

Emonic Environment

Users Guide

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1. What is the Emonic Environment?

The Emonic Environment (EE for short) allows you to create, browse, compose, and exchange audio, video and text in an improvisational manner. It is designed to provide you a new kind of interaction with a computer, one in which the computer takes an active role in determining the content of what is being created. It makes your media look, sound, and behave differently than how it would have if you were the only “decision maker” in its design, who used the computer for no more than executing ideas. In the EE, the computer contributes to the creation process in various ways which will be described later on.

To input media into the EE you can use cell phones, stills cameras, video cameras, and microphones. Controlling the EE can be done using a mouse, keyboard, MIDI controllers, sensors, and cell phones. The operation of the EE, once you get the meaning of different elements, is pretty straightforward: you add, connect, and modify three types of elements: **nodes**, **actions**, and **emons**.



Nodes control the behavior of the emons over time. They relate to emons through Actions, which are commands that you can define on your own, let the computer create for you, or get from other on-line users of the EE.



Emons control the display properties of your media – its looks and sound. There are multiple types of emons, each one is responsible for a particular type of manipulation of what you can hear or see.



Actions are functions that let nodes control emons. Each Action allows modifying one or more of the properties of emons.

In practice, you put together nodes to form a network which we call the *structural network*. You, then, populate it with emons to provide content in the form of audio, video, or text. The physical layout of the structural network and the configuration of its nodes control how the emons behave. In other words, the structural network of interconnected nodes and their Actions control the properties of emons in a similar fashion to the way a sequencer helps you arrange media samples and control their parameters. You can see an example of such a typical EE setup in figure 1 below.

Interconnected nodes communicate within the network by firing stimuli at each at other. Stimuli can be fired in one direction which you define. Once stimulated, a node performs its Action. Nodes can be triggered to fire stimuli in several ways. You can manually activate a node by clicking on it. A node also can be triggered by an outside source such as a sensor or a cell phone, and you can program it to

fire periodically. The more stimuli travel through the network the stronger the effect this network has on emons.

The effect of the structural network on emons is determined by actions.

