection
7. Toggle water dispenser

MEMO *Once the "Disconnect" button is selected, the Robocafe program will stop and will have to be restarted*

3. Safety Instructions

All information and instructions in the present Safety Instructions section have been compiled in consideration of current standards and guidelines, the state of technology and our many years of experience and knowledge.

Programming Manual is a separate document to be found on company website for the product. The Programming manual provide you with all the information necessary to edit and run the code safely.

3.1 Safety information

The instructions facilitate the safe and efficient use of the Robocafe from Reliable Robotics. The instructions are part of the information package and must always be kept near products and equipment and should be available for the personnel, operator at user site at any time.

3.2 Safety information related to the intended use and reasonably foreseeable misuse

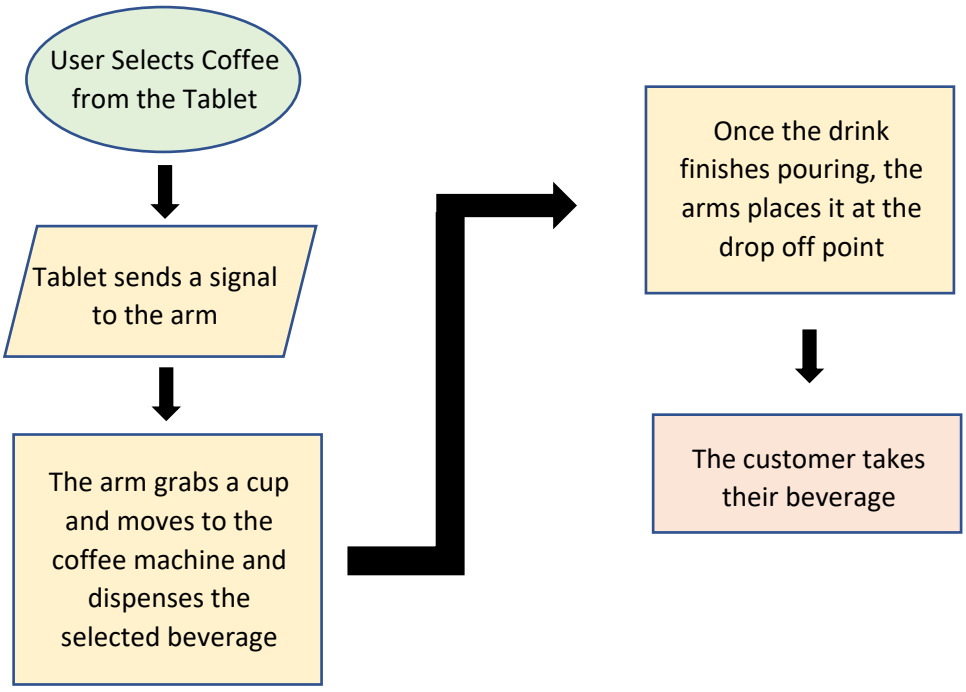
- Never bypass or manipulate the safety equipment or safety components.
- Never exceed the specific thresholds (temperature and load conditions) of the system.
- Never carry out unauthorized changes or other technical modification to the system
- Never use replacement parts other than those approved by the manufacturer.
- Only use liquids for cleaning which guarantee system material resistance.
- Only user operating liquids the manufacturer has approved for the system.

