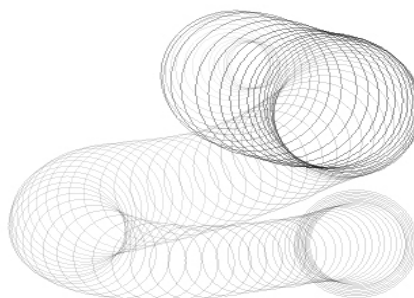# X-MOTION

TUTORIAL

INSTALLATION

This program is compiled to run under Windows 2000/XP Platforms. The system hardware minimum requirements are:

- IBM-compatible computer (586 and above)
- Windows XP
- a hard disk with a minimum of 50 MB free memory
- a video capturing device
- infra-red filtered camera with a back light
- projector
- markers system

After downloading the RAR file containing the program binaries and libraries, you should copy this folder to your program files folder on your computer.

You will find 2 folders: XMotion Capture, related to the capturing process, and XMotion Drawing, related to graphics generation.

capture   exe

Each folder has a bin folder, where the .exe files are located. For XMotion Drawing, besides the .exe, there is also a .bat file, to edit default configurations of background color, window size and full screen option.

In the first tutorial, you will experiment the default style, using only the .exe files to check if the system is properly working. In the second, you will learn how to edit the .bat file and to change graphic parameters, becoming able to create your own visual styles.

drawing   exe

bat
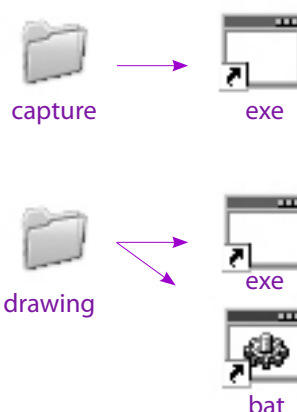
SIMPLE EXAMPLE: RUNNING X-MOTION
Try X-Motion in two different states, making a transition to change from one to another.

1

Turn on the back light of the infra-red camera, and position it to a certain distance of the user (around 2m). This distance can be changed, in a future use, by editing the capturing configurations.
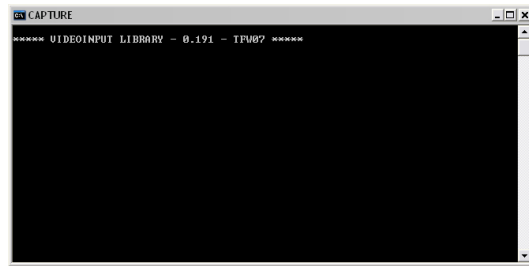

~2m

2

Make sure the camera is not yet capturing the marker. So <u>leave it out of the scene</u> – it can be behind you, or behind an object. You will bring it back after the system is running.
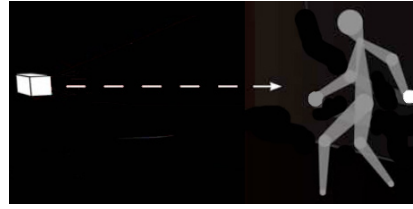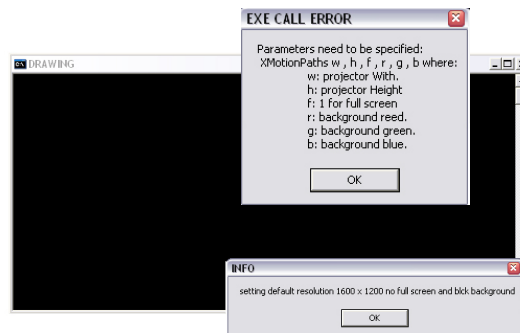

3

Open XMotionCapture.exe.
A small black window will appear.

4

Open XMotionDrawing.exe.
The default parameters need to be confirmed in pop-ups, by clicking 'ok'.
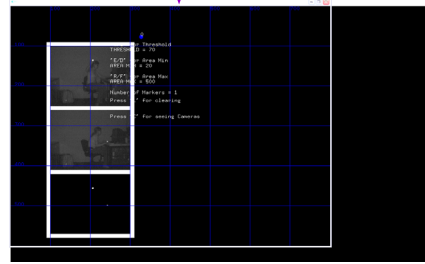

5

Bring the marker back to the scene.

6

Two windows will appear: one, smaller, results from XMotion Capture. It shows three camera views on your left. : you can see the marker being detected. Configuration information (such as threshold) is also shown in this screen.
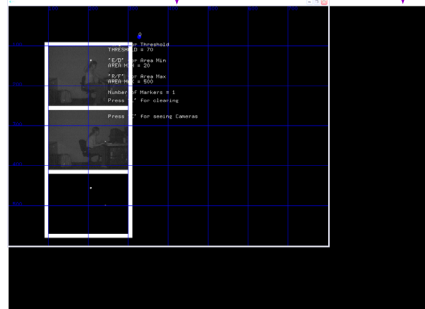
Capture window ↓

7

The other window, larger, is where the graphics will appear as you move the marker. <u>Select this window so you can start drawing.</u>