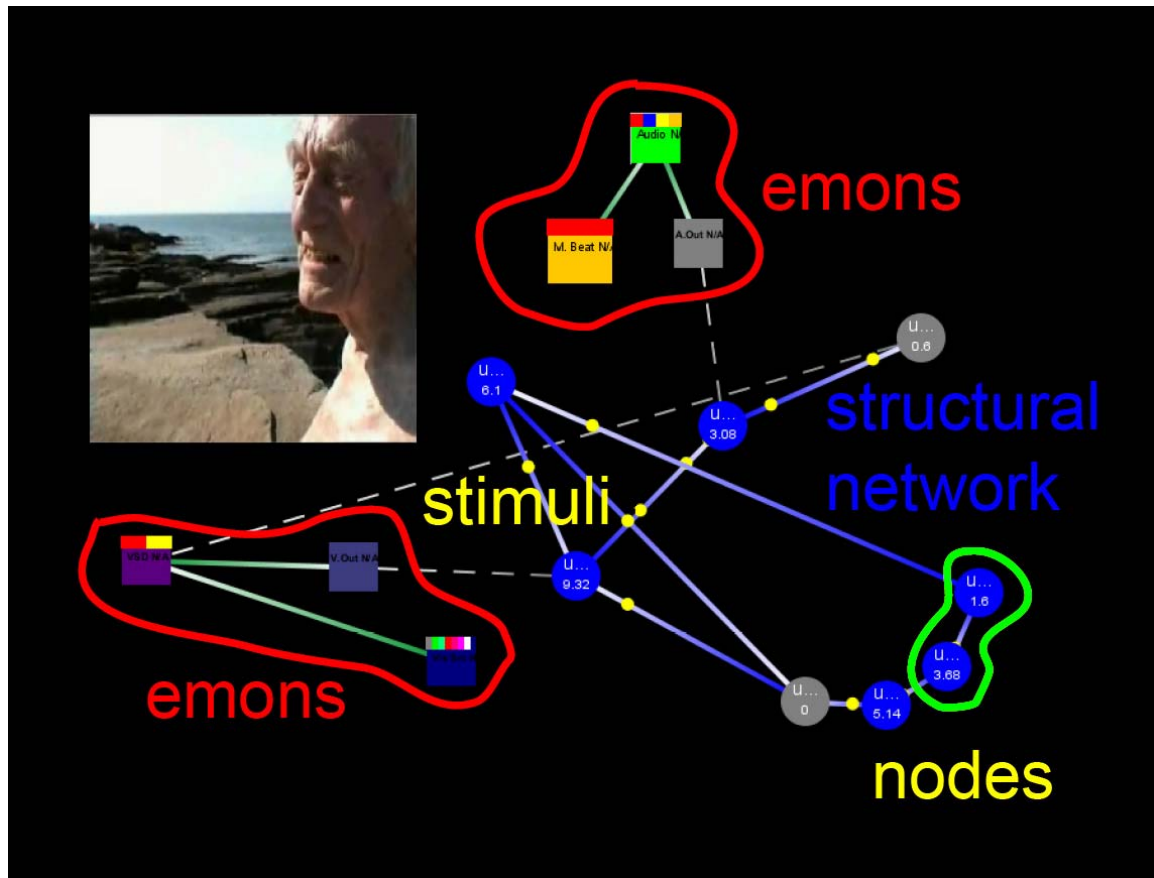


Fig 1. The elements that compose a typical layout of the EE

2. The structural layer and the properties of nodes

The Structural Layer is made of connected nodes. This network is an instrument for observing and influencing the ongoing activity of emons within the Emonic Environment.

For those interested, the Structural Layer is modeled as a recurrent neural network, allowing evaluation of events propagation over time and concerned solely with change of its elements' activities.

Each node possesses several properties. The most important of these is the *activation level* which tells you how "active" a certain node is.

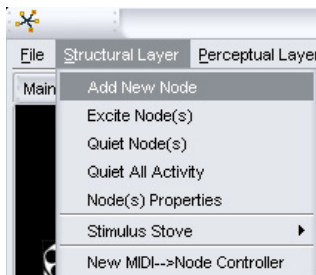


The nodes communicate by sending stimuli to each other. When you activate a node (e.g., by you clicking on it), its activation level goes up. If you or another connected node bring it higher than a certain threshold, which you can define separately for each node, a stimuli is sent to all the connected nodes, making them more activated as well.

It is possible to increase and decrease the activation level of a single node as well as of a group of nodes simultaneously. This can be performed by participants, other nodes, external devices and sensors, or the ongoing evolutionary process (you'll see more about that later).

2.1. Adding and connecting nodes

Click "Structural Layer" in the top menu, select "Add New Node." Repeat this process one more time. You should see two circles on your screen now.



To connect the two nodes click with the middle mouse button first one circle, then similarly on the second. They should be now connected. Stimuli will flow only in one direction, from the one on which you first clicked to the one you clicked on second.

2.2. Setting node firing conditions

You can set the firing conditions of a node by right clicking over it and selecting *Set Fire Conditions*. This menu allows you to define the threshold activation level at which a node fires stimuli. You can choose the activation level at which the node will fire by moving the sliders located on the sides of the menu window (see figure 2.1). The left half of the window sets the firing conditions when the

activation of a node is increasing, while the right side of the window sets the firing conditions when the activation of a node is decreasing.

Having defined the firing threshold you can choose one of three options for firing stimuli, by picking one of the three radio buttons. Selecting the top button means firing will occur once, at the activation level you chose. Selecting the middle button means firing will occur every time the node reaches the activation level you chose. Selecting the middle button means firing will occur as long as the node's activation level is above or below the activation level you chose.

Once you defined the two parameters mentioned above, hit the *add* or *remove* buttons, your selection will appear in the list located at the bottom of the window. You can repeat this process as many times as you want, to set different firing conditions.

