1. Introduction

Casvi is a Computer Algebra System that allows the development of basic and advanced mathematical operations,

through the use of the Maxima mathematical engine. Casvi allows you to perform various operations from different branches of mathematics,

such as algebra, differential calculus, and integral calculus.

2. Modules

The Casvi system offers 8 modules:

- File
- Casvi
- Simplify
- Calculation
- Graph
- Help.

- Algebra
- Equations

Below, we detail the key combinations the user must press to access each of the Casvi system's interactive menus:

- To access the File menu, the user must press the alt + a key combination.
- To access the Casvi menu, the user must press the alt + s key combination.
- To access the Simplify menu, the user must press the alt + d key combination.
- To access the Calculation menu, the user must press the alt + f key combination.
- To access the Graph menu, the user must press the alt + g key combination.
- To access the Help menu, the user must press the alt + h key combination.

- To access the Algebra menu, the user must press the alt + j key combination.

- To access the Equations menu, the user must press the alt + k key combination.

Each module is described below.

2.1 File Menu

This menu contains the following options: new, open, save, and print. The Casvi system offers the option to print in Braille format as well as convert the results obtained into MathML code. To access the file menu, the user must press the Alt + A key combination.

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message for the user.

2.1.1 New

Allows the creation of plain text files (*.txt). To create a file, the user must follow the instructions below:

- Open the file menu. Press the "Alt + A" or "Alt + A" keys.

- Navigate the File menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "New" option. Press the "Enter" key.

- Enter the file name and press "Enter" to create it. The user will hear the message "File created."

All files will be created in the path: "C:\Casvi\CasviFiles\"

2.1.2 Open

Allows you to open plain text files (*.txt). To open a file, follow the instructions below:

- Open the file menu. Press "Alt + a" or "Alt + A".

- Navigate the file menu. Press the up and down arrows to scroll through the menu options.

- Select the "Open" option. Press the "Enter" key.

- Navigate the file directory. Press the up and down arrows to scroll through the files in the directory.

- Select the file and press "Enter" to open it. The user will hear the message "file loaded".

2.1.3 Save

Stores the data found in the Casvi system text editor. To save the data to a file, follow the instructions below:

- Open the file menu. Press "Alt + a" or "Alt + A" keys.

- Navigate the file menu. Press the up and down arrows to scroll through the options on this menu.

- Select the "Save" option. Press the "Enter" key.

- Navigate the confirmation screen. Press the up and down arrows to scroll through the options on this screen.

- Select "Yes" and press "Enter" to save the data. The user will hear the message "Changes saved."

All files will be saved in the path: "C:\Casvi\CasviFiles\".

2.1.4 Print

Prints the data found in the Casvi system text editor.

- Open the file menu. Press "Alt + a" or "Alt + A" keys.

- Navigate the file menu. Press the up and down arrows to scroll through the options on this menu.

- Select the "Print" option. Press the "Enter" key. - Navigate to the screen displaying available printers. Press the up and down arrows to scroll through the printers installed on your computer.

- Select the printer and press "Enter" to print the data.

2.1.5 Printing in Braille

Prints data found in the Casvi system text editor in Braille format. To print in Braille format, follow the instructions below:

- Open the file menu. Press "Alt + a" or "Alt + A".

- Navigate to the file menu. Press the up and down arrows to scroll through the options on this menu.

- Select the "Print in Braille" option. Press the "Enter" key.

- Navigate to the screen displaying available printers. Press the up and down arrows to scroll through the printers installed on your computer.

- Select the printer and press "Enter" to print the data in Braille format.

2.1.6 Generate MathML Code

Generates the last operation performed by the Casvi system into MathML code. To generate the code, follow the instructions below:

- Open the file menu. Press "Alt + a" or "Alt + A."

- Navigate the file menu. Press the up and down arrow keys to scroll through the menu options.

- Select the "Generate MathML Code" option and press "Enter" to generate the MathML code. The user will hear the message "code generated."

- The file will be created in the path: "C:\Casvi\Files\MathML\".

