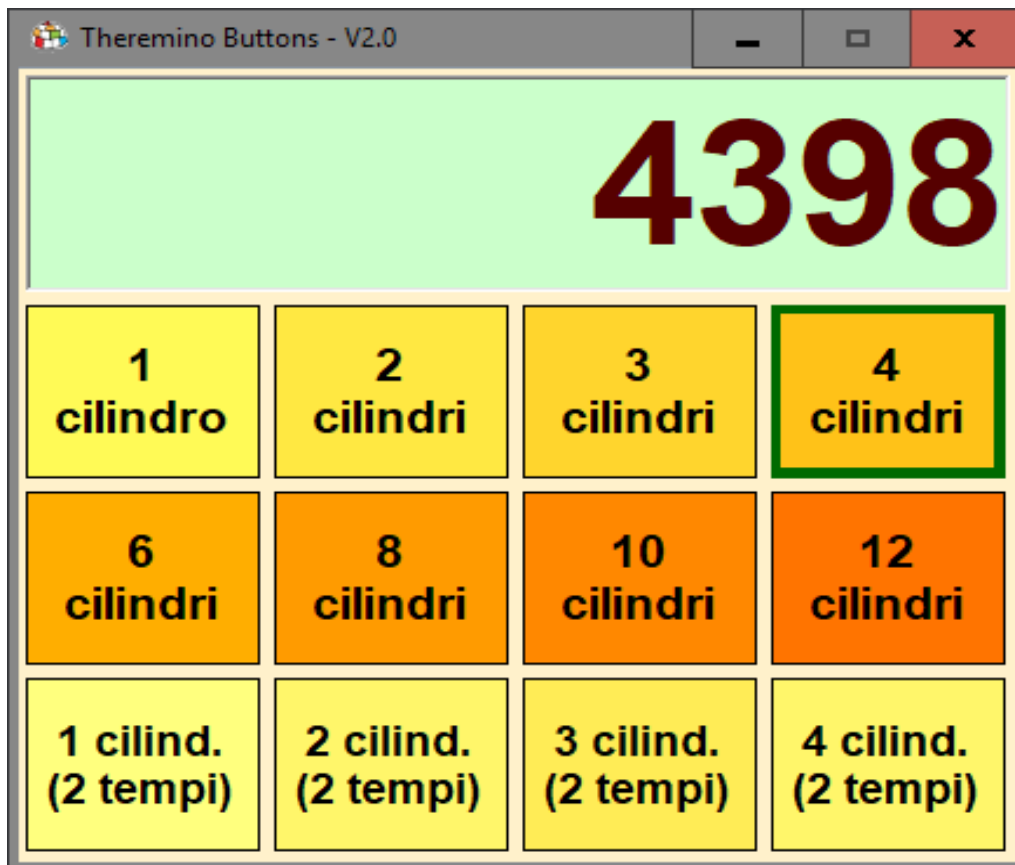Theremino **System**

Theremino Buttons V2.x

The "Buttons" application

This application is the fastest method provided by the Theremino system to create control panels for use with the mouse or the Touch Screen.

You do not need to know a programming language, just write the text to appear on the buttons and adjust a few options. Anyone can quickly learn how to create new buttons and text boxes. As well as change the color, size, and also arrange the controls to one or more rows and columns.
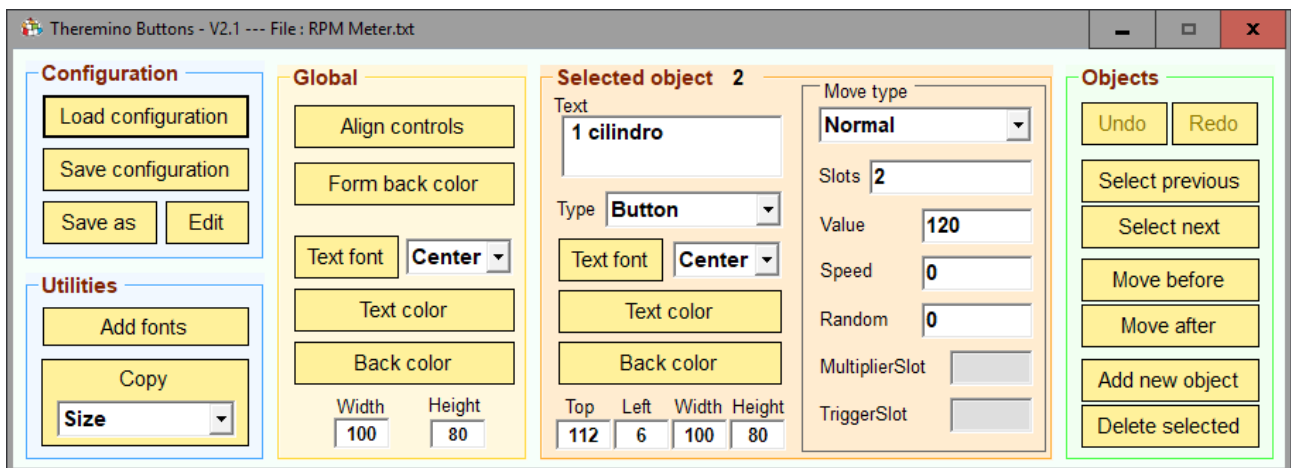
Here are some examples of panels that can be created.
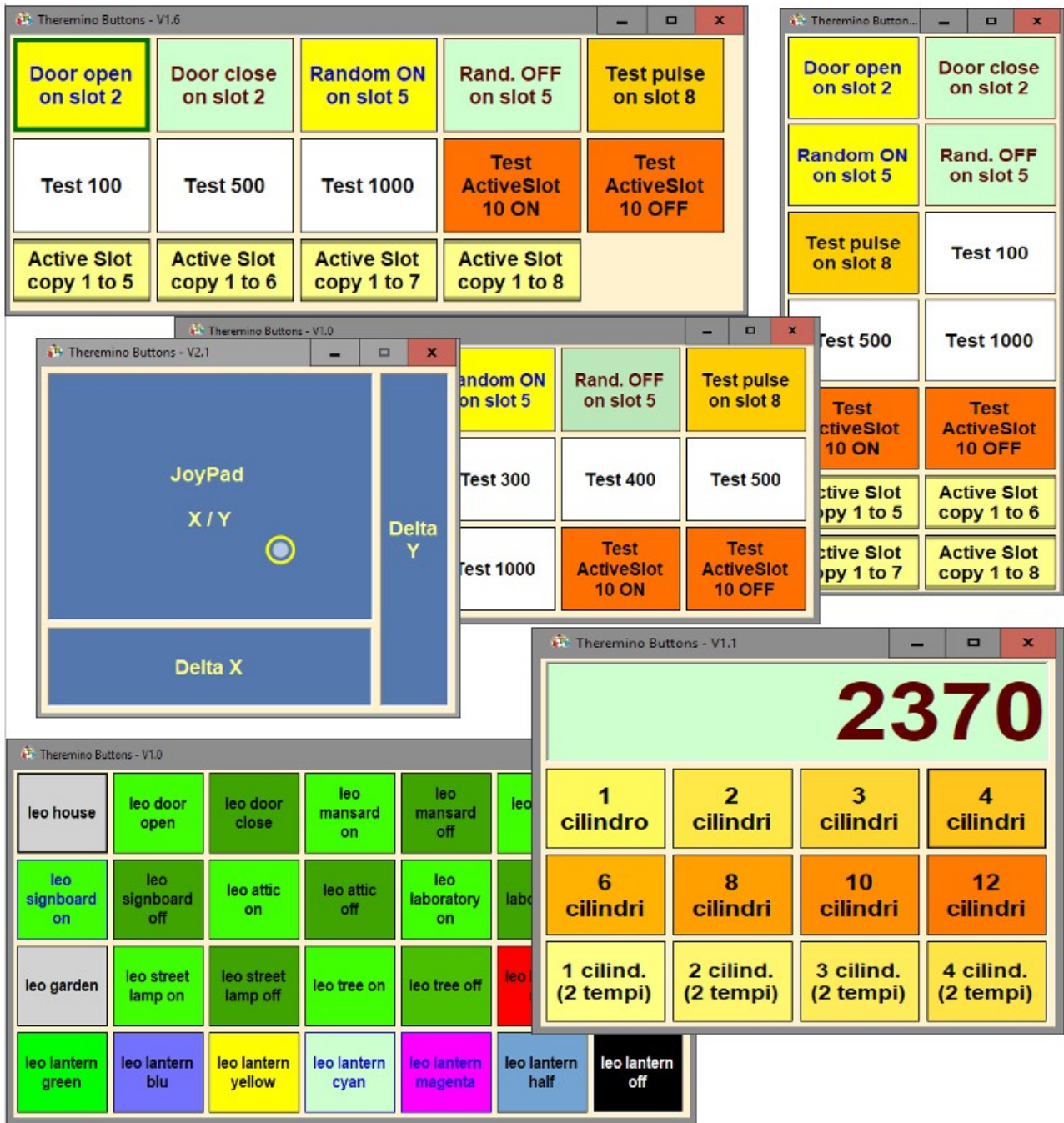
Modify controls