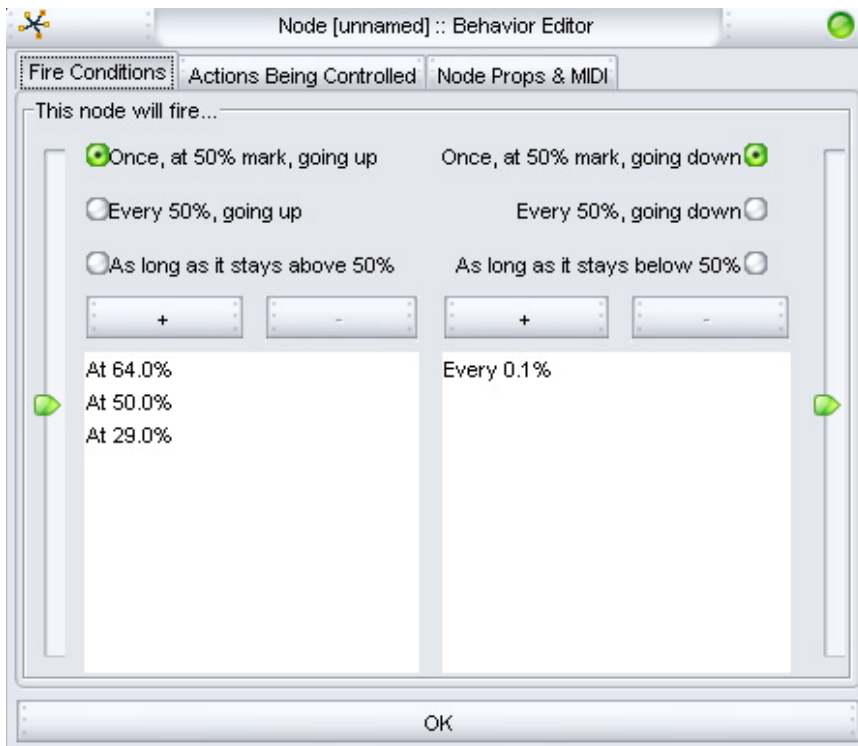


Fig. 2.1. Set Fire Condition Menu

2.3. Setting node properties

You can set the properties of a node by right clicking over it and selecting *Set Properties* (figure 2.2.). This window allows you to name a node, see the names of the nodes it is connected to (if such are defined) and define properties of its activation status.

Setting the *decay rate* defines the decrease in the node's activation level each system beat. This beat occurs automatically every second. The *input multiplier* is

a parameter that determines by how much the activity of an oncoming stimulus will be multiplied, thus effecting the activation level of the node when receiving stimuli. The *weight* is the activity of each stimulus shot. The *output multiplier* is a parameter that determines how much the activation level changes every time a stimulus is fired. The activation level changes by the weight of each stimulus multiplied by the output multiplier. Setting the *time delay* defines how long it takes the stimulus to arrive at the next node.

3. Types of emons that exist and their properties

In order to provide media content, you populate the structural layer with emons of various types, each with its own set of properties. The emons control how the media is generated, modified, and played back (e.g. speed or volume of sound, rotation angle of a video frame, semantic relationship of a piece of text). Emons can be connected to other emon types for the creation of nested processing structures.

Here are the types of emons that exist and their inherent properties

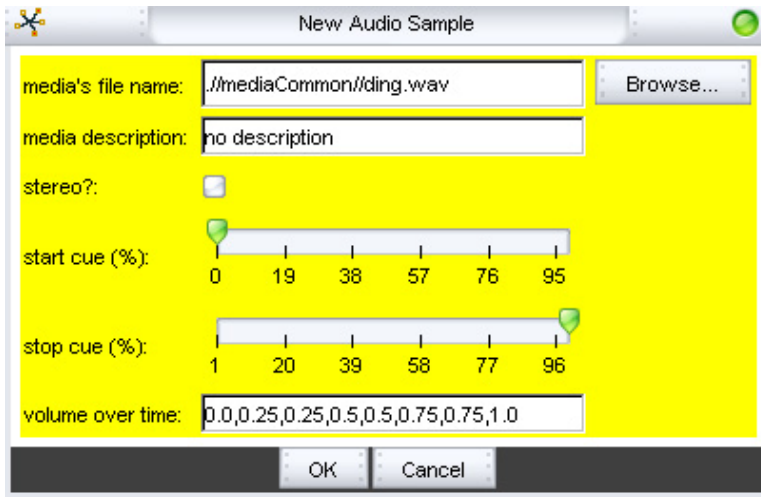
3.1. Audio sample

AudioSample emon controls how a given audio sample, be it recorded by you, or retrieved from a database, is played back. AudioSample emons allow manipulation of sample-based audio; properties such as volume, start / stop cue points, playback direction, time and pitch shift, audio file location (locally or on the net), and other properties, are all individually adjustable.

To understand the usefulness of the individual properties, remember that any property repeats over time. For example, take a look at the start and stop cues: let's say you have an audio file where the middle part fits well in a given context, but you don't feel like cluttering the overall output with the rest of the sample. Instead of permanently changing the sample, you can just change the start and stop cues, to indicate which portion of the sample should be played. Now, as you go on, you might decide that the rest of the audio sample fits the new conditions better and get a result by simply changing the cues. After all, any editor can do that, but now consider that you can set up an action that will each time change one or both of the cues, thus changing which part of the audio sample you hear based on other actions. In other words, as your network evolves, the portion of an audio sample being played can be changed to create a different sound without modifying the source.