2.1.7 Exit

Allows you to exit the Casvi system. To exit the system, follow the instructions below:

Option A

- Open the file menu. Press "Alt + a" or "Alt + A."

- Navigate the file menu. Press the up and down arrow keys to scroll through the menu options.

- Select the "Exit" option. Press the "Enter" key.

- Navigate to the confirmation screen. Press the up and down arrows to scroll through the options on this screen.

- Select "Yes" and press "Enter" to exit the Casvi system.

Option B

- In the Casvi system editor, press the "Esc" key.

- Navigate to the confirmation screen. Press the up and down arrows to scroll through the options on this screen.

- Select "Yes" and press "Enter" to exit the Casvi system.

2.2 Casvi Menu

This module allows you to view all Casvi system menus, perform general settings, clear the text editor, and clear all data stored by the Casvi system.

It also has an option for users to learn and remember the location of each key. To access the Casvi menu, press "Alt + s" or "Alt + S".

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message for the user.

2.2.1 Menus

Displays all Casvi system menus. To select a menu, follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S".

- Navigate the Casvi menu. Press the up and down arrow keys to scroll through the menu options.

- Select the "Menus" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system modules. Press the up and down arrow keys to scroll through the available menus.

- Select the menu and press the "Enter" key to open it.

2.2.2 Settings

Allows you to configure general Casvi system settings. The user has six configuration options: audio, language, speech synthesizer speed,

significant numbers, decimals, and fractions. To choose a configuration option, follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S."

- Navigate the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Settings" option and press the "Enter" key.

- Navigate the screen containing the Casvi system configuration options. Press the up and down arrows to scroll through the available options.

- Select the configuration option and press the "Enter" key to open it.

The following describes each configuration option.

2.2.2.1 Audio

Sets the volume level of the Casvi system. To configure this setting, follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Settings" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system settings. Press the up and down arrows to scroll through the available menus.

- Select "Audio." Press the "Enter" key.

- Enter 1 for high, 2 for medium, or 3 for zero (enter only the number depending on the desired level). Press the "Enter" key to complete the configuration.

The user will hear the message "Configuration completed."

2.2.2.2 Language

Sets the Casvi system language. To configure this, follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Settings" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system settings. Press the up and down arrows to scroll through the available menus.

- Select "Language." Press the "Enter" key.

- Enter 1 for Spanish, 2 for English, or 3 for Portuguese (enter only the number of the desired language). Press the "Enter" key to complete the configuration.

The user will hear the message "Configuration completed."

2.2.2.3 Speech Synthesizer Speed

Sets the speech synthesizer speed. To configure this, follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S" keys.

- Navigate through the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Settings" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system settings. Press the up and down arrows to scroll through the available menus.

- Select "Speech Synthesizer Speed." Press the "Enter" key.

- Enter a value between 1 (slow) and 10 (fast). Press the "Enter" key to configure the settings. The user will hear the message "Configuration completed."

2.2.2.4 Significant Numbers

Sets the significant numbers. To configure this setting, the user must follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Settings" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system settings. Press the up and down arrows to scroll through the available menus.

- Select "Significant Numbers." Press the "Enter" key.

- Enter the number of significant digits. Press the "Enter" key to configure the settings. The user will hear the message "Configuration completed."

2.2.2.5 Decimal Numbers

Allows you to express fractions in decimal form. To configure this setting, the user must follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Settings" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system settings. Press the up and down arrows to scroll through the available menus.

- Select "Decimal Numbers" and press the "Enter" key. The user will hear the message "Setup completed."

2.2.2.6 Fractional Numbers

This setting allows the system to retain fractions when they are entered. For example, if you enter the fraction 1/2 instead of solving and

the result is "0.5," Casvi will retain the fraction as the result. To configure this setting, follow the instructions below:

- Open the Casvi menu. Press the "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the options in this menu. - Select the "Settings" option. Press the "Enter" key.

- Navigate the screen containing the Casvi system settings. Press the up and down arrows to scroll through the available menus.

- Select "Fractional Numbers" and press the "Enter" key. The user will hear the message "Configuration completed."

