CrochetCraft User Manual

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Chapter 1

Introduction

1.1 Product Overview

Crochet is a method to turn yarn into textiles. It is a form of art that uses a crochet hook to knot the yarn in such a way to produce a three-dimensional product, which can range from clothing and toys to bags and public art displays. A crochet pattern is a list of steps to produce a specific product, analogous to a cooking recipe. The design of crochet patterns typically involve many iterations of producing, refining, and experimenting, and the CrochetCraft app attempts to simplify this process.

CrochetCraft is a web application that produces real-time 3D visualizations of crochet patterns. It allows designers to input their textual pattern and view the simulated product resulting from the pattern. Designers can refine and iterate on their pattern without the time-consuming process of constructing the design in the real world each time.

1.2 First Sample Run

Start the CrochetCraft application by opening crochetcraft.jtai.dev in your web browser. Once loaded, the application's screen layout will be displayed, as shown in figure 1.1. Left-click anywhere in the pattern text box, and type or copy-and-paste the following pattern:

```
0. ch 11
1. sc 10
2-10. ch 1, turn, sc 10
ch 1
```

After all of the above text has been inserted, a 3D visualization of the pattern will be displayed in the rendering area. Next, use the mouse to highlight the text 2-10 in the Pattern text box, and overwrite it by typing 2-20. The modified pattern will be visualized in the rendering area.
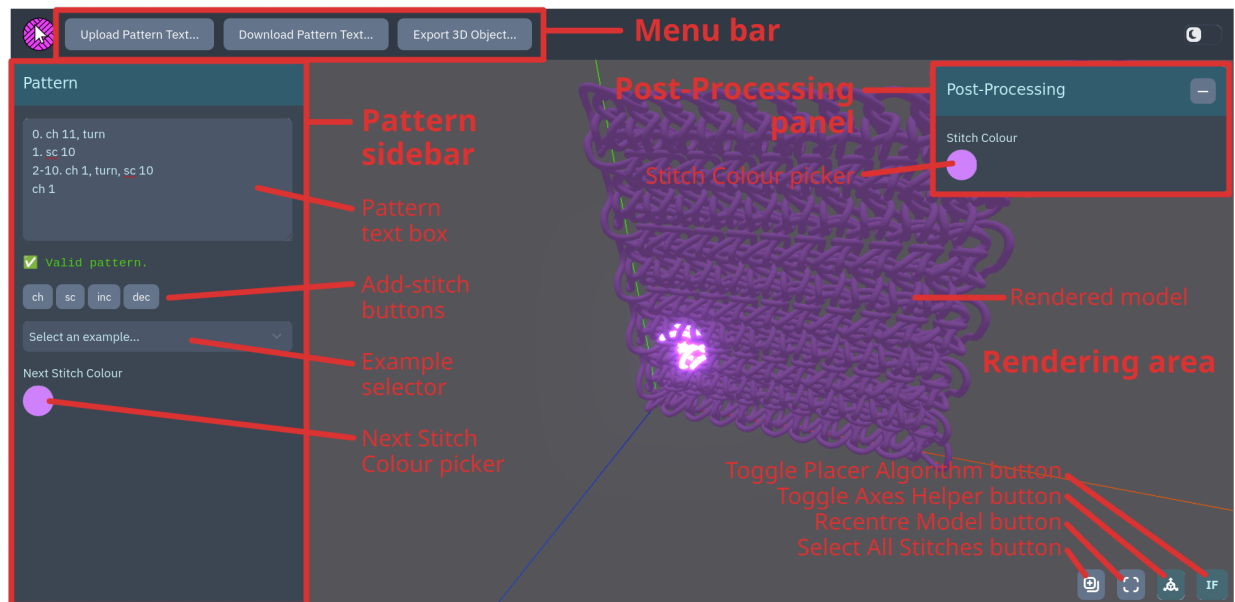
Figure 1.1: The screen layout of CrochetCraft

Chapter 2

Conventions

2.1   User Assumptions

You, the user of CrochetCraft, are assumed to understand American crochet terminology, and be competent in the basic usage of the device that is running CrochetCraft.

2.2   Computer System Assumptions

CrochetCraft runs in a web browser, so it is assumed that you are using a browser that is up-to-date, and has not been tampered with. It is assumed that you are using a device with a keyboard and mouse. If you wish to use any features of the computer filesystem, it is assumed that your device has sufficient free space for these features.