Multiple start and stop cues may exist, with two versions : (1) a mask that preserves the length of the sample in its playback, introducing silence in the

masked-out portions of the sample, or (2) a selective mask that plays only the desired portions, skipping over the masked-out spots.



3.2. Master Players

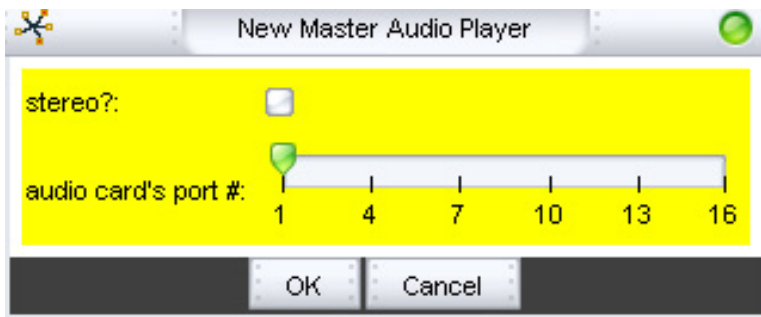
One of the key improvisational principles is the continuous incorporation of ongoing contextual events into the improvisation. The Master Player emons express this concept by controlling the spatial placement of sound, video, and text. A person standing in one part of the room may hear a certain output and choose to modify the tempo of the audio he hears, while a participant on the other side of the room may hear a combination of other outputs and change what audio samples are playing. As a result a whole set of behaviors can be constructed by the participants; for instance, by dynamically changing connections between Audio Sample and Master Output emons, one can control the spatial presence of audio in particular areas, with the mutation of this balance resulting in shifting or rotating of sound around a room for a fully encompassing atmosphere.

3.2.1. Master audio player

Master Audio Player emon is responsible for the overall audio playback, resulting from the sum of all the ongoing audio manipulations.

Properties:

- Audio output port number, which defines which channel the audio output will connect to.

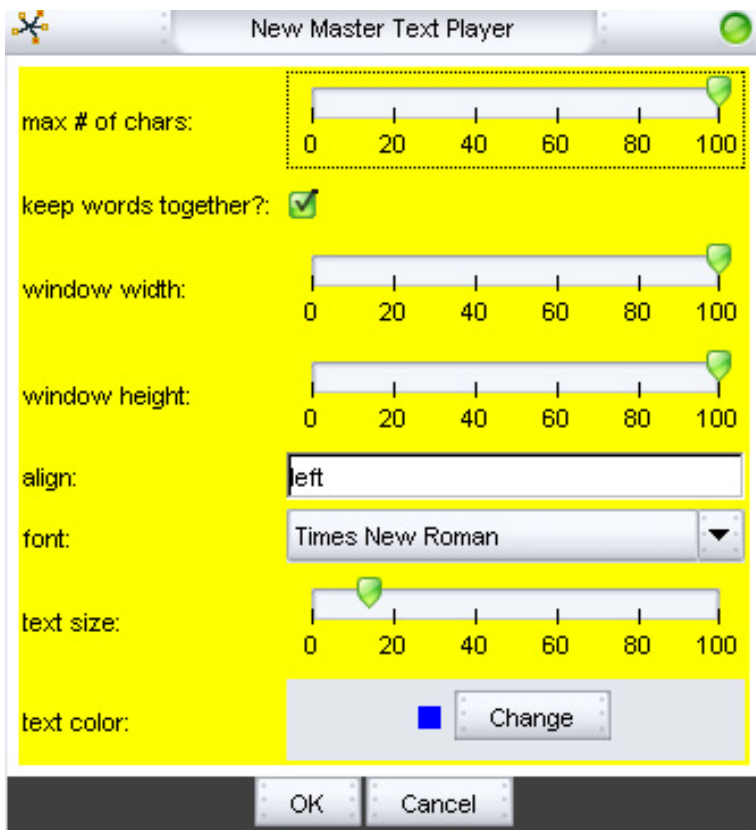


3.2.2. Master text player (can be laid over master visual player).

Master Text Player emon is responsible for the overall text display, resulting from the sum of all the ongoing text manipulations.