2.2.3 Clear Editor

This command clears the Casvi system editor. To use this command, the user must follow the instructions below:

Option A

- Open the Casvi menu. Press the "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Clear Editor" option and press the "Enter" key.

Option B

- In the Casvi system editor, type "clc" and press "Enter."

2.2.4 Clear All

This command clears all information displayed and stored by the Casvi system. To use this command, the user must follow the instructions below:

Option A

- Open the Casvi menu. Press "Alt + s" or "Alt + S."

- Navigate the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Clear All" option and press "Enter."

Option B

- In the Casvi system editor, type "clear" and press "Enter."

2.2.5 Test the Keyboard

The "Test the Keyboard" tool allows the user to see the location of the keys on the computer keyboard. This makes it easier to learn and adapt to using the Casvi system functions. When pressing each key, the corresponding audible message will be played. To use this function, the user

must follow the instructions below:

- Open the Casvi menu. Press "Alt + s" or "Alt + S" keys.

- Navigate the Casvi menu. Press the up and down arrows to scroll through the menu options.

- Select the "Test keyboard" option and press the "Enter" key.

2.3 Equations Menu

Allows you to find the roots of a polynomial, calculate the root of an expression in a given range, and solve a linear system of up to 10 equations.

To access the equations menu, press "Alt + k" or "Alt + K."

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the available options

in this menu. Each option in this menu will play an audio message to the user.

2.3.1 Solve

Find the roots of a polynomial. To perform this mathematical operation, the user must follow the instructions below:

- Open the equations menu. Press "Alt + k" or "Alt + K."

- Navigate the equations menu. Press the up and down arrow keys to scroll through the options in this menu.

- Select the "Solve" option and press the "Enter" key. The user will hear the message "Enter the polynomial."

- Enter the polynomial and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

If the polynomial is entered incorrectly, the user will hear the message: "Incorrect syntax."

2.3.2 Find Root

The purpose of this function is to analyze the zero crossings on the x-axis of an expression; this expression must be found within a closed range of real numbers.

To perform this mathematical operation, the user must follow the instructions below:

- Open the equations menu. Press "Alt + k" or "Alt + K."

- Navigate the equations menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Find Root" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the lower limit."

- Enter the lower limit and press "Tab." The user will hear the message "Enter the upper limit."

- Enter the upper limit and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

If one of the parameters required by this function is entered incorrectly, the user will hear the message: "Incorrect syntax."

2.3.3 Polynomial Roots

Find the roots of a polynomial.

- Open the equations menu. Press "Alt + k" or "Alt + K."

- Navigate the equations menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Polynomial Roots" option and press "Enter." The user will hear the message "Enter the polynomial."

- Enter the polynomial and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

If the polynomial is entered incorrectly, the user will hear the message: "Incorrect syntax."

2.3.4 Solving a Linear System

Solve a system of up to 10 linear equations with 10 unknowns. To perform this mathematical operation, the user must follow the instructions below:

- Open the equations menu. Press "Alt + k" or "Alt + K."

- Navigate the equations menu. Press the up and down arrows to scroll through the menu options.

- Select the "Solve a linear system" option and press "Enter." The user will hear the message "Enter the number of equations."

- Enter the number of equations (from 1 to 10) and press "Enter." The user will hear the message "Enter variables."

- Enter variables separated by commas (e.g., x, y, ...) and press "Tab" to continue. The user will hear the message "Enter equation 1."

- Enter equation 1 and press "Tab" to continue. The user will hear the message "Enter equation 2."

- Enter equation 2 and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

If one of the parameters required by this function is entered incorrectly, the user will hear the message: "Incorrect syntax."

2.4 Algebra Menu

This module aims to facilitate the user's solution of linear algebra problems. To access the algebra menu, press "Alt + j" or "Alt + J."

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message to the user.

2.4.1 Generate Matrix

Generates an nxm matrix. To use this function, the user must follow the instructions below:

- Open the algebra menu. Press "Alt + j" or "Alt + J".

- Navigate through the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Generate Matrix" option and press "Enter". The user will hear the message "Enter the name of the matrix".