3.3 Safety information regarding the use

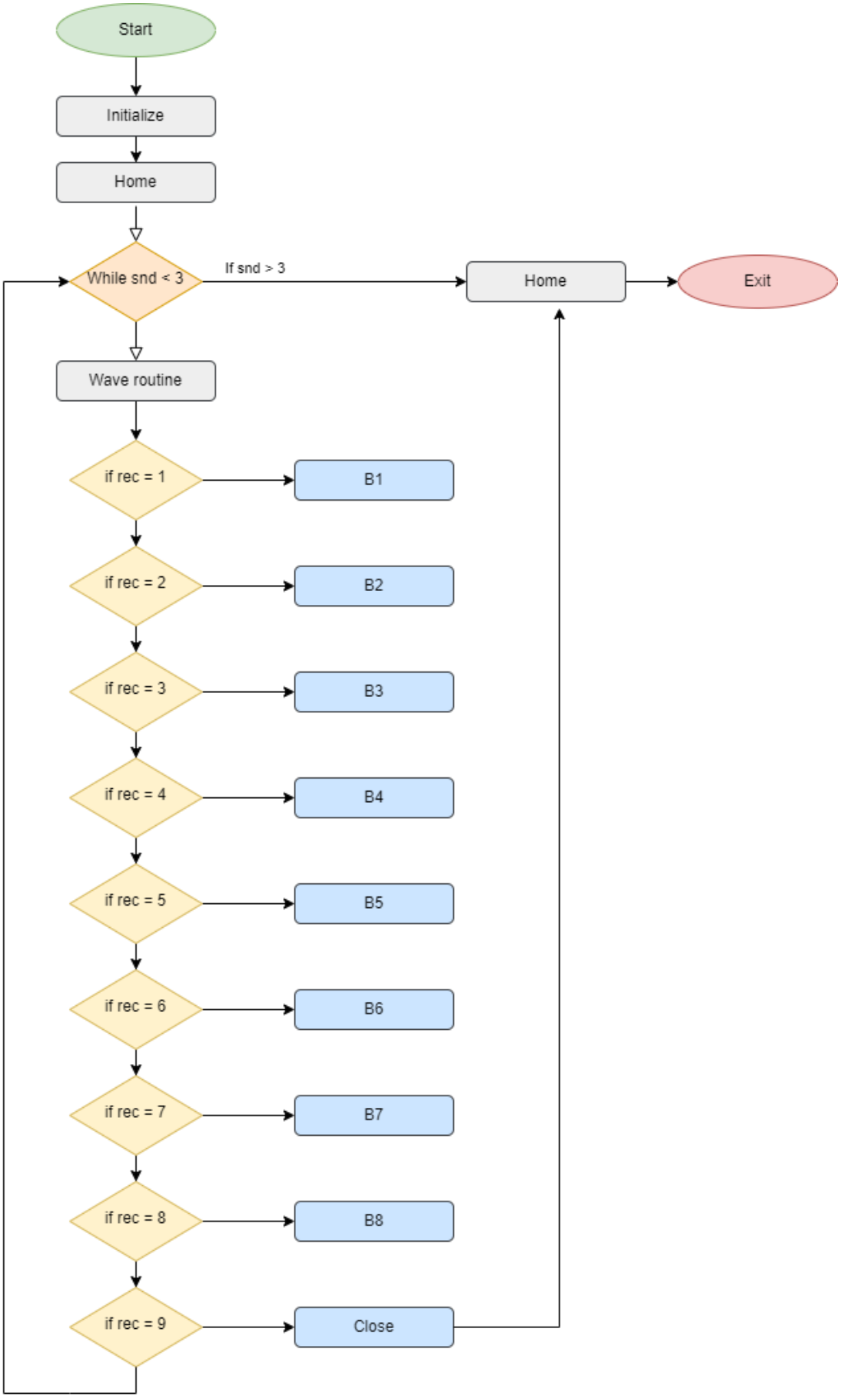
Before editing the code of the Robocafe, ensure the robot is in the 'Disabled' state and the power to the coffee machine is switched off. Make sure you have easy access to the Emergency Stop button and you are seated a safe distance away from the CR5 arm.

4. Process

4.1 Workflow of the Robocafe



4.2 Workflow of code



5. Preparation

5.1 Download and Installation of Software

To download the DobotSCStudio please visit the following link:

https://www.dobot.cc/downloadcenter/industrial-software-platform.html?sub_cat=244#sub-download

Once the software has been installed, launch the application, and connect to the CR5 controller.

