User Guide

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and Programming: Raoul Watson

Based on the original concept
of "The Factory" by: Marge Kosel & Mike Fish

Note: This user guide is in draft status. No professional editing has been done. I apologize for errors in its contents. Some page references may be incorrect.

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Introduction

"The Machine" introduces problem solving. Teaches the concept of "thinking ahead" and to break down a problem into parts in order to solve them.

"The Machine" gives valuable practice in reverse engineering where a final product is known, and you must work backwards in order to solve the problem.

Introduces shape, angle, and rotation.

Introduces the concept of simple step-by-step programming logic.

The target audience of "The Machine" are students from K to 12.

This guide is divided into three main instructional sections:

1. A quick introduction to The Machine.
2. A program description.

The Machine is designed for a Macintosh Operating System.

The Machine

Program Objective

Grade level: K-12

Time required: Five to ten minutes for program familiarization.
Five to ten minutes for each activity.

Objectives: To introduce students to the concept of problem solving, analysis of a problem, and working backwards. Introduction to shapes, angles, and rotation.

The Machine

Installation

System Requirements:

“The Machine” requires a minimum of Mac OS 10.12.

Installation:

Run the installer and it will create a folder in your application folder.

Note: If you have an antivirus program, the installation will trigger your anti-virus program to check the file prior to the first-time execution. This is normal, simply let your antivirus do its job. This check will only happen once during the first time run.

The Mac operating system may also warn you that this file was downloaded from the Internet. This is also normal for the first time run.

Note: If for any reason in the future you need to uninstall or remove The Machine, this can be accomplished simply by:

Dragging the folder of the app into the trash.

The Machine

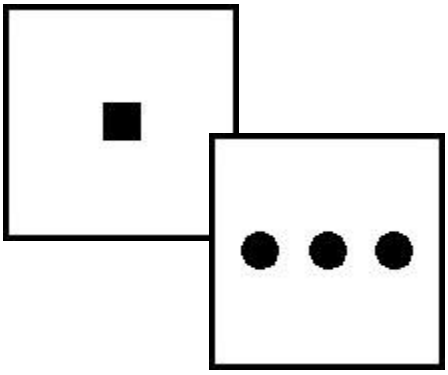
Main Screen

From the Applications folder, locate “The Machine” folder and double click the application icon. Once selected, the program will now run and after several seconds, the main screen will be displayed:

At the center is a multifunction machine with several functions, punch, stripe and rotate.

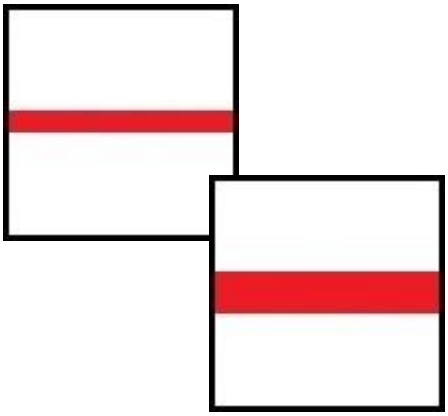
How the Punch Machine Works

The punch machine punches holes into the raw material. You can make square or circular holes. The punch machine can be programmed to make one, two, or three holes.



How the Stripe Machine Works

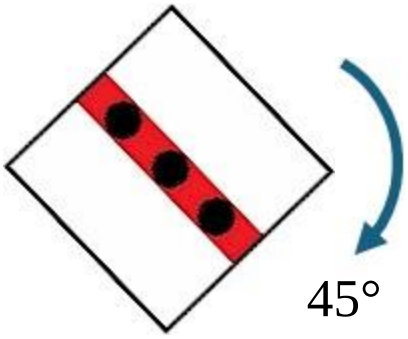
The Stripe machine paints stripes across the middle of the raw material. The Stripe Machine can be programmed to paint a thin, medium, or thick stripe.