- Enter the name of the matrix and press "Tab". The user will hear the message "Enter the number of rows".

- Enter the number of rows and press "Tab". The user will hear the message "Enter the number of columns".

- Enter the number of columns and press "Tab". The user will hear the message "Enter the matrix element".

- Enter the matrix element and press "Enter". The user will automatically hear the result obtained. Furthermore, the results will be

presented in the Casvi system editor.

Once created correctly, the matrix will be stored in memory with the previously assigned name.

2.4.2 Entering a Matrix

Allows you to enter a matrix of up to 9 rows and 9 columns. Below are the instructions for entering a matrix of 2 rows and 2 columns.

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Insert Matrix" option and press "Enter." The user will hear the message "Enter the name of the matrix."

- Enter the name of the matrix and press "Tab." The user will hear the message "Enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "Enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 array, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will automatically hear the matrix entered. Additionally, the results

will be displayed in the Casvi system editor.

Once entered correctly, the matrix will be stored in memory with the previously assigned name.

2.4.3 Invert Matrix

Finds the inverse of a matrix. The requirements for a matrix to be invertible are as follows:

- The matrix must be square.

- The determinant of the matrix must be non-zero.

Below are the instructions for inverting a matrix with 2 rows and 2 columns:

Option A

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Invert Matrix" option and press "Enter." The user will hear the message "enter the matrix."

- Press "Alt + m" or "Alt + M" keys to activate the "Insert Matrix" function. The user will hear the message "enter the matrix name."

- Enter the matrix name and press "Tab." The user will hear the message "enter the number of rows." - Enter the number of rows and press "Tab." The user will hear the message "Enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 array, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

To invert a matrix using option B, a matrix must first be entered. Below are the instructions for inverting the previously entered matrix M:

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate through the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Invert Matrix" option and press "Enter." The user will hear the message "Enter Matrix."

- Enter the name of the matrix (in this case, M) and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed

in the Casvi system editor.

2.4.4 Characteristic Polynomial

Calculates the characteristic polynomial of a matrix. Below are the instructions for calculating the characteristic polynomial of a 2x2 matrix:

Option A

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Characteristic Polynomial" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the matrix."

- Press "Alt + m" or "Alt + M" to activate the "Insert Matrix" function. The user will hear the message "Enter the name of the matrix."

- Enter the name of the matrix and press "Tab." The user will hear the message "Enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "Enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 matrix, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

To calculate the characteristic polynomial of a matrix using option B, a matrix must be previously entered. Below are the instructions for calculating

the characteristic polynomial of the matrix M (previously entered):

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate the algebra menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Characteristic Polynomial" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the matrix."

- Enter the name of the matrix (in this case M) and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed

in the Casvi system editor.

2.4.5 Determinant

Calculates the determinant of a matrix. Below are the instructions for calculating the determinant of a 2x2 matrix:

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Determinant" option and press "Enter." The user will hear the message "enter the matrix."

- Press "Alt + m" or "Alt + M" to activate the "Insert Matrix" function. The user will hear the message "enter the matrix name."

- Enter the matrix name and press "Tab." The user will hear the message "enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 matrix, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

To calculate the determinant of a matrix using option B, a matrix must be previously entered. Below are the instructions for calculating the determinant of the matrix M (previously entered):

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Determinant" option and press the "Enter" key. The user will hear the message "Enter the matrix."

- Enter the name of the matrix (in this case, M) and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed

in the Casvi system editor.

2.4.6 Eigenvalues

Calculate the eigenvalues of a matrix. Below are the instructions for calculating the eigenvalues of a 2x2 matrix:

Option A

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Eigenvalues" option and press the "Enter" key. The user will hear the message "enter the matrix."

- Press "Alt + m" or "Alt + M" to activate the "Insert Matrix" function. The user will hear the message "enter the matrix name."

- Enter the matrix name and press "Tab." The user will hear the message "enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "enter the elements of the 2x2 array, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2." - Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. The results will also be displayed in the Casvi system editor.