To modify the controls hold down the CTRL key on the keyboard, and click the left mouse button on a button or on a free zone.

CTRL + click opens this window (which we will explain in the following pages).

With this window commands you change the controls, the display text, the colors and the read-write properties of the Slot signals. Then you dispose the controls and create new controls and delete them.

When this window is open, you can resize the main window. This way you can rearrange the controls on more rows or columns.

Once closed this window, the main window will not be sizable.

The following pages discuss the "Buttons", "Text boxes" and "Active slots". Sometimes we call them with the collective name "Controls".

First experiments

Experiment without worry, all changes are temporary. They also remember the next restart of the application, but do not modify the sample configurations that are stored in the "Configurations" folder.

To eliminate what has been done and restore one of the examples, simply press the "Load" button, do not save e and reload the configuration.
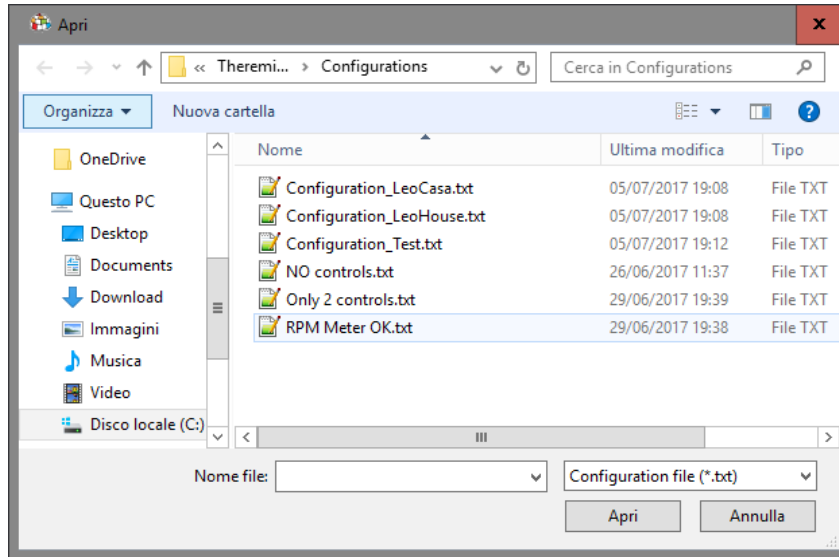
After some time you will start to become familiar and you will want to save your own creations. In this case you press "Save" and you will use a new name or overwrite the example configuration.
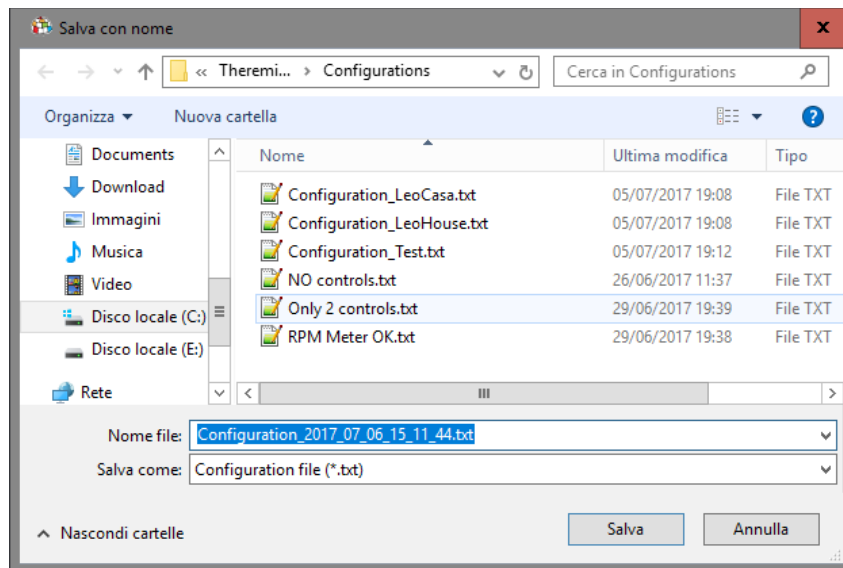
In case you overwrite the example configurations for error, the you can go to recover from folder called "Configurations - Backup".