5.2 Description of Software

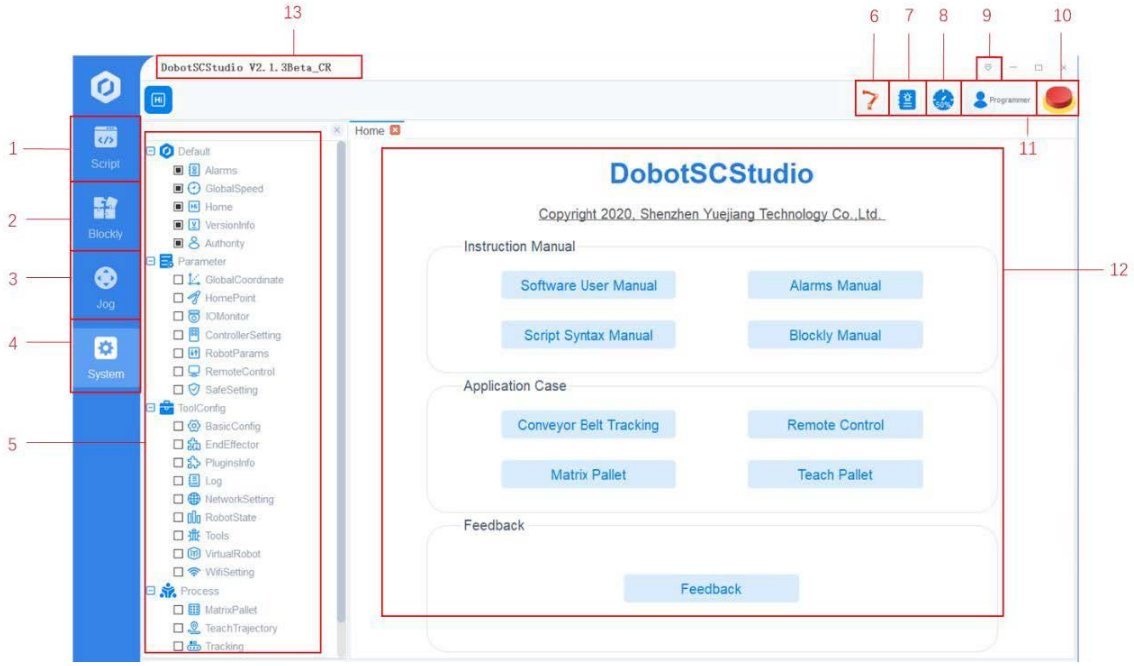


Figure 6 - DobotSCStudio Interface

1. Project – You can build or import a project, and debug or run it
2. Blockly – You can write programs by graphical language.
3. Jog – Jog the robot in different coordinate systems.
4. System – Set system configurations. Such as Network setting, RobotParams, Coordinate, Process, etc.
5. System bar
6. Click this button to enable or disable the motor
7. Check robot alarm – When an alarm is triggered, this icon will flash red
8. Set global velocity rate
9. IP setting or check update
10. Emergency stop switch
11. Select user mode – watcher, operator, programmer, manager
12. Interactive window
13. Show the current running mode

To better understand the DobotSCStudio software, please refer to the DobotSCStudio User Guide (Dobot, 2022)