Capture window ↓   Drawing window ↓

8

The first configured state is a white, filled circle. This circle moves as you move the marker.
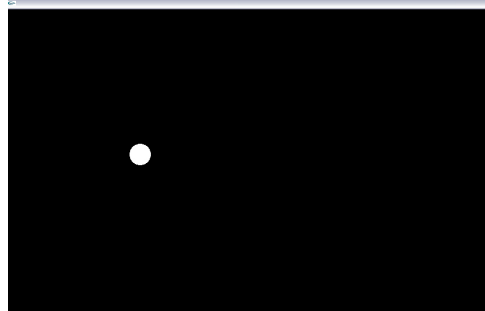
9

After testing this graphic state for a while, you will try the next configured state. Therefore, it is necessary to make a transition action. In this tutorial, the <u>transition type is by keyboard</u>:

- leave the scene (it means, hide the marker so the camera can not see it)
- press 'M' on your keyboard
- bring the marker back to scene, no graphic state will be on
- press 'M' again, and you'll see the second graphic state (a red, filled circle).
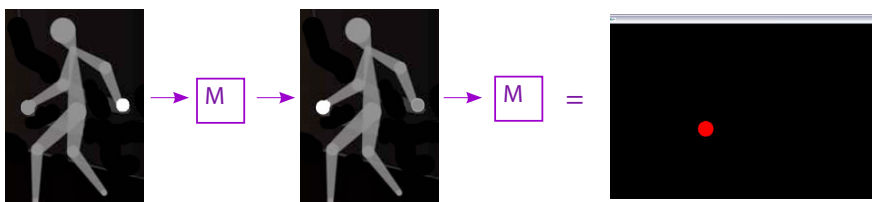
10

To go back to the first state, repeat the same procedure above.

ADVANCED EXAMPLE: EDITING THE GRAPHICS

Edit two graphic states and a transition between them.
There will be changes in the background and window size as well.
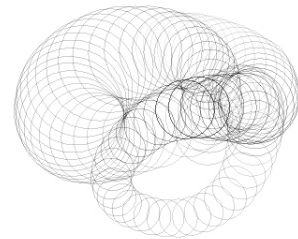
The first graphic element is a group of black circles. They get bigger or smaller according to the vertical position of your marker, and get more or less transparent according to the scalar speed of your movement.

The second graphic element, called 'amoeba', is a line with two small circles, each one located at the limits of this line. The size of this line will change according to the X position. This graphic element will be visible as a group, which will have a wavy movement. The color will gradually change from green to blue, according to scalar speed.
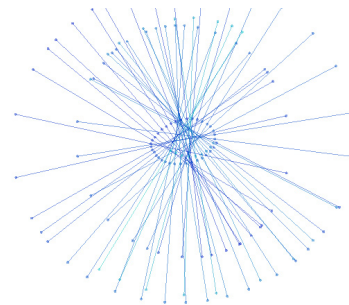
1

Open XMotion Drawing\files\machine00\estado_A.paf, in a text editor or in a specific editing program.
Here you will change the graphic parameters for state A.
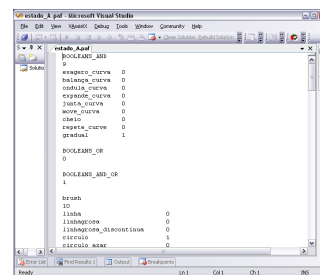
2

The parameters appear in different blocks. Here you will see only the blocks which will be edited; the changes are highlighted.

BOOLEANS_AND
9
exagero_curva   0
balança_curva   0
ondula_curva   0
expande_curva   0
junta_curva   0
move_curva   0
cheio   0 ⟶ From filled (1) to outline (0).
repete_curve   0
gradual   1 ⟶ It keeps initial values,
                        creating gradual sizes for the circles.

It changes the behavior of the basic element (in this case, the circle).
1 is on, 0 is off.
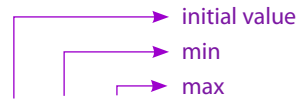More than one can be selected.

⟶ initial value
⟶ min
⟶ max

coor_curva_r   0   0   255
coor_curva_g   0   0   255
coor_curva_b   0   0   255
coor_curva_a   10   10   100

Here you configure the color of the element: R, G and B with initial value = 0 means black.
The alpha values will dynamically change from 10 to 100, as we link them in the LINKEDS parameter .

num_vertices   100   0   10000

This number defines the amount of elements in the screen, at the same time.

LINKEDS
2 ⟶ number of items
radio_circulos
coor_curva_a

LINKEDS_LIST
2
radio_circulos   vertex_position_y
coor_curva_a   vertex_scalar_speed

Here are the graphic parameters which will be linked to curve parameters: element size (circle radius) and transparency (alpha value).

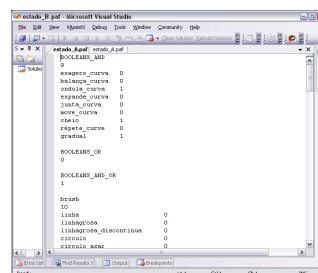At the linkeds list, it is possible to effectively link a graphic to a curve parameter (radius to vertical position, transparency to scalar speed).