The control types

In the future perhaps we add other controls but currently they are only four:
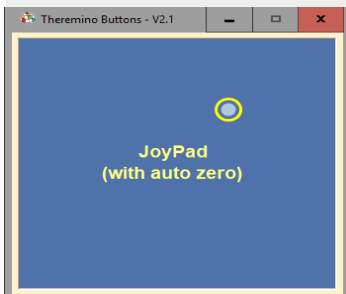
1) Button

You press them with the mouse left button (or by touching the screen) and set the "Value" in the selected "Slot".
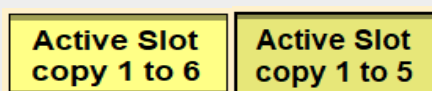
2) TextBox

They show the value read by the selected Slot.

3) JoyPad

They control X/Y movements or the left and right motor of the three-wheeled or tracked vehicles.

4) ActiveSlot

They write in a Slot based on the value read from another Slot. No need to press them or even that they are visible. So they usually keep them until last and narrows the window to not show them.

The next pages will explain what you can do with each of these controls.

The "Button" control
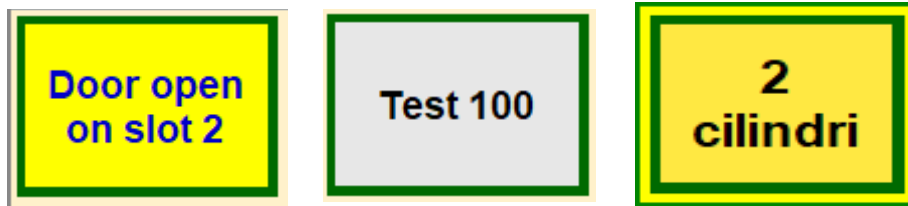
The "Button" when clicked with the mouse or pressing the touch-screen set a value in one Slot.

Each "Button" has five main properties:

- **Slots** - A number from 0 to 999 that specifies the Slot to write on. You can also specify more Slots by writing their separated numbers with a space.

- **Value** - Any negative or positive number. The number can be an integer from less than sixteen million to over sixteen million or with decimals -3.4028235E+38 to +3.4028235E+38.

- **Speed** - The rate at which the value of the Slot has to change from the current value to the final value. Normally they use speed from 10 to 1000. If the "Speed" is zero, then the speed is considered to be infinite and the final value is set immediately.

- **Random** - Amount of random variation. If "Random" is active (non-zero) then "Speed" adjusts the speed of the random variation. This parameter can be used for special lighting effects, for example to the flicker of an LED light to simulate a flame.

- **Move type**
  Choosing **Partial** the movement is interrupted releasing the button and restarts pressing it. Choosing **Pulse** the final value is set for the "Speed" time in milliseconds, and immediately after the Slot is reset to zero. If "Speed" is equal to zero then the value is retained until the button is released (warning this behavior has changed from version 2.2 onwards, so if you need a pulse you must set "Speed" with a non-zero value).

The "Button" also have the display properties (Text / TextAlign / TextFont / TextColor / BackColor / Width / height) with which it determines their appearance, colors and sizes. For information about these properties read pages "*Global Panel*" and "*Selected object panel*".

The "TextBox" control

The "TextBox" read the value from a Slot and present it.


Each "TextBox" has four main properties:

- ◆ **Move type** - In the TextBox this control is always "Normal".

- ◆ **Slots** - A number from 0 to 999 that specifies the Slot to write on. You can also specify more Slots by writing their separated numbers with a space.

- ◆ **Speed** - The rate at which the value is updated. At low speeds, the measured value is more stable because it is made the average among many consecutive values. Normally they use speed from 10 to 1000. If the "Speed" is zero, then the speed is considered to be infinite and the average is not performed.

- ◆ **Multiplier Slots** - A number from 0 to 999 that specifies the Slot from which to read the multiplication factor. The displayed value is pre-multiplied by this factor.
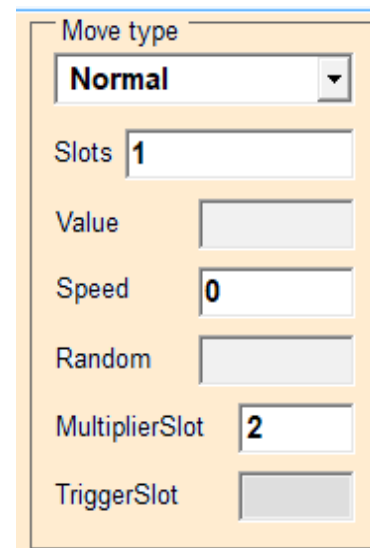
Important: If you set the "-1" value to "Multiplier Slot", or if the slots indicated by "Multiplier Slot" contain zero, then the text box displays the text that was written in the "Text" property.

The "TextBox" also have the display properties (Text / TextAlign / TextFont / TextColor / BackColor / Width / Height) with which it determines their appearance, colors and sizes. For information about these properties read pages "*Global Panel*" and "*SelectedObject Panel*".

The "JoyPad" control
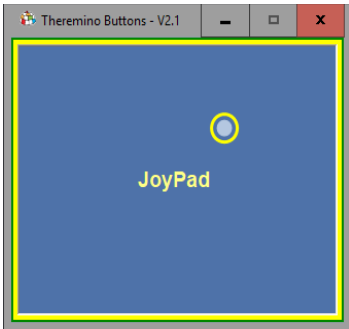
This control has many uses. You can drive vehicles, move robotic arms, slewing cameras or adjust servo positions.

We worked a lot on those controls to make them work well with both the mouse and the touch screen. You can then use them also on a tablet, even without changing the right button options, and even turning the tablet vertically.

An approximately square shape is suitable to control two axes (two motors or servo-controls). Otherwise stretching controls vertically or horizontally you get the sliders.

In this image you see three controls, one X/Y and two sliders. But on the same page you can create at will, and can act in many ways, even on the same Slot. So you can control the same mechanisms, in more ways than one, for added convenience.

Depending on the chosed "Move type" the operation changes.