How the Rotate Machine Works

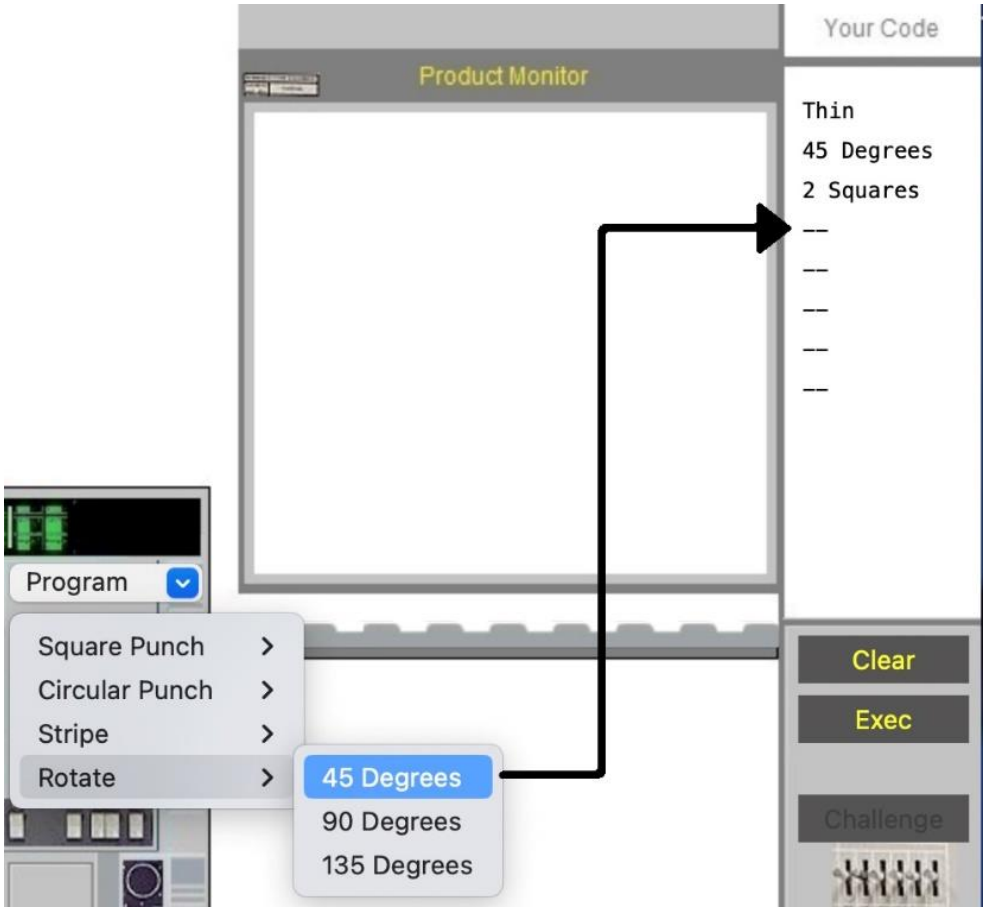
The Rotate Machine turns the raw material around clockwise.

You can program the machine to turn 45, 90, or 135 degrees.