6. The Code

6.1 Explanation of the code

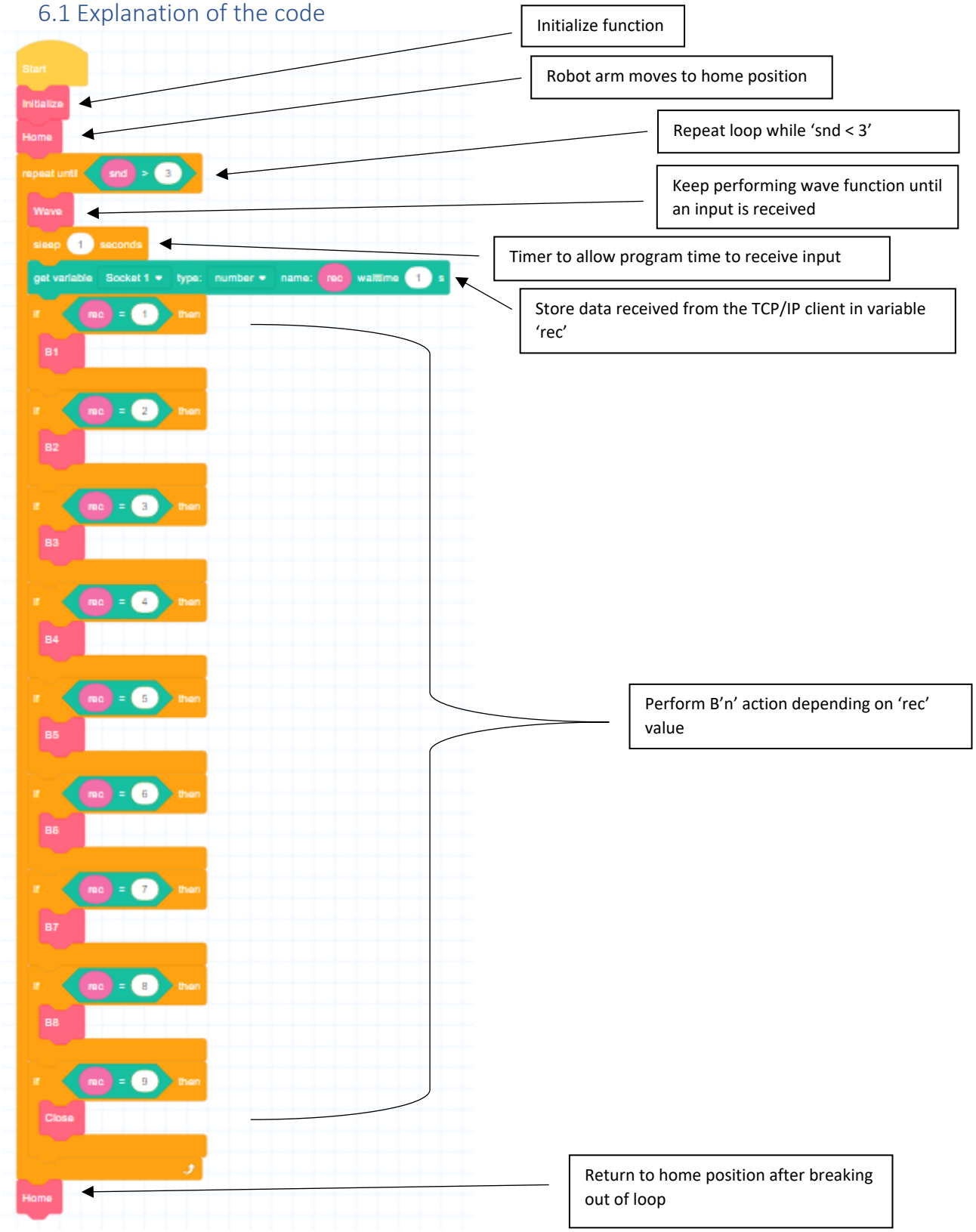


Figure 7 - Main Code

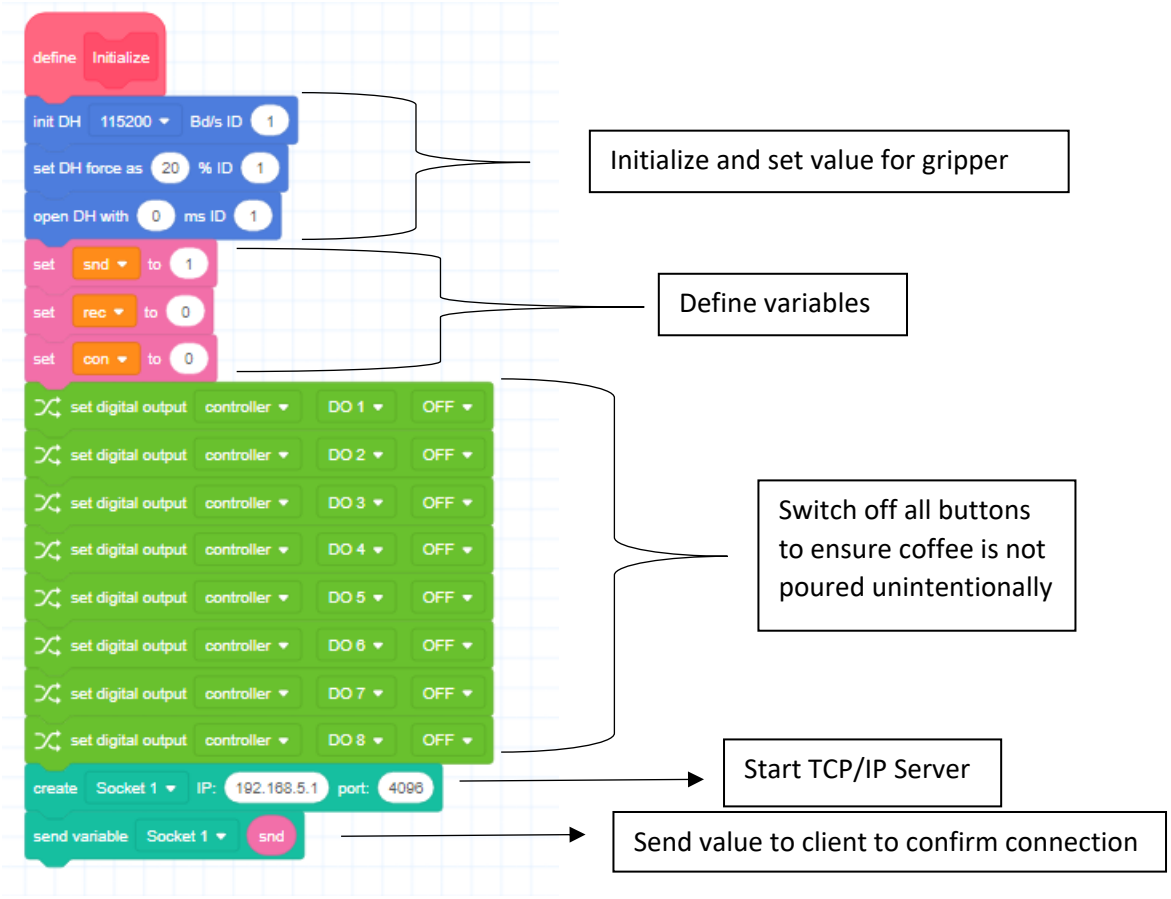


Figure 8 - Initialize function

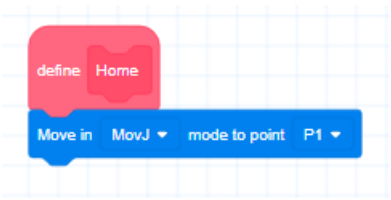