To calculate the eigenvalues of a matrix using option B, a matrix must be previously entered. Below are the instructions for calculating the eigenvalues

of the matrix M (previously entered):

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Eigenvalues" option and press "Enter." The user will hear the message "Enter matrix."

- Enter the name of the matrix (in this case, M) and press "Enter." The user will automatically hear the result obtained. The results will also be displayed

in the Casvi system editor.

2.4.7 Autovectors

Calculates the autovectors of a matrix. Below are the instructions for calculating the eigenvectors of a 2x2 matrix:

Option A

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate through the algebra menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Autovectors" option and press "Enter." The user will hear the message "enter the matrix."

- Press "Alt + m" or "Alt + M" keys to activate the "Insert Matrix" function. The user will hear the message "enter the matrix name."

- Enter the matrix name and press "Tab." The user will hear the message "enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 matrix, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

To calculate the eigenvectors of a matrix using option B, a matrix must be previously entered. Below are the instructions for calculating the eigenvectors

of the matrix M (previously entered):

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Auto vectors" option and press "Enter." The user will hear the message "enter matrix."

- Enter the name of the matrix (in this case, M) and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed

in the Casvi system editor.

2.4.8 Adjoint Matrix

Returns the adjoint of a matrix. Below are the instructions for calculating the adjoint matrix of a 2x2 matrix:

Option A

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options. - Select the "Adjoint Matrix" option and press "Enter." The user will hear the message "Enter the matrix."

- Press "Alt + m" or "Alt + M" to activate the "Insert Matrix" function. The user will hear the message "Enter the name of the matrix."

- Enter the name of the matrix and press "Tab." The user will hear the message "Enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "Enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 matrix, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "Row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "Row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

To calculate the adjoint matrix of a matrix using option B, a matrix must be previously entered. Below are the instructions for calculating the adjoint matrix

of the matrix M (previously entered):

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J."

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Adjoint Matrix" option and press "Enter." The user will hear the message "Enter matrix."

- Enter the name of the matrix (in this case, M) and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed

in the Casvi system editor.

2.4.9 Transpose Matrix

Returns the transpose of a matrix. Below are the instructions for calculating the transpose of a 2x2 matrix:

Option A

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate through the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Transpose Matrix" option and press "Enter." The user will hear the message "enter the matrix."

- Press "Alt + m" or "Alt + M" keys to activate the "Insert Matrix" function. The user will hear the message "enter the matrix name."

- Enter the matrix name and press "Tab." The user will hear the message "enter the number of rows."

- Enter the number of rows and press "Tab." The user will hear the message "enter the number of columns."

- Enter the number of columns and press "Enter." The user will hear the message "Enter the elements of the 2x2 matrix, row 1, column 1."

- Enter the first element of the matrix and press "Tab." The user will hear the message "row 1, column 2."

- Enter the second element of the matrix and press "Tab." The user will hear the message "row 2, column 1."

- Enter the third element of the matrix and press "Tab." The user will hear the message "row 2, column 2."

- Enter the fourth element of the matrix and press "Enter." The user will hear the message "Enter matrix."

- Finally, press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

To calculate the transpose of a matrix using option B, a matrix must be previously entered. Below are the instructions for calculating the transpose of the matrix M (previously entered):

Option B

- Open the algebra menu. Press "Alt + j" or "Alt + J" keys.

- Navigate the algebra menu. Press the up and down arrows to scroll through the menu options.

- Select the "Transpose matrix" option and press "Enter." The user will hear the message "enter matrix."

- Enter the name of the matrix (in this case M) and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed

in the Casvi system editor.

2.5 Calculus Menu

Allows the user to perform advanced mathematical operations, such as determining the LaPlace transform of a function, developing a Taylor series, or performing

differential and integral calculus operations on one variable. To enter the calculus menu, press "Alt + f" or "Alt + F."

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message to the user.

2.5.1 Integrate

Calculates the integral of an expression with respect to the variable of integration. This integration is undefined, meaning you should not enter limits of integration.

To perform this mathematical operation, the user should follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate the calculation menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Integrate" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.2 Definite Integration

Calculates the integration of an expression with respect to the variable of integration. This integration is definite, meaning you must enter limits of integration.