The modes that begin with "Joy" are used to drive vehicles with two drive wheels and a free wheel, or to drive two tracks vehicles. The movement options are explained in the next page.

The "Freq" and "Counter" modes stabilize the speed of the motors by means of two additional slots (one for each motor) that must be configured in the HAL as counter with frequency or simple counter.

The X/Y modes serve to drive vehicles with steering wheels. Moving horizontally you steer, and moving vertically you get power, forward or in reverse.

For the horizontal cursors you use the X/Y mode and send only the X writing only the first slot. For vertical sliders you write "-1" for the first slot and then a space and the slot number for the Y (for example, "-1 6").

All modes can have the "Auto zero" option, in some abbreviated to "Auto". This option stops the vehicle immediately if you detach your finger from the tablet or if you release the mouse button.
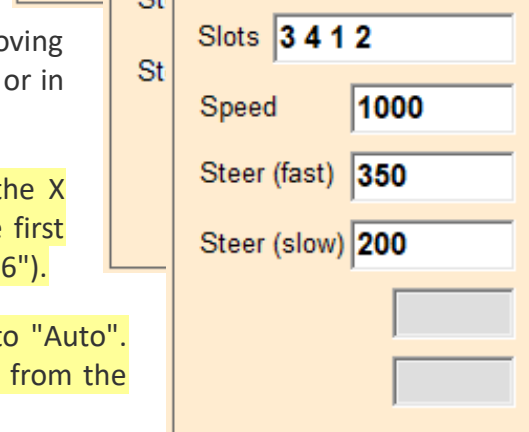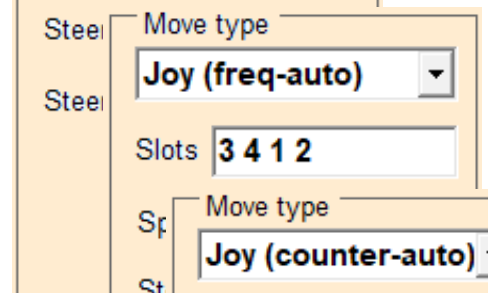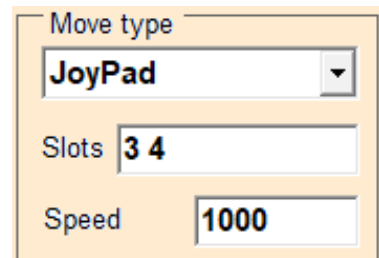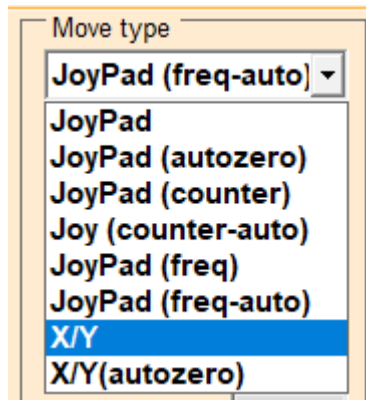
The "JoyPad" Control - Parameters

The type X/Y acts on two axes independent between them. In the Slots box you set up two numbers to indicate the slot on which to write the X and the Y values. You can therefore control a pointing device, for example a camera, or drive a vehicle with steering wheels.

Moving in the horizontal (X) will emit values ranging from 0 to 1000. The central location send the value 500, which, in the case of a vehicle with steerable wheels, indicates to go straight.

Moving in vertical (Y) you output values from 0 to 1000. By moving the bottom you have the value 0 and at the top the value 1000, which in the case of a vehicle, represent the maximum speed backward and forward.

All Joy modes (no XY) They are for vehicles with two motors connected to left and right wheels or tracks. Giving more power to the right motor you turn to the left and vice versa. In the "Slots" box you specify the Slots of the drivers for the left and right motors.

With **Speed** you set the speed of movement back and forth.

With **Steer (fast)** you set for the amount of steering when the vehicle is moving fast (normal values around 300..500).

With **Steer (slow)** you set for the amount of steering when the vehicle moves slowly (normal values around 300..500).

The Joy types with "freq" stabilize the motor speed by reading a frequency that indicates the speed of rotation.
Since you have to read a frequency for each of the two motors, we will have to indicate two additional slots in the Slots box. In the case that you see here on the left, the Slot 3 and 4 are the left and right engine, and the Slots 1 and 2 are the counters of the left and right motors.

The Joy types with "counter" stabilize the motor speed by reading a counter, from which is derived the speed of rotation. Since you have to read a counter for each of the two motors, we will have to indicate two additional slots in the Slots box. In the case that you see here on the left, the Slot 3 and 4 are the left and right engine, and the Slots 1 and 2 are the counters of the left and right motors.

More details on the "counter" and "freq" types in the file "SimpleRover" that you download from *this page*.
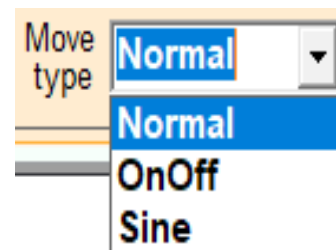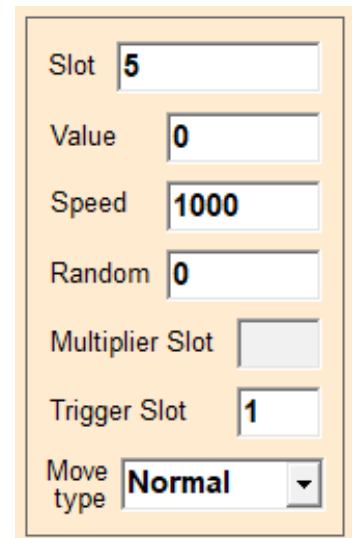
The "ActiveSlot" control

The "ActiveSlot" buttons are not acting pressing them, but which are activated by the values read from a Slot called "Trigger".
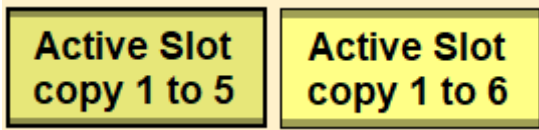
Each "ActiveSlot" has six main properties:

- 🔸 **Slots** - A number from 0 to 999 that specifies the Slot to write on. You can also specify more Slots by writing their separated numbers with a space.

- 🔸 **Value** - Any negative or positive number. The number can be an integer from less than sixteen million to over sixteen million or with decimals -3.4028235E+38 to +3.4028235E+38.

- 🔸 **Speed** - The rate at which the value is updated. At low speeds, the measured value is more stable because it is made the average among many consecutive values. Normally you use speed from 10 to 1000. If the "Speed" is zero, then the speed is considered to be infinite.