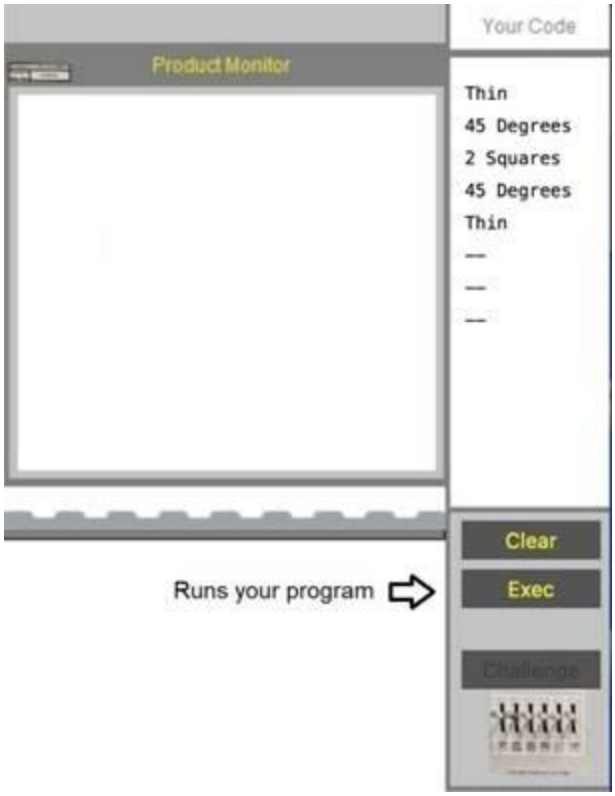
Creating a Product

On the front panel of the machine located at the center of the screen, there is a pop-up menu labeled “Program.” You can have up to eight steps of programming the three machines. You select the steps of your program by selecting the appropriate machine and parameters from the Program pop-up menu. Every time you make a programming menu selection, the step is added to the steps located on the top right of your screen.



The Machine

As you are entering these steps, the commands are sent to the memory of the appropriate machine. If you have made a mistake, the only way you can fix it is by erasing it all from the machine memory. You use the "Clear" button to do this.



Once you are satisfied with your programming steps, you can click the "Exec" button in order to execute the code.

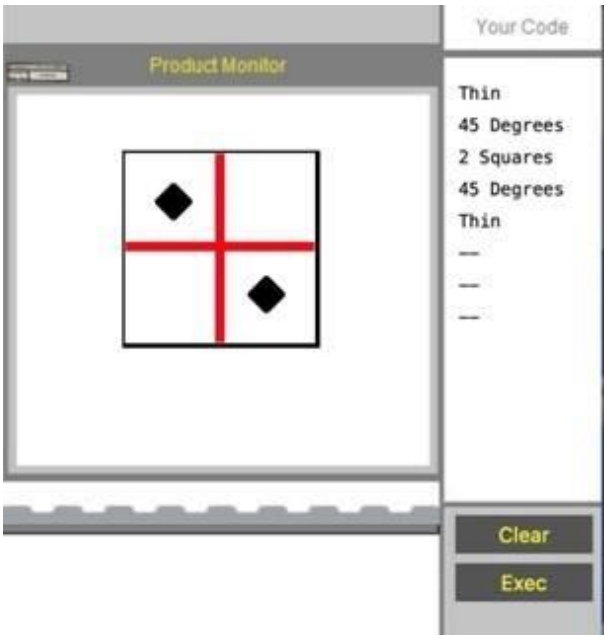
What happened to my steps?

Your raw material in the format of a square sheet metal is supplied by the delivery machine on the left to the machine via a conveyor belt. Once at the machine station, your program steps will be executed as listed. For example, if you have the following steps:

```
Thin
45 degrees
2 squares
45 degrees
Thin
```

The Machine

During execution, the first thing that will happen is that the stripe machine will spray a thin line across (parallel to the conveyor belt). The rotating machine will then rotate clockwise 45 degrees. At this point, your square metal plate will look like a diamond if viewed from the top (after the 45-degree rotation). Next the punch machine will punch 2 square holes in the plate. Next, the metal is rotated 45 degrees clockwise.