To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Definite Integration" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the lower limit."

- Enter the lower limit and press "Tab." The user will hear the message "Enter the upper limit."

- Enter the upper limit and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.3 Derivation

Returns the derivative of an expression with respect to the variable. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Derivation" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.4 Find Limit

Calculates the limit of an expression as the real variable "x" approaches the defined value. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Find Limit" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the point."

- Enter the point and press "Tab." The user will hear the message "Enter the direction."

- Enter the direction and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.5 Get Taylor Series

Calculates approximations of the function through a power series or the sum of integer powers. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Get Taylor Series" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the point."

- Enter the point and press "Tab." The user will hear the message "Enter the maximum degree."

- Enter the maximum degree and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.5.6 Calculate Sum

Calculates the sum of an expression or function within a range of values. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Calculate Sum" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter from."

- Enter "from" and press "Tab." The user will hear the message "Enter to."

- Enter "to" and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.5.7 Calculate Product

Calculates the product of an expression or function within a range of values. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F".

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Calculate Product" option and press "Enter". The user will hear the message "Enter the variable".

- Enter the variable and press "Tab". The user will hear the message "Enter from".

- Enter "from" and press "Tab". The user will hear the message "Enter to".

- Enter "to" and press "Tab". The user will hear the message "Enter the expression".

- Enter the expression and press "Enter". The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.5.8 Laplace Transform

Calculates the Laplace transform of an expression based on the time variable t to a new expression based on the frequency variable s. To perform

this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Laplace Transform" option and press "Enter." The user will hear the message "Enter the old variable."

- Enter the old variable and press "Tab." The user will hear the message "Enter the new variable."

- Enter the new variable and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.5.9 Inverse Transform

Calculates the inverse Laplace transform of an expression based on the variable at frequency s to a new expression based on the variable at time t. To perform

this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press the "Alt + f" or "Alt + F" keys.

- Navigate the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Inverse Transform" option and press the "Enter" key. The user will hear the message "Enter the old variable."

- Enter the old variable and press "Tab." The user will hear the message "Enter the new variable."

- Enter the new variable and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.5.10 Greatest Common Divisor

Returns the greatest common divisor of polynomial 1 and polynomial 2. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Greatest Common Divisor" option and press "Enter." The user will hear the message "Enter polynomial 1."

- Enter polynomial 1 and press "Tab." The user will hear the message "Enter polynomial 2."

- Enter polynomial 2 and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.11 Least Common Multiple

Returns the least common divisor of polynomial 1 and polynomial 2. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Least Common Multiple" option and press "Enter." The user will hear the message "Enter polynomial 1."

- Enter polynomial 1 and press "Tab." The user will hear the message "Enter polynomial 2."

- Enter polynomial 2 and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.12 Dividing Polynomials

Divide two input expressions (polynomials) of different degrees. The entered variable must be the same for both mathematical expressions.

To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Divide Polynomials" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter polynomial 1."

- Enter polynomial 1 and press "Tab." The user will hear the message "Enter polynomial 2."

- Enter polynomial 2 and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.5.13 Partial Fractions

Expands the entered expression into partial fractions relative to the main variable. To perform this mathematical operation, the user must follow the instructions below:

- Open the calculation menu. Press "Alt + f" or "Alt + F."

- Navigate through the calculation menu. Press the up and down arrows to scroll through the menu options.

- Select the "Partial Fractions" option and press "Enter." The user will hear the message "Enter the variable."

- Enter the variable and press "Tab." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.6 Simplify Menu

This module helps the user simplify mathematical expressions that initially contain multiple terms or complex expressions into shorter or simplified expressions.

It allows you to factor algebraic expressions. To access the simplify menu, press "Alt + d" or "Alt + D."

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message to the user.

2.6.1 Simplify Expression

Evaluates an expression and returns a simplified expression. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D."

- Navigate the simplify menu. Press the up and down arrow keys to scroll through the options in this menu.