- 🔸 **Random** - Amount of random variation. If "Random" is active (non-zero), then Speed adjusts the speed of the random variation. This parameter can be used for special lighting effects, for example to the flicker of an LED light to simulate a flame.

- 🔸 **Trigger Slot** - A number from 0 to 999 that specifies the Slot from which to read the input value. To get a Sine non dependent from a Slot set "Trigger Slot" to "-1".

- 🔸 **Move type**
  Choosing **Normal** the value of the Slot "Trigger" is copied into the output Slot (naturally also taking into account of Speed and Random).
  Choosing **OnOff** if the Slot "Trigger" exceeds 500 then the "Value" is set in output, otherwise it is set to a zero.
  Choosing **Sine** a sine wave is generated from zero to "Value". If the "Trigger" Slot has value "-1" then the output is always active and "Speed" controls the frequency. With the value "0" the output is stopped. With positive values "Trigger" control the frequency 1 = slow, 1000 = very fast.

The "ActiveSlot" also have the display properties (Text / TextFont / TextColor / BackColor / Width / height) with which it determines their appearance, colors and sizes. For information about these properties read pages "*Global Panel*" and "*SelectedObject Panel*".

Arrange the controls

To move controls, the property window must be open.
It opens with CTRL + Click or with Double-click on a area free from controls.
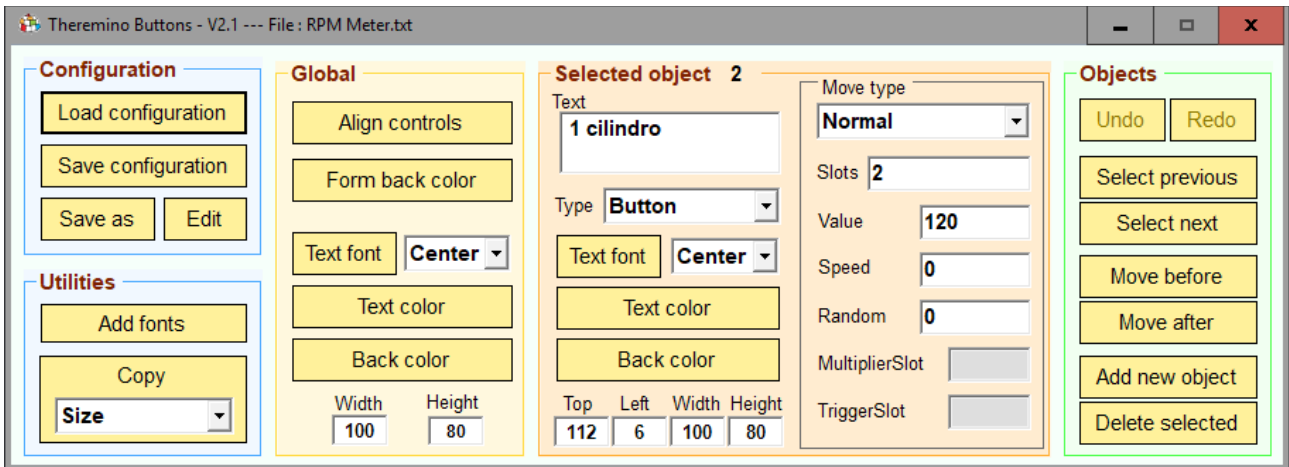
To move a control

- ◆ Select the desired control with a click.
- ◆ Modify "Top" and "Left" in the "Selected object" panel.
- ◆ Otherwise use keyboard arrows.
- ◆ Otherwise press CTRL and the left mouse button on the control and move it.

To resize a control

- ◆ Select the desired control with a click.
- ◆ Modify "Width" e "Height" in the "Selected object" panel.
- ◆ Otherwise press SHIFT and use keyboard arrows.
- ◆ Otherwise press SHIFT and the left mouse button on the control and resize it.
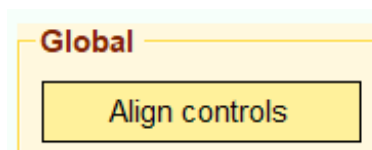

After arranging manually the controls, you can use the "Align controls" button to refine the alignment.

If you do not get the desired effect with AlignControls, it may be helpful to press it again, or improve the manual alignment and then press it again.

You can also manually resize the main window by dragging it from one of the edges or from one corner. Or use the "Align controls" button that automatically minimizes it.
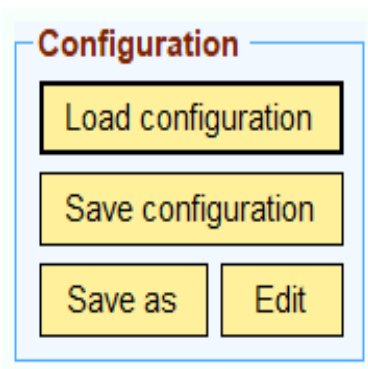
The properties window

The properties are divided into panels with different colors.
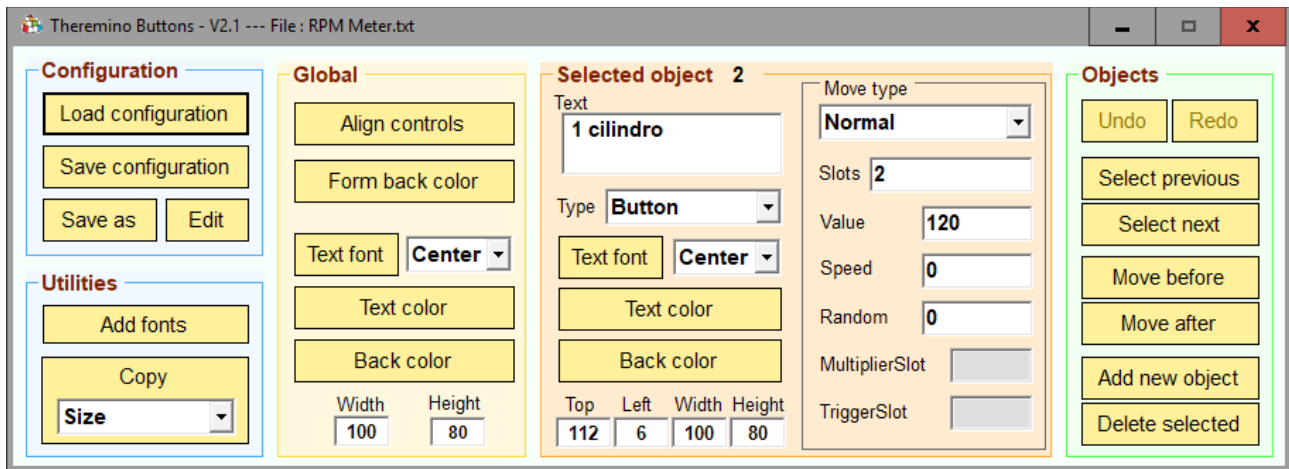
In the following chapters are explained one by one the panels and their commands.