Figure 9 - Home function

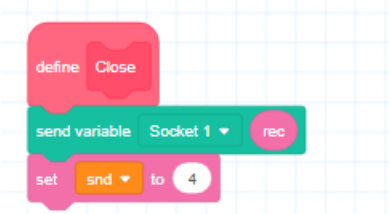
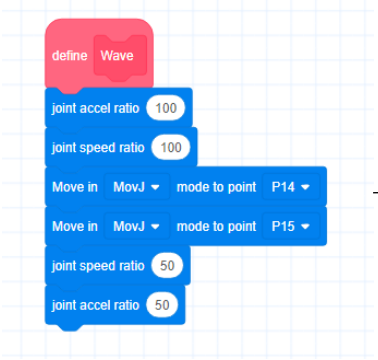


Figure 10 - Close function

Move arm to P1 position

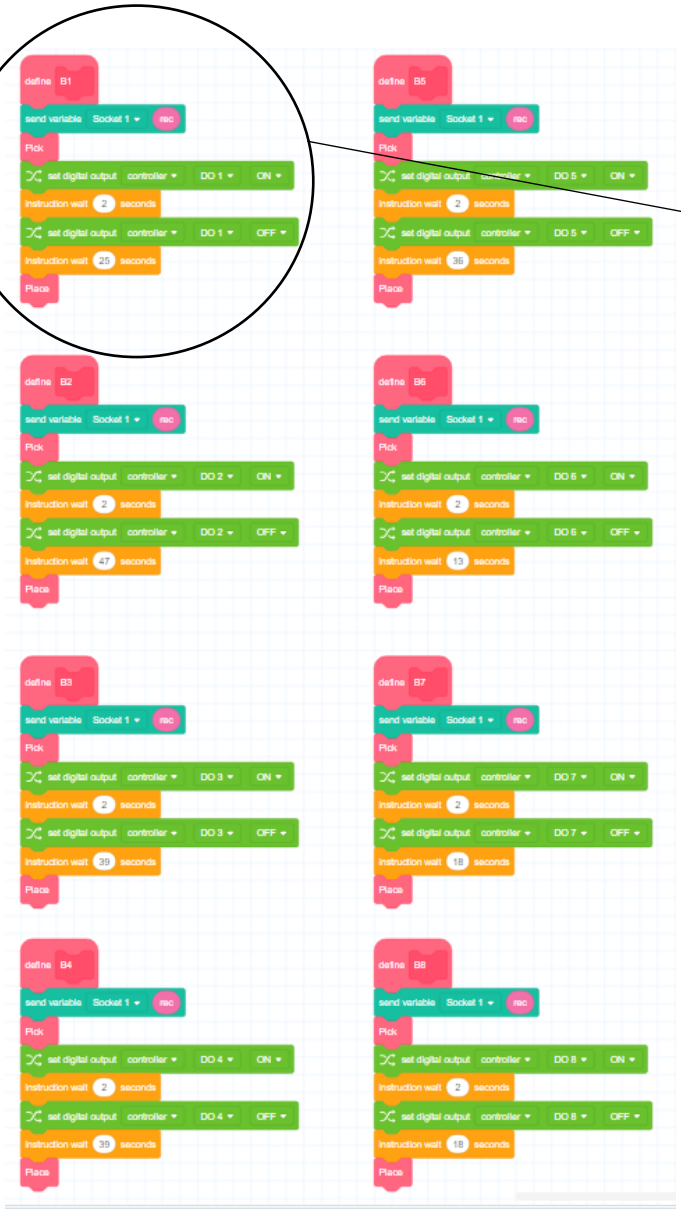
Send ‘rec’ value to client before closing