Properties

- Maximum number of characters, determines how many letters appear.
- Words Together, determines if words are out in line or wrapped around.
- Text Window width and height
- Align left right center or justify
- Font
- Font Size
- Font Color

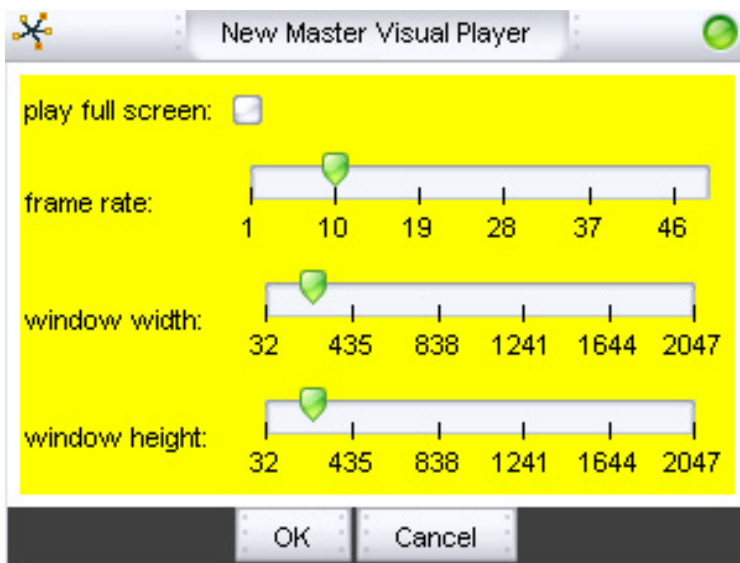


3.2.3. Master visual player

Master Visual Player emon is responsible for the overall video playback, resulting from the sum of all the ongoing visual manipulations.

Properties:

- Size – how large of a window is desired (or full screen)
- Display ID – only relevant for multi-display scenarios where the network is to be placed on one screen and the visual result on another
- Coordinates on screen - where the video window will initially appear. Can be manipulated by Actions or genetic algorithms to make the video move on screen.
- Layering of the sources – the priority order of the emons connected to the Master Visual Player emon. The latest to connect will be the top-most, the earliest - the lowest. Yes, life of emons is not fair.

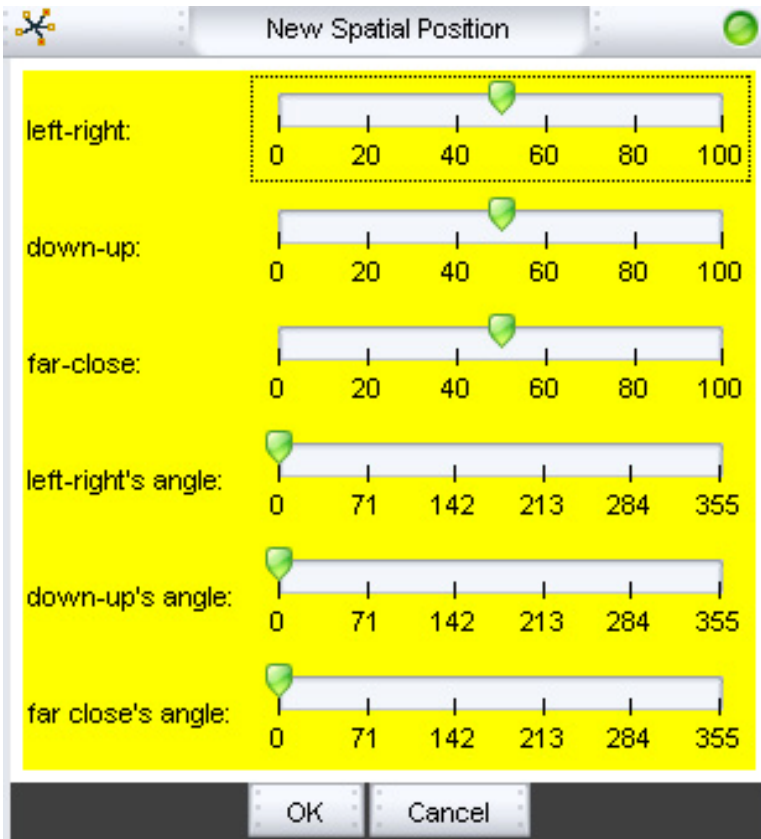


3.3. Spatial position

Spatial Position emon defines the position and rotation of the image in 3D.