- Select the "Simplify Expression" option and press the "Enter" key. The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.6.2 Simplify Radicals

Simplifies the expression, which can contain logarithms, exponentials, and radicals, converting it to canonical form, meaning that all functionally equivalent expressions

are reduced to a single form. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D."

- Navigate the simplify menu. Press the up and down arrows to scroll through the menu options.

- Select the "Simplify Radicals" option and press "Enter." The user will hear the message "Enter the expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.6.3 Factoring an Expression

Factorize an expression that can contain any number of variables or functions. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D."

- Navigate through the simplify menu. Press the up and down arrows to scroll through the menu options.

- Select the "Factorize expression" option and press "Enter." The user will hear the message "Enter expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.6.4 Complex Factoring

This function is responsible for factoring all types of equations that contain a complex solution. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D" keys.

- Navigate the simplify menu. Press the up and down arrows to scroll through the menu options.

- Select the "Factorize complex" option and press "Enter." The user will hear the message "Enter expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. The results will also be displayed in the Casvi system editor.

2.6.5 Expand Expression

Expand a factored expression. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D" keys.

- Navigate the simplify menu. Press the up and down arrows to scroll through the menu options.

- Select the "Expand expression" option and press "Enter." The user will hear the message "Enter expression."

- Enter the expression and press "Enter." The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.6.6 Contract Logarithms

This function uses logarithmic properties to solve and simplify equations that contain logarithms. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D".

- Navigate the simplify menu. Press the up and down arrows to scroll through the menu options.

- Select the "Contract Logarithms" option and press "Enter". The user will hear the message "Enter the expression".

- Enter the expression and press "Enter". The user will automatically hear the result obtained. Additionally, the results will be displayed in the Casvi system editor.

2.6.7 Trigonometric Simplification

This function uses trigonometric identities to solve and simplify equations. To perform this mathematical operation, the user must follow the instructions below:

- Open the simplify menu. Press "Alt + d" or "Alt + D".

- Navigate through the simplify menu. Press the up and down arrows to scroll through the menu options.

- Select the "Trigonometric Simplification" option and press "Enter". The user will hear the message "Enter the expression".

- Enter the expression and press "Enter". The user will automatically hear the result obtained. Furthermore, the results will be displayed in the Casvi system editor.

2.7 Graphic Menu

This module focuses on the audio presentation of some mathematical functions. Play files without speech that vary over time.

To access the Graphic Menu, press "Alt + g" or "Alt + G".

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message for the user.

2.7.1 Plot 2D

Perform the audio representation of some mathematical functions; interpret the graph of the function on a 2D plane. To use the Plot 2D function, the user must follow

the instructions below:

- Open the graph menu. Press the "Alt + s" or "Alt + S" keys.

- Navigate the graph menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Plot 2D" option. Press the "Enter" key.

- Navigate the screen containing the plotting functions. Press the up and down arrows to scroll through the available functions.

- Select the function (e.g., sin(x)) and press "Enter." The user will hear the audio representation of the selected function.

2.8 Help Menu

Provides the user with information on how each module, submodule, and function of this program works. Here, the user will find general descriptions and examples of the Casvi system. To access the help menu, press "Alt + h" or "Alt + H."

To navigate this interactive menu, you can use the arrow keys or press the letter that begins the name of each of the options available in this menu.

Each option in this menu will play an audio message for the user.

2.8.1 Casvi Help

This option contains five menus: Simplify, Calculation, Graph, Algebra, and Equations. Each menu has descriptions of each of its functions.

To access the Casvi system help, the user must follow the instructions below:

- Open the help menu. Press "Alt + h" or "Alt + H."

- Navigate the help menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Casvi Help" option. Press the "Enter" key.

- Navigate through the help options. Press the up and down arrows to scroll through the available menus.

- Select the menu and press "Enter" to open it.

- Navigate through the menu functions. Press the up and down arrows to scroll through the available functions.

- Select the function and press "Enter" to open it. The user will hear a description of the function.

2.8.2 Examples

Contains examples of mathematical operations that the Mejía system can perform. To access the Casvi system examples, the user must follow the instructions below:

- Open the help menu. Press the "Alt + h" or "Alt + H" keys.