2.3   Notational Conventions

The following text conventions are used in this manual:

- Libertine is used for normal text.
- *Libertine italicized* is used for new terms in normal text.
- **Libertine bolded** is used for emphasis.
- Noto Sans is used for program names and user interface input/output.
- Noto Sans italicized is used for widget names.
- `Bitstream Vera Sans Mono` is used for internal representation contents.
- `Bitstream Vera Sans Mono italicized` is used for variables of internal representation syntax.

2.4   Terms

Listing 1 details the basic grammar used when parsing the pattern text. Furthermore, table 2.1 contains the list of keywords. In each row, the keywords listed next to each other can be used interchangeably. For example, sc2tog has the same meaning as dec, so whenever the grammar includes "dec", sc2tog can also be used.

```
pattern := (line? NEWLINE)* line?
line := row_number? foundation? instructions

row_number := INTEGER ("–" INTEGER)? "."
foundation := "mr" ","

instructions := (instruction "," | COLOR ":")* instruction
instruction := "turn" | stitches | repeat

stitches := stitch | stitch count | count stitch
stitch := "dec" | stitch_type "st"? "inc"?
stitch_type := "ch" | "sc"

repeat := "(" instructions ")" count
        | count "(" instructions ")"
        | "*" instructions "," "rep" count "from"? "*"
        | "*" instructions "," "rep" "from"? "*" count

count := "x"? (INTEGER | "twice" | "thrice") "x"? "more"? "times"?
```

Listing 1: The pattern grammar understood by CrochetCraft

The following terms are used throughout the manual:

CrochetCraft the name of the web application

user the person who uses CrochetCraft, addressed by "you"

device whatever electronic device CrochetCraft is currently running on, inclusive of hardware and operating system

crochet the art of creating textiles by using a crochet hook and yarn

yarn the material used in the art of crochet

amigurumi the Japanese art of knitting or crocheting stuffed toys out of yarn

pattern a set of textual instructions that detail how to create a crochet project

stitch a simple, indivisible knot built on top of previous stitches, used to build patterns

foundation the initial loop used to start a pattern

Keywords	Meaning
stitch, st	stitch
mr, mc	magic ring
chain, ch	chain
single, sc	single crochet
increase, inc	increase
decrease, dec, sc2tog	decrease
turn	turn
repeat, rep	repeat
from	from
twice, two	two times
thrice, three	three times
times, time, x	times
more	more

Table 2.1: The keywords and their meanings, as recognized by CrochetCraft.

screen layout the buttons, text boxes, widgets, and other elements visible on the screen in the CrochetCraft app

rendering area the area of the screen used for displaying the rendered model

rendered model the 3D object created and shown based on the inputted pattern text

session an invocation of CrochetCraft

Pattern *sidebar* the user interface widget to the left of the rendering area

Pattern *text box* the text box within the Pattern sidebar which holds your input pattern text

add-stitch buttons the set of buttons below the Pattern text box that allows the user to input stitches one at a time

Next Stitch Colour *picker* the colour picker below the add-stitch buttons which determines the colour for the next added stitch

Post-Processing *panel* the user interface widget on the right side of the rendering area

Stitch Colour *picker* the button in the Post-Processing panel which can change the colour for the selected stitch in the rendered model

menu bar the user interface component above the rendering area, which contains the Upload Pattern Text button, Download Pattern Text button, and Export 3D Object button

Upload Pattern Text *button* the button in the menu bar that, when pressed, allows you to select a text file from your local device such that the contents of that text file populate the Pattern

text box

Download Pattern Text *button*   the button in the menu bar that, when pressed, allows you to
download your pattern text as a text file to your local device

Export 3D Object *button*   the button in the menu bar that, when pressed, allows you to down-
load your rendered model as an OBJ file to your local device

2.5   Other Abbreviations

internal representation   any kind of data, not visible to the user, used internally by CrochetCraft
to represent crochet patterns

GUI   Graphical User Interface

OBJ   a geometry definition file format, to which a rendered model can be exported

***what you see is what you get* (*WYSIWYG*)**   software that displays content in a realistic form
while it is being edited

2.6   Basic User Interface Goals

CrochetCraft aims to be a friendly GUI for crochet amateurs and enthusiasts. Not much crochet
modelling software exists, and most of this software does not provide fast and accessible ren-
dering. The main appeal of CrochetCraft is from the benefits of its WYSIWYG approach and its
capability of fast pattern iteration. Its basic goals are:

- It is simple for you to import your crochet pattern text into the Pattern text box, and it is
  simple for you to export a 3D object of the rendered model in OBJ format.

- It is easy for you to view your rendered model at many different angles.