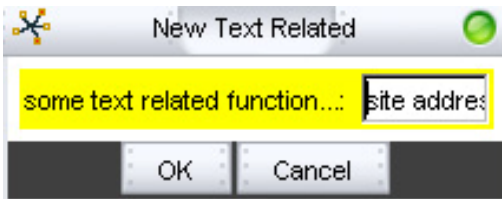
Properties:

- Left-Right
- Down-Up
- Far-Close
- Left-Right's Angle
- Down-Up's Angle
- Far-Close's Angle



3.4. Text Related

The text related emon finds online text that is related to the one you put in the text sample and displays it through the existing master text player.



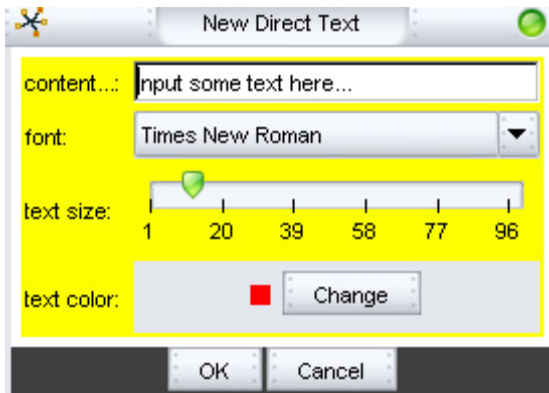
3.5. Text Rhyme

Text rhyme emon finds online text that rhymes with the one you put in the text sample and displays it through the existing master text player.



3.6. Text sample

The Text Sample emon allows interactive input of text to be displayed in real time.



Properties

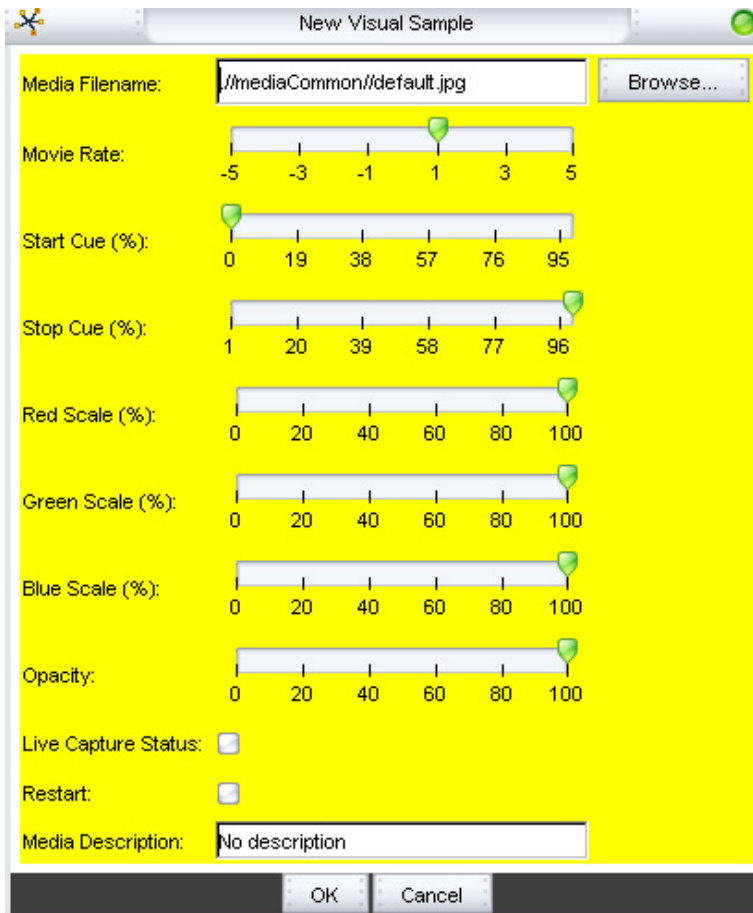
- Content, which defines the text content to be displayed.
- Font Size
- Font Color

3.7. Visual sample

VisualSample emon allows playback of video and still pictures. As such, it parallels the functionality of AudioSample and TextSample emons. To play a picture or a video, set the File property of the emon to point to a file on your disk (or online) that contains the video or the picture you'd like to manipulate. As a rule, any file format recognized by Quicktime for Windows should be readable (i.e., .MOV, .AVI, .MPEG, .JPG, etc).

The emon's properties are:

- Media Filename – the file you'd like to manipulate.
- Movie Rate for – the speed and direction (forward or rewind) at which a video plays. It can be defined on the range -500% to 500%, where 100% is the natural play speed.
- Start and Stop cues define the limits, within the sample media file, at which the playback begins and ends.
- Individually addressable prominence of the red, blue, and green channels for the media sample being displayed.
- Opacity property defines the transparency level of the image displayed.
- Live Capture should be clicked if image arrives from a live camera.
- Play Sample will allow you to run the sample file.