3

Open XMotion Drawing\files\machine00\estado_B.paf.

4

It will be the same procedure for state B:

```
BOOLEANS_AND
9
exagero_curva    0
balança_curva    0
ondula_curva     1   ─────────────────────▶   The elements will move in a wavy
expande_curva    0                             way, oscilating their location.
junta_curva      0
move_curva       0
cheio            1
repete_curve     0                             It keeps initial values,
gradual          1   ─────────────────────▶   creating gradual colors and sizes.
```

```
brush
10
linha                    0
linhagrosa               0
linhagrosa_discontinua   0
circulo                  0   ──────────▶   Changing from the element 'circle'
circulo_azar             0                 to the element 'ameba' .
ellipse                  0
poligono                 0
estrelha                 0
ameba                    1
tinta                    0
```

```
INTEGERS
7                    ─────────────▶   The number of items will change
poligon_sides        3    9            from 6 to 7, because:
estrelha_pontas      5    25
ameba_logitude_1  200    50   ───▶   You will include 2 parameters for
ameba_logitude_2  200    50           the longitude of the amoeba, with
ameba_radio_centro   2    6            initial and max. values.
ameba_radio_lados    2    6
discontinuidade      3    10          Radius values will also change.
```

Initial color, predominant blue.

```
coor_curva_r    0     0    255
coor_curva_g   70    10    200   ───▶   Green values will change
coor_curva_b  200     0    255          according to speed, between 10
coor_curva_a  100     0    100          (min) and 200 (max).
```

```
num_vertices   50    0   10000          Amount of elements in the screen.
```

```
LINKEDS
2
ameba_logitude                          Longitude will be linked to the
coor_curva_g                            horizontal position of the marker;
LINKEDS_LIST                            and the green values will change
2                                       according to the scalar speed of
ameba_logitude   vertex_position_x      the movement.
coor_curva_g     vertex_scalar_speed
```

5

Now that the states are configured, it's time to edit the transition action. Open XMotion Drawing\files\machine00\machine00.smf, in a text editor or in a specific editing program. You will change from a keyboard type to a vectorial type. To change from A to B, and vice-versa, it will be configured to go with the marker to a certain position on the window. The position value is in pixels.

```
numberOfTransitions= 2
transition= A_B
        fromState= state_A
        toState= state_B
        numberOfEvents= 1
        type= 1                        ────→   0: scalar, 1: vectorial, 2: keyboard
        parameterName= vertexPosition
        conditionOperator= >    ────→   for x
        conditionOperator= >    ────→   for y    ────→   x > 400
        value= 400              ────→   for x            y > 200
        value= 200              ────→   for y
        numberOfCallBacks= 0
```

```
transition= B_A
        fromState= state_B
        toState= state_A
        numberOfEvents= 1
        type= 1
        parameterName= vertexPosition
        conditionOperator= <    ────→   for x
        conditionOperator= <    ────→   for y    ────→   x < 100
        value= 100              ────→   for x            y < 100
        value= 100              ────→   for y
        numberOfCallBacks= 0
```

6

To conclude this first part of the process, you will edit the .bat file, configuring background color and window size. Click with the right button over XMotionDrawingBlack.bat and change it to:

XMotionDrawing.exe 1024 768   0   255 255 255

window size
full screen
RGB values

7

Now the new configuration is ready. To run the system to try it out, click first at XMotionCapture.exe, and then at XMotionDrawingBlack.bat.
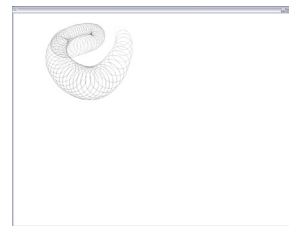
XMotionCapture.exe

XMotionDrawingBlack.bat

8

A smaller, white window will appear, in which you can generate graphics through the marker's movement. The state A will be on scene.

9

To change from state A to B, go with the marker to your bottom-left.

(You have configured, by editing the file machine00. smf, that the state B would appear if the marker would be at least at x=400 and y=200.)
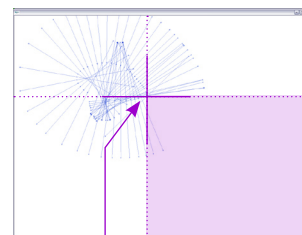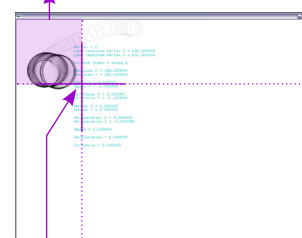
x= 400
y= 200

transition area

10

To change back to A, go with the marker to your upper-right. The marker should be located at most at x and y=100.

If you press Z on your keyboard, you can see specifications of capture while using X-Motion, including X and Y positions. It appears in light green in the screen.

transition area

x= 100
y= 100