- It is easy for a pattern designer to iterate and make modifications to a pattern, to improve
  it.

2.7   Organization of this Manual

The remainder of this manual is organized primarily on use cases. The Use Cases chapter describes
the basic use cases, including the possible GUI interactions in depth. After the Use Cases chapter,
the Troubleshooting & Tips chapter describes what you should do if you encounter common
errors as well as how to use CrochetCraft effectively. Lastly, the Limitations chapter describes
the restrictions on the current version of CrochetCraft.

Chapter 3

Use Cases

The use cases of CrochetCraft are classified by the section of the GUI your initial interaction occurs in.

3.1   Crochet Pattern Entry

Crochet patterns may be entered in two ways: using the Pattern text box or the add-stitch buttons.

You may enter the pattern text in the Pattern text box:

1. Any text may be typed into the Pattern text box, but only text that satisfies the grammar shall be considered valid.

2. If the resulting text within the Pattern text box is considered to be a valid pattern, the rendering area will update to display a new rendered model corresponding to the updated pattern text.

You may consider alternative methods of direct text entry into the Pattern text box:

- You may copy and paste text into the Pattern text box. This is done using the copy or paste shortcuts of the underlying device.

- You may use speech-to-text to input the pattern text into the Pattern text box box.

Regardless of the method of text entry, the rendering area will update to display a new rendered model corresponding to the updated pattern, if it is valid.

You may add one stitch to the end of a pattern using one of the add-stitch buttons. Each add-stitch button is labelled with the stitch that it will add to the rendered model, and each button corresponds to a different stitch.

1. You press the appropriate add-stitch button. For example, to add a chain stitch, press the button labelled ch.

2. The text corresponding to that stitch is added to the end of the Pattern text box.

3. If the resulting pattern text is valid, the rendering area will update to display a new rendered model corresponding to the updated pattern text.

As an alternative to traditional text input, you may press any of the add-stitch button multiple times to add multiple stitches. After each button press, the Pattern text box will update, and if the pattern text is still valid, the rendering area will update too.

In the case that the resultant text in the Pattern text box is invalid, the rendering area will not update, and will continue to display the same rendered model corresponding to the last valid pattern text.

3.2 Viewing Crochet Pattern

You may view the rendered model in the rendering area. Typically, no additional input is required to view the rendered model; the rendered model will be readily displayed on the screen under normal usage in the absence of your input.

You may interact with the rendering area using your mouse and keyboard to change the perspective that the rendered model is viewed from.

Panning the camera:

1. You may pan the camera by either (1) holding right-click, or (2) holding Shift and left-click, and then moving your mouse in a direction within the rendering area.

2. The rendering area's perspective will shift in the direction that the mouse moves in.

Rotating the camera:

1. You may rotate the camera by holding left-click and moving your mouse in a direction.

2. The rendering area's perspective will rotate around the centre of the rendered model along the direction in which the mouse moves.

Zooming the camera:

1. You may zoom the camera in or out by scrolling the mouse wheel up or down.

2. The rendering area's perspective will zoom in or out depending on the scroll direction. Scrolling down zooms the camera out, and scrolling up zooms the camera in.

In the case that the rendered model is no longer visible in the rendering area after the viewing perspective is changed, CrochetCraft does not correct this. However, you can reset the camera to ensure the rendered model is visible again.

Resetting the camera:

1. Click the Recentre Model button at the bottom-right corner of the rendering area.

2. The rendering area's perspective will be reset, nullifying any panning, rotating, and zooming done previously.

3.3 Interacting with the Rendered Model

You may interact with the rendered model using your mouse to either hover or select the individual stitches of the rendered model.

Hovering:

1. You may hover over an individual stitch by moving the mouse pointer so it is over one of the stitches within the rendered model.

2. The rendering area will update, so the stitch that is under the mouse pointer will glow.

If the mouse pointer is over empty space, and there is no stitch under the pointer, no action is taken, and the rendering area will not change what is displayed.

Selecting:

1. First, a stitch in the rendered model must be hovered over.

2. You may then left-click to select the hovered stitch.

In any use case involving a selected stitch — in particular, interactions with the Post-Processing panel — the stitch involved in step 2 is the one that will be affected.

If a long press is performed, the hovered stitch will only be selected if the mouse pointer still lies on top of the stitch in the rendered model when the left-click is released.

If no stitch is being hovered over, but a left-click is performed within the rendering area, CrochetCraft deselects the selected stitch, if there is one.