- Navigate through the help menu. Press the up and down arrows to scroll through the options in this menu.

- Select the "Examples" option. Press the "Enter" key.

- Navigate through the example options. Press the up and down arrows to scroll through the available menus.

- Select the menu and press "Enter" to open it.

- Navigate through the menu functions. Press the up and down arrows to scroll through the available functions.

- Select the function and press "Enter" to open it. The user will hear three examples of the selected function.

2.8.3 About

Displays Casvi system information. To access this option, the user must follow the instructions below:

- Open the help menu. Press "Alt + h" or "Alt + H".

- Navigate through the help menu. Press the up and down arrows to scroll through the menu options.

- Select the "About" option and press "Enter". The user will hear Casvi system information.

2.8.4 Tips

Displays Casvi system suggestions. To access this option, the user must follow the instructions below:

- Open the help menu. Press "Alt + h" or "Alt + H."

- Navigate the help menu. Press the up and down arrows to scroll through the menu options.

- Select the "Tips" option and press the "Enter" key. The user will hear suggestions from the Casvi system. To change the suggestion, press "Tab."

3. Special Commands

These commands work with the F1 to F9 keys. Each of these keys performs different functions that can be applied both on the main screen

and on screens generated from the options available in each menu. It should be noted that, once a special command has been activated, it is necessary to press the escape key "Esc" to exit and proceed to enter another command. Each command is described below.

3.1 F1 Command: Playback

This command allows the user to know what they are typing. For example, if you are in the Casvi system editor, pressing this key will explain the line the cursor is on, providing the line number and what is written on it. It also allows you to know the function the cursor is on in the Casvi system menus.

3.2 F2 Command: Arithmetic Operators

Displays the Casvi system arithmetic operators menu.

- Addition +
- Subtraction -
- Multiplication *
- Division /
- Power ^
- Factorial !

Pressing the "Enter" key on any of these operators will insert the selected operator into the command line where the cursor was located.

3.3 Command F3: Mathematical Operations

There are 12 mathematical operations in this menu, which are:

- Square root
- Logarithm
- Logarithm base 2
- Logarithm base 10
- Absolute value
- Sine
- Cosine
- Tangent
- Cotangent
- Secant
- Cosecant
- Exponential function

When any of these mathematical operations is selected, a window will appear where the argument of the selected function must be entered,

as appropriate. Once the argument has been entered correctly, press the "Enter" key. The new expression will be added where

the cursor was.

3.4 Command F4: Special Constants

This menu contains five special constants that can be used by the Casvi system: 0, pi, e, infinity, and -infinity.

3.5 Command F5: Expressions

There are expressions stored in the Casvi system. They can be edited in the console after being selected. Some of the stored expressions are as follows:

- sin(x)
- cos(x)
- tan(x)
- sec(x)
- cot(x)
- x*sin(x)^2
- sin(x)*cos(x)
- x^2*cos(x)
- sec(x^3)
- log(5x+7)
- 1/x

3.6 Command F6: Stored Variables

This command allows you to view the stored variables. To use a variable, press the "Enter" key on one of them.

The variable will be inserted where the cursor was. To assign a value or expression to a variable, follow these steps:

- Type the variable name, which can be a word or a letter. The name should be followed by " : ".

- Then, type the expression you want to assign to the variable.

- Finally, press "Enter" to store the variable.

3.7 Command F7: Results

Pressing this key opens a new window where you will find all the results obtained from the operations performed by the Casvi system.

3.8 Command F8: Transformations

Pressing this key will display a menu called Transformations, from which you can select two options. The first option transforms values

in radians to degrees, and the second option performs the reverse process. To use it, simply press "Enter" on the transformation option you want to perform.

Next, another box will open in which you must enter the value to be transformed, then press "Enter." The result will be displayed on the screen.

3.9 Command F9: Fraction

This command allows you to enter a fraction.

3.10 Additional Commands

3.10.1 % Command

This command displays the result of the last operation performed.

3.10.2 Command :

This command allows you to assign a value to a variable. A variable name always begins with a letter and can contain both letters and numbers.