Change ‘snd’ value to break loop



Basic wave movement

Figure 11 - Wave function



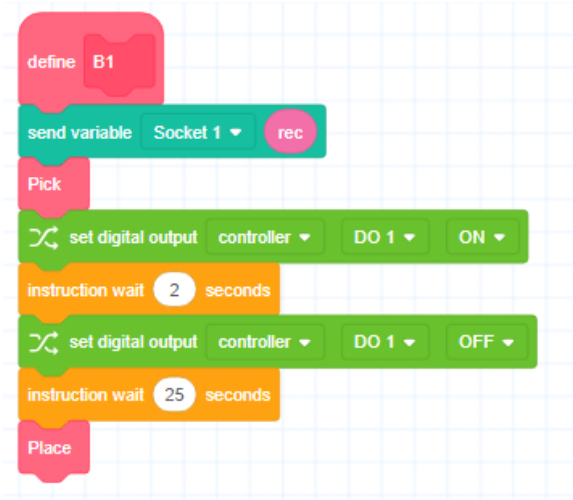
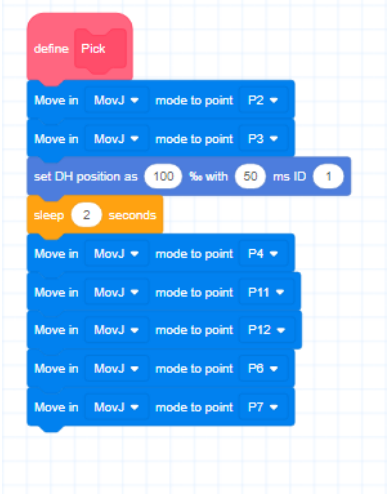


Figure 12 - B1 function as example

1. Send ‘rec’ value back to client to confirm selection
2. Run ‘Pick’ function
3. Set button on for 2 seconds before switching off to simulate a click
4. Wait x seconds depending on time to pour the beverage
5. Run ‘Place’ function

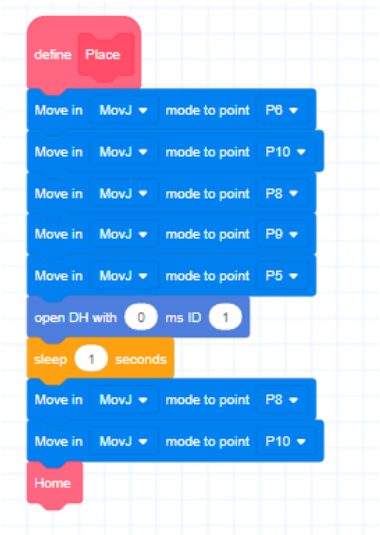
Figure 13 - B'n' functions



Move to predefined points

Close gripper and wait x seconds so arm doesn’t move before the gripper closes

Figure 14 - Pick function



Move to predefined points

Close gripper and wait x seconds so arm doesn't move before the gripper closes

Go to home position

Figure 15 - Place function

6.2 How to Identify and Solve Problems

Error	Cause	Solution
…	…	…

7. Appendices

7.1 Supplied Accessories, Consumables, and Spare Parts

7.1.1 Supplied Accessories

- 8oz disposable coffee cups

7.1.2 Consumables

- Coffee Beans
- Milk Powder
- Hot Chocolate Powder

7.1.3 Spare Parts

- 1 extra Gripper

8. Related Documentation

Dobot. (2022, October 10). *DobotSCStudio User Guide (CR).* Retrieved from Dobot: https://www.dobot.cc/downloadcenter/industrial-software-platform.html?sub_cat=244#sub-download

Food Safety Department. (2020, March). *Food Code 2020*. Retrieved from Government of Dubai: https://www.dm.gov.ae/wp-content/uploads/2020/11/Food-Code-2.0-Draft-Version-4.pdf