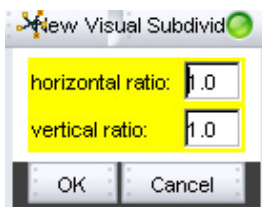
3.8. Visual Subdivide

Visual Subdivide emon divides and replicates its input (a VisualSample or another Visual Subdivide emon).

Properties:

-Horizontal ratio and Vertical ratio. The two arrays of ratios define how the incoming signal is divided, individually for the X and Y axes, cloning the original image into multiple copies.

For example, setting the horizontal property to [1, 2, 3] will result in three horizontal copies of the source signal, arranged side by side, with the ratio of their relative sizes being 1 : 2 : 3.



4. Types of actions that exist and the action designer menu

Each node can be configured using the Node Behavior Editor, selected by right clicking over a node. Aside from providing access to the Set Properties window and the Set Fire Conditions window, the middle tab is the *Actions Being Controlled* window (figure 4.1.). In this window you can define the action controlled by a node. Each node can have multiple actions associated with it. An Action affects one Emon property of one or more emons of a given emon type.

As described in section 2, each time a node is activated beyond a certain threshold it fires a stimulus at another node. When it receives a stimulus, it performs an action.

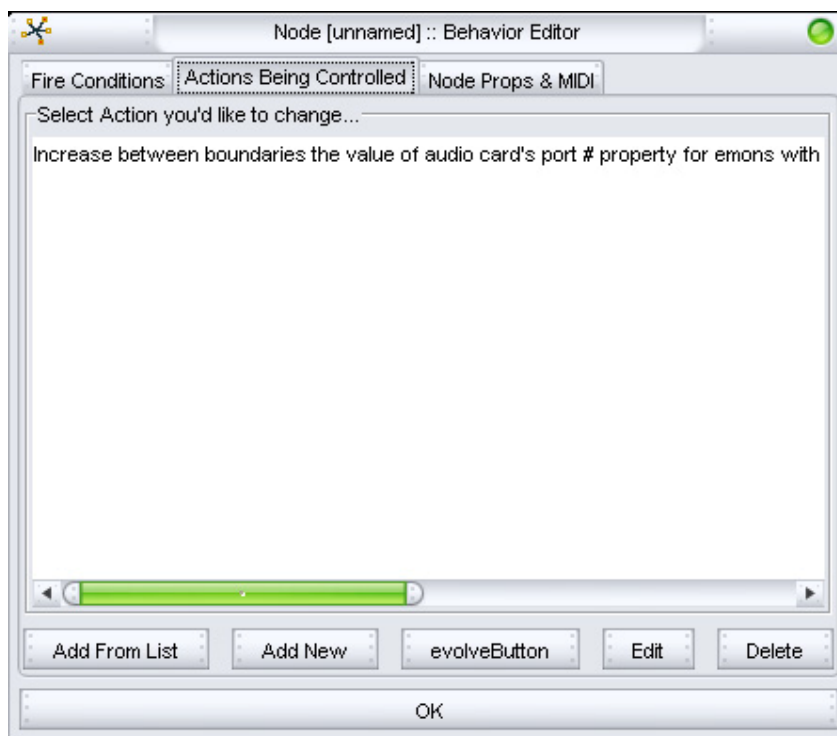


Fig 4.1. Actions being controlled window

4.1. The Action Designer

The Action Designer connects the activity within the Structural network to the media processing activity of emons. You can configure this connection in real time, or set it in advance. In practice, actions are assigned to specific nodes through the Action Designer window. The Action Designer forms the mediation between the structural layer and the emons, making it potentially possible to replace either one with a different type of controller or media system if desired, converting the EE into an improvisational hub.

4.1.1. Assigning an action to a node

In order to assign an action to a node you need to access the Action Designer window. You can assign actions in two ways. The first is by right clicking on the desired node and selecting *Add/Edit Actions*. The Actions Being Controlled window will pop up (figure 4.1.), click the *Add New* button at the bottom of the window to access the Action Designer window (figure 4.2.). The second is by middle clicking over the desired node and then middle clicking on an already existing emon on which you would like the action to take effect.