"Configuration" panel

This panel includes the controls to read, write and edit configurations.

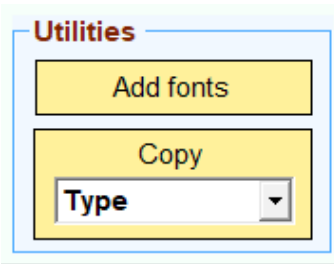**Load configuration** - Load a configuration.

Save configuration - Save the current configuration.

Save as - Save the current configuration with a new name.

Edit - Opens the configuration in NotePad
(see: *Edit the configuration file*).

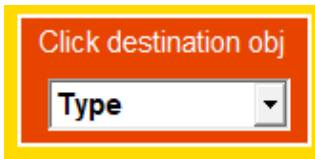# "Utilities" panel

This panel currently contains two commands.

Add fonts - Adds the "7-segment" characters if they are not already in the system.

Copy- This is a very useful button. It allows you to quickly copy the selected control properties to other controls. If you use it well can save you considerable time. See *this page*.

But be careful not to make mistakes. This button is as powerful as a bazooka. So it is good to remember to turn it off as soon as you finish using it.

"Global" panel

This panel includes the commands that act "globally". All controls will have these colors and sizes unless you change them individually.
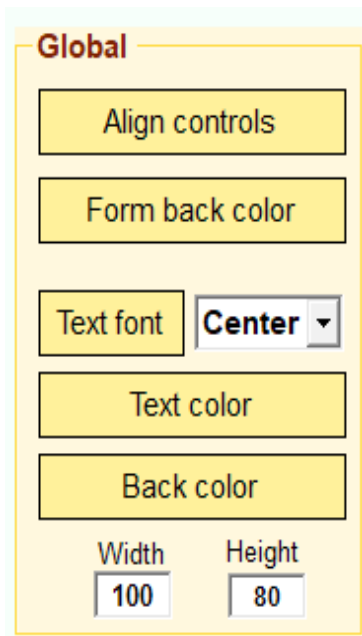
Align controls - Automatic controls arrangement. See *this page*.

Form back color - Use this button to change the background color of the main window.

Text fonts - The font and size to use for text.

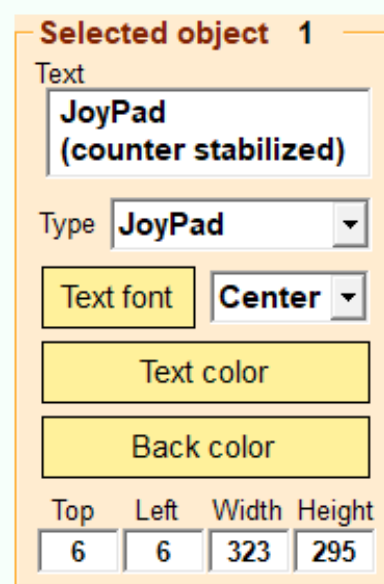**Center** - The text alignment (could be also Left or Right).

Text color - The text color of the controls.

Back color - The background color of the controls.

Width and height - Size of controls in pixels.

"Selected object" panel

This panel includes the controls to change the selected object (see *This Page*).

Selected object - The number indicates the selected control.

Text - The text that appears on the control.

Type - The type "Button", "TextBox" or "ActiveSlot".
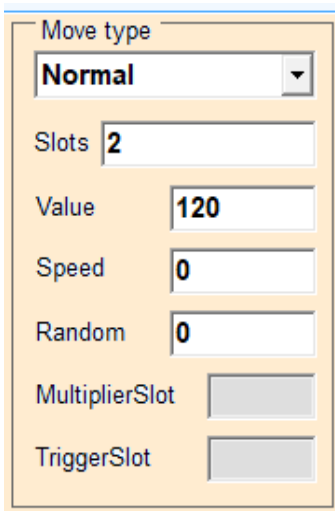
Text fonts - The font used for text.

Center - The text alignment (could be also Left or Right).

Text color - The text color.

back color - The background color.

Width and height - Size of controls in pixels.

In the TextBox it is possible to add spaces and also to force a line feed pressing ENTER.

The "Selected objects" panel also contains these controls, which determine how to write and read the Slot values.

The basic behavior of a button is to write the value specified in the "Value" in the Slot specified by "Slot."

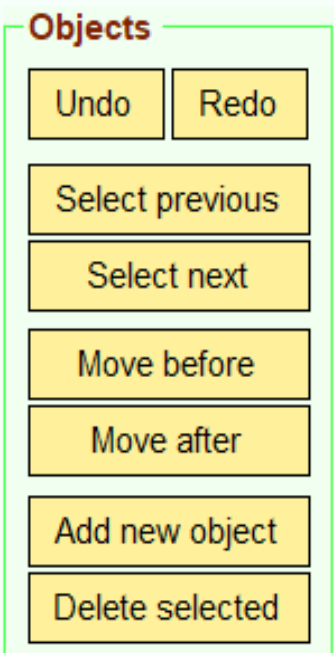Further details are explained in specific controls:
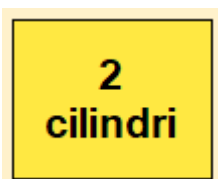*Button*
TextBox
JoyPad
Active Slot

"Objects" panel

This panel includes the controls to select, rearrange, create and delete controls.

Undo - Undo the last change.
Redo - Redo the last change.

Select previous - the previous control is selected.
Select next - the next control is selected.

Move before - The selected control is moved before.
Move after - The selected control is moved after.

Add new object - Creates a new control.
Delete selected - The selected control is deleted.

When you create a new control should start with a check similar to the one you want to create. So before you select a suitable control and then press the "Add new object".