3.4 Post-Processing the Rendered Model

After a stitch has been selected, as described in the Interacting with the Rendered Model section, the Post-Processing panel will be displayed. This can be used to alter a stitch's colour after rendering.

It is important to note that post-processing changes only affect the rendered model and any exported 3D objects. The pattern text is not affected. This means, when the pattern text is changed, all changes made in the Post-Processing panel are lost.

Changing the colour of a stitch:

1. After selecting the desired stitch, left-click the Stitch Colour picker.

2. In the resulting dialog, select the desired colour. The dialog may vary depending on your device's operating system or web browser.

3.5 Loading and Saving Crochet Patterns

You can save your crochet pattern into a file on your device and load it later. This allows you to resume your work at a later time or share your work with others.

Saving your crochet pattern:

1. Left-click the Download Pattern Text button in the menu bar.

2. The current contents of the Pattern text box will be saved as a file onto your device. Depending on your device's operating system or web browser, the file may be saved in a standard location, or you may be prompted for a location to save the file.

Loading a saved crochet pattern:

1. Left-click the Upload Pattern Text button in the menu bar.

2. In the dialog box, select the file which was previously saved with the download function. The dialog box may vary depending on your device's operating system or web browser.

In the case that the selected file is not a valid file that was previously saved with the download function, the error File format not recognized appears, and the file is not loaded.

You can export the rendered pattern as a 3D model file, which can be opened in third-party applications.

Exporting your crochet pattern:

1. Once the rendering area displays the desired 3D model, left-click the Export 3D Object button in the menu bar.

2. The 3D model currently displayed in the rendering area will be saved as a file onto your device in OBJ format. Depending on your device's operating system or web browser, the file may be saved in a standard location, or you may be prompted for a location to save the file. The file can be opened in a variety of third-party software that supports loading files in OBJ format. Please consult the user manual for the third-party software to ensure it is capable of loading such files.

Chapter 4

Troubleshooting & Tips

4.1 Troubleshooting

You input a pattern with an unrecognized stitch name.

→ Modify the pattern to change or remove the unrecognized stitch name. The recognized stitches are listed in the Terms section.

You input a pattern with invalid or unrecognized syntax.

→ Modify the pattern to conform to the grammar laid out in the Terms section.

You try to load a file that is not a crochet pattern.

→ Open a plain text file instead, or open the desired file with the appropriate software and copy and paste the pattern text into the CrochetCraft application.

You input a pattern with an excessively large amount of stitches.

→ Reduce the number of stitches in the pattern. See the Limitations chapter for more details.

You enter an invalid value in the settings panel. For example, a non-number when a number is required.

→ Enter a valid number without spaces, thousands separators, or other symbols.

You open the app in an outdated/incompatible browser.

→ Use a device that satisfies the requirements listed in the Computer System Assumptions section.

You close the window without saving the pattern being typed.

→ Ensure you have used the `Download` function to save your work before closing the web browser window.

You add more than one foundation stitch.

→ Remove the additional foundation stitches. CrochetCraft is only designed to render one crochet part at a time; different parts which are intended to be sewn together must be rendered separately.

4.2 Tips

- The example selector can be used to load a variety of sample crochet patterns, which can help you get started.

- Amigurumi patterns typically start with a magic circle, while clothing and similar textiles typically start with a slip knot and chain stitches.

- Use the Download Pattern Text button to avoid losing your work.

Chapter 5

Limitations

These are the limitations that apply to the pattern text:

- The crochet pattern text input is not inclusive of all terminology recognized by American crochet terminology, or other natural language. The crochet pattern text input is limited to what is included in the table describing the grammar used by the Pattern text box.

- Supported crochet pattern text is limited to the list of acceptable tokens only. Invisible characters, combining characters, or other Unicode characters that interfere with normal text display may cause parsing errors.

Limitations on the crochet pattern text input apply to uploaded pattern texts too.

For performance reasons, there are limitations on the number of stitches that CrochetCraft can render. CrochetCraft supports patterns with up to 20 000 stitches before user interactions have unreasonable delays of above 300 ms.

The CrochetCraft application makes a few assumptions about real-world crochet patterns, which limits what crochet patterns can be rendered satisfactorily. Here are the following assumptions:

- Crochet patterns only contain one foundation stitch.

- Crochet patterns do not contain yarn threads intersecting through each other.

- Crochet patterns are composed of a common set of well-defined stitches.

- Crochet patterns are constructed one stitch at a time.

- Each stitch connects to the previous one in the pattern and possibly to other earlier stitches in the pattern.

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