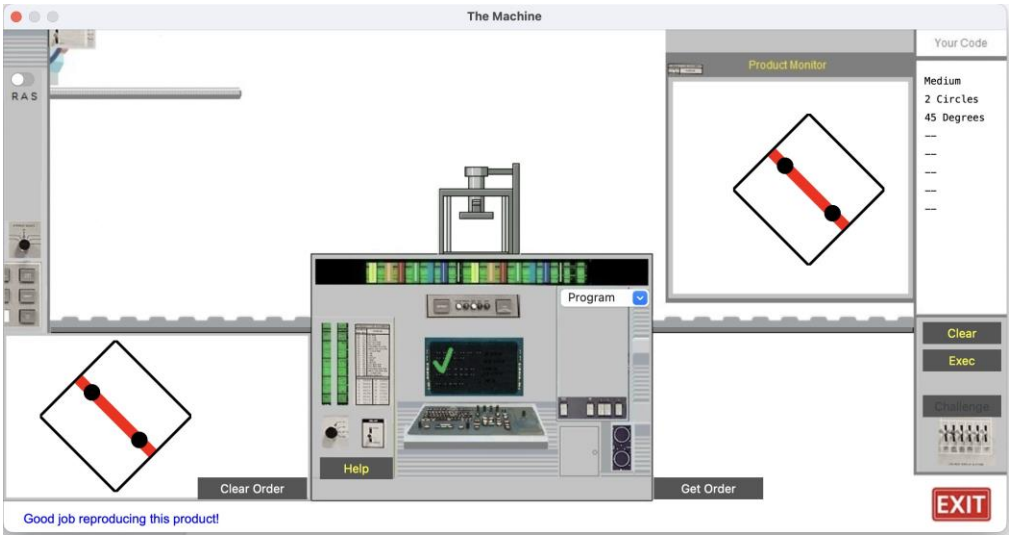
Your square metal which was a diamond shaped when viewed from the top (from the previous 45-degree rotation) will now appear back as a square when viewed from the top. The spray machine will then spray a thin band across.

Since there are no more steps, the product will be moved out from the station, and it can be viewed inside the "Product Monitor."

Challenging Someone

Once your product is displayed, the button "Challenge" will become available. You can challenge someone to reproduce the product you have just created.

The person challenged will enter the steps that they think will reproduce the product by following the same steps as described on page 7. When the final product is displayed on the product monitor, if this was a result of a challenge or an order, you will be told whether you were successful or not in reproducing the product.



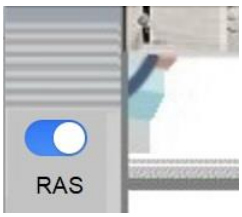
Keep in mind that your resulting product must match identical to the challenge, including its orientation.

Generating an Order

You can also ask the computer to generate a challenge product for you by clicking the “Get Order” button. This button produces a random order for you to reproduce. The order can be very simple (requiring 1 or 2 steps), or a medium (requiring 3 to 5 steps) to challenging orders (requiring 6 to 8 steps).

Because the order is generated randomly, it is possible that you get a repeat. When this happens or the order is just too simple or not to your liking, you can simply click the button "Clear Order." You can then generate another order using the "Get Order" button.

Reduced Animation Switch



The RAS Switch is located on the top left of the raw material delivery station. In the "on" position, will cause the product to be generated "behind the scenes" and delivered by the conveyor belt directly to the product monitor. This will eliminate the delay caused by the machine animation.

The Exit button exits and terminates the program.

Strategies and Tips

Be efficient in your steps. Do as many operations as possible in the minimum number of steps. The examples below produce the same product but one made in a less efficient manner:

Efficient

```
Thin
45 degrees
3 squares
45 degrees
Thick
```

Inefficient

```
Thin
45 degrees
1 square
2 squares
45 degrees
Thin
Thick
```

We must also realize that you cannot undo certain operations. For example, if you have applied a thick paint stripe, applying a thin stripe on the next step will not change the product appearance. Another example would be if you have punched a square hole. Punching a circle hole on the next step will not change the square punch already made. The opposite, however, will work (i.e. stripe thick after thin and square punch after circle).

When analyzing a product, keep in mind that the rotate machine rotates clockwise. So, if you are looking at a product which final disposition is in a diamond shape, working backwards you should realize that there is a rotate operation as one of the last steps. The same holds true for punches and stripes. Since they are always applied parallel to the conveyor belt, a final product not having stripes or punches across, cannot be made as the last step.