Controls selected
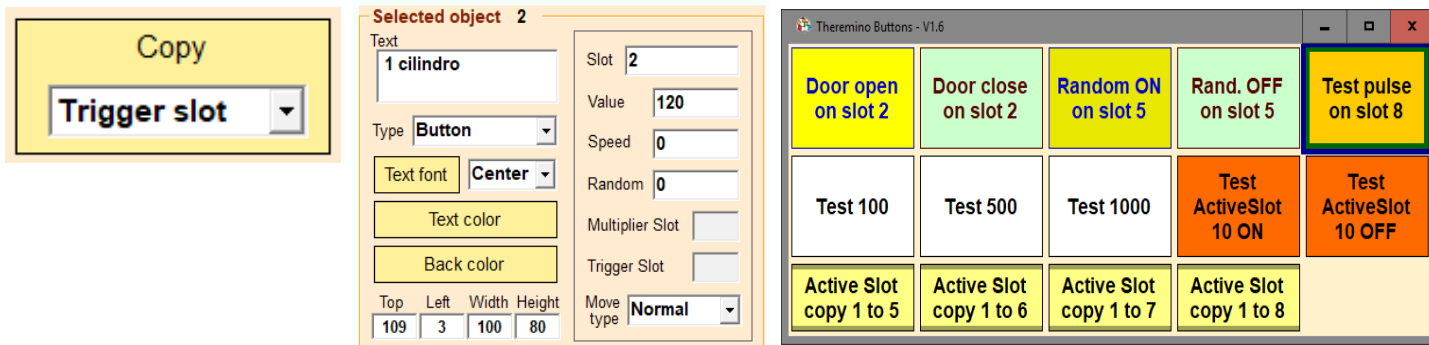
The non-selected controls have the thinnest edge.

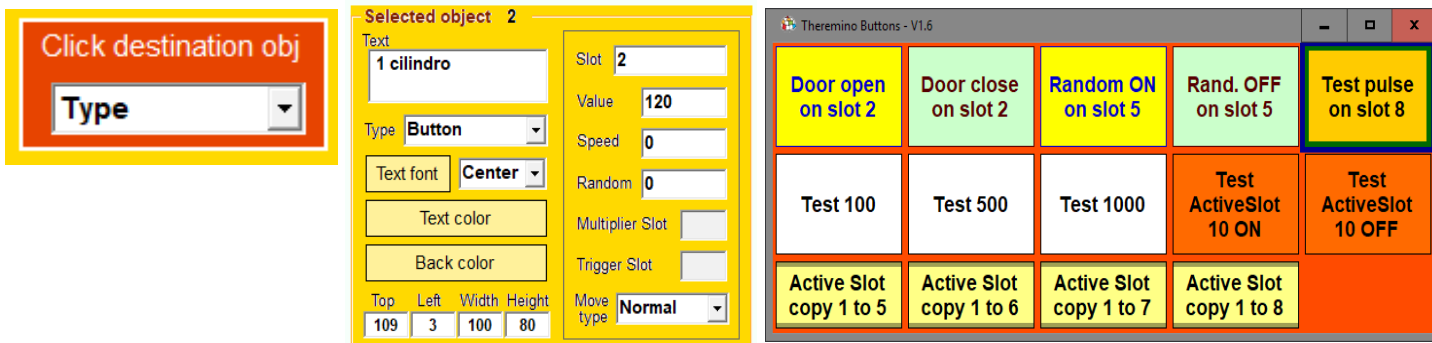The selected controls are highlighted with a thick border.

The selected controls are highlighted with a double border when the Edit window is open.

The "Copy" button

Pressing the "Copy" button ...

... the "Copy" button turns red, the "Selected Object" area turns yellow and the control window turns red.

This makes it obvious that you are copying the same but you can forget about it.
So be careful to disable the button just finished copying.

Until the "Copy" button is on, every click on a control copy of the properties of the selected control (with thick blue border) to the control on which you click.
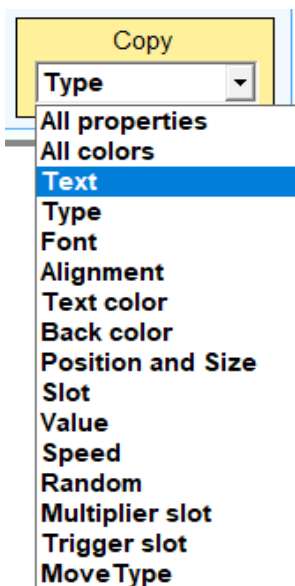
The properties to be copied are established choosing them from the list.

If you choose "All properties" then all the properties are copied.
If you choose "All colors" then all colors are copied.
If you choose "Text" only the text is copied.
If you choose "Type" you copy the type (Button, TextBox or ActiveSlot).
If you choose "Font" then the font of the text is copied.
If you choose "Alignment" then the alignment (Left, Center or Right) is copied.
If you choose "TextColor" or "BackColor" then text color or background is copied.
If you choose "Size" then the size (width and height) is copied.
If you choose "Slot" then you copy only the Slot value.
If you choose "Pulse / OnOff" then only the button state is copied.
If you choose "Value" then you copy only the value that is in the "Value" box.
If you choose "Speed" then you copy only the speed value.
If you choose "Random" then you copy only the random value.
If you choose "Multiplier slot" then you copy only the multiplier-slot value.
If you choose "Trigger slot" then you copy only the trigger-slot value.
If you choose "Move Type" only the movement type is copied.

Edit the configuration file

In some cases it may be preferable to manually edit the configuration file. The file is called "Configuration.txt", is located next to the executable of the application and can be easily opened with the button "Edit configuration" which is seen in *__this chapter__*.

The first few lines specify the general properties of all controls:

```
'============================
'General props
'============================
FormWidth  = 692          ' Width of the main window in pixels.
FormHeight = 292          ' Height of the main window in pixels.
FormColor  = 255 240 200  ' Color: three numbers from 0 to 255, for Red, Green and Blue.
TextFont   = Arial, 14.25pt, style = Bold  ' Type, size and style of text characters.
TextColor  = 000 000 000  ' Color : three numbers from 0 to 255, for Red, Green and Blue.
BackColor  = 255 255 255  ' Color : three numbers from 0 to 255, for Red, Green and Blue.
Width      = 130          ' Width of control, if not specified individually.
Height     = 90           ' altness of the controls, unless specified individually.
```

Then, for each check, there is a part that specifies its properties:

```
'============================
'Controls
'============================
Button        ' The first line indicates the type "Button", "TextBox" or "ActiveSlot".
Slots = 2     ' The Slot on which to write the output value.
Value = 1000  ' The value to be written in the output Slot.
Speed = 5     ' The speed of change from the current value to the final value.
```

Some checks have special properties:

```
Random      = 200   ' Amount of randomness added to the value.
TriggerSlot = 1     ' The Slot from which is read the activation value (ActiveSlots).
```

These properties are explained in specific controls: __Button__, __TextBox__ and __Active Slot__.

All controls can have text, colors and individual dimensions. If you do not specify these properties, the control will have the general properties specified by the general parameters at the beginning of the file:

```
TextFont    = Door open on Slot 2   ' The text to be presented on the control.
TextColor   = 000 000 200           ' The color of the text in the control.
BackColor   = 255 255 000           ' The control background color.
Width       = 180                   ' Width of the control in pixels.
Height      = 60                    ' Height of the control in pixels.
```

These properties are explained in the panel on the page: __"Selected Object"__.

An application example - RpmMeter
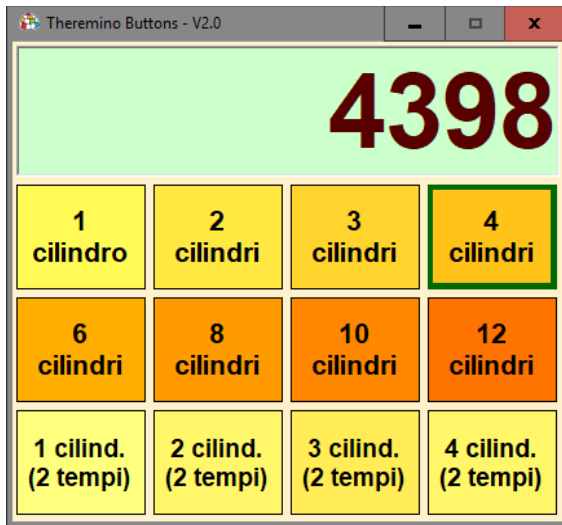
The "guzzj" user of the GRIX site (**www.grix.it**) asked if he could use the theremino system to measure RPMs (revolutions per minute) of internal combustion engines.

We have therefore taken this case as an example to show that you can create simple applications without programming.

The application is functioning and has large buttons that allow you to also use it on a tablet with the touch screen or a mobile phone with Windows

The buttons for the various types of engines have been configured to set multiplication coefficients appropriate to transform the frequency value (in cycles per second) to the RPM (revolutions per minute) value. These coefficients are written in one Slot each time a button is pressed.

The upper text box, which acts as a viewer, has been configured to read the frequency value, multiplying it by the coefficient, and display the final value in revolutions per minute.

When you start the application you have to choose a type of engine otherwise the display always marks zero.

To remind the user, we wrote in the "Text" property the phrase "Motor ?".

This phrase is visible until the Multiplicator Slot contains zero and as soon as you choose an engine it is replaced by the number of revolutions. Learn more about this behavior on the **Textbox control** page.
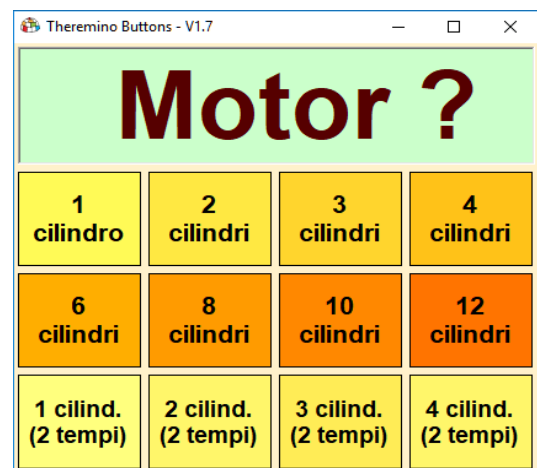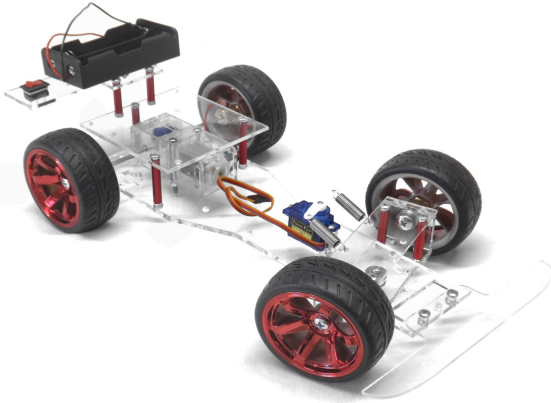
More information about the RpmMeter application in the "RpmMeter_ITA.pdf" file that you download from this page:
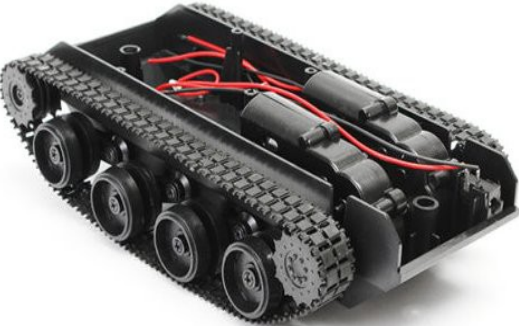
www.theremino.com/downloads/foundations#buttons

An application example - Simple Rover

With the JoyPad control you can control vehicles with steering wheels, or vehicles with two tracks, or even vehicles with two-wheel drive and a free wheel.

Vehicles with steering wheels are the easiest to drive, you set the control as X/Y and go straight.

Even the crawlers go pretty well when they go fast. But at low speeds they tend to turn and you have to correct a lot to make them go straight.
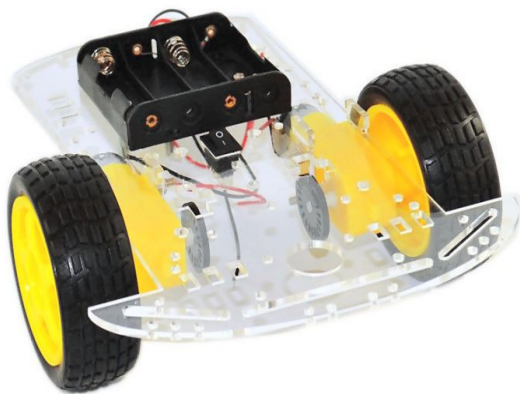
Vehicles with two wheels and a freewheel are the most difficult to control. To make them go straight you need to keep track of the speed of the motors with perforated discs and optical sensors.

This model is very economical and has good motors and even optical discs to control them.

More details on the control of these vehicles in the "SimpleRover.pdf" file that you download from *this page*.