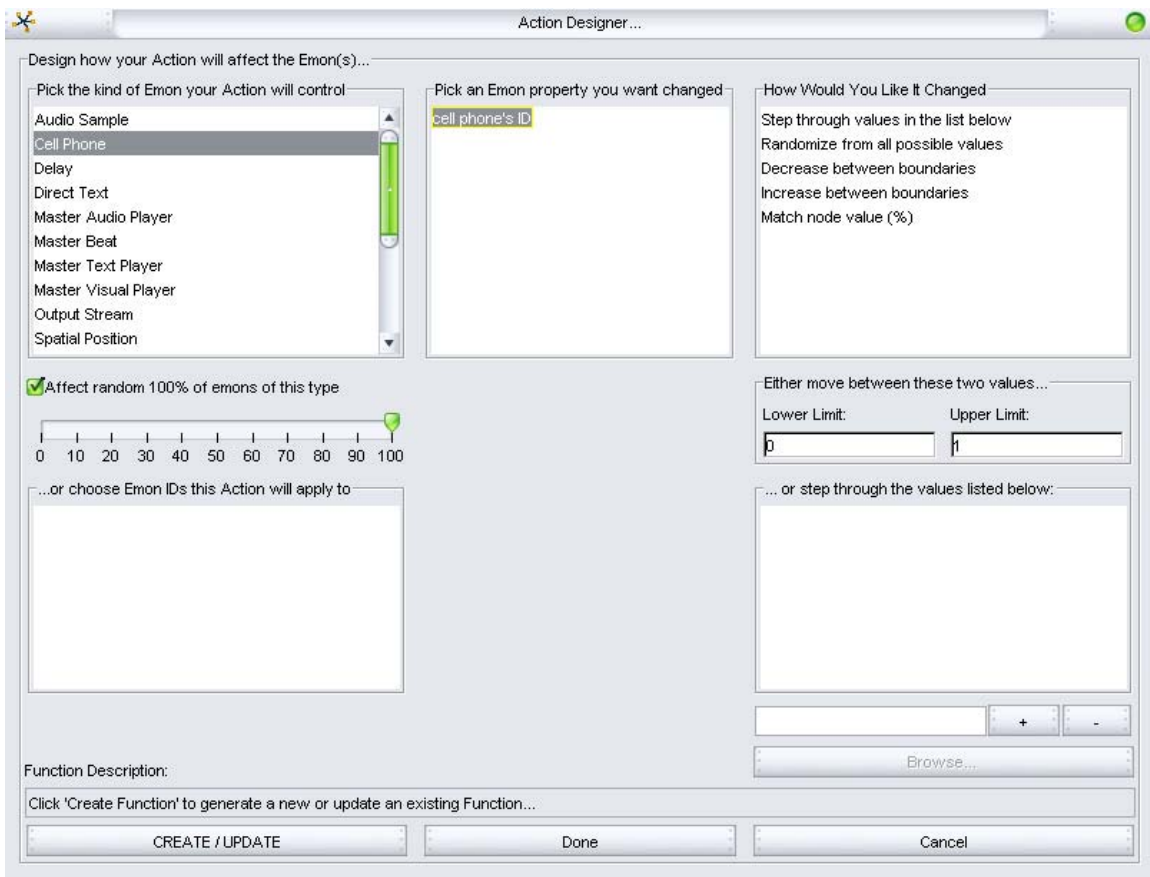


Fig. 4.2. The Action Designer window

The left column of the window displays a list of all emons. Choose the one in which you would like the action to control a certain property. Once you choose an emon to control, the middle column will be populated with all the properties this emon has, which is a similar list to the one described for each emon in section 3. Choose a property to be controlled. The rightmost column will display a list of possibilities for this property to change. The full list of possibilities includes *step through values in the list below*, *Randomize from all possible values*, *Decrease between boundaries*, *Increase between boundaries*, *Match node value (%)*. Please note that each property can be changed in one or more of the above ways, but not necessarily all. Select the way in which you would like the property

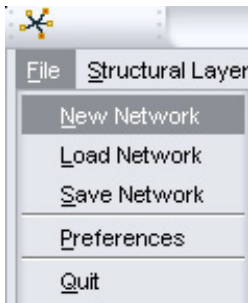
to change and input the associated values in the appropriate box, if you are requested. Once selected, click CREATE/UPDATE. You can repeat this process multiple times to assign several actions to a node. Once finished click Done.

If you chose the first method of assigning an action (as described above) the emons you selected in the leftmost column will appear on the screen and a dashed line will connect them with the node which controls their properties. If you chose the second method, a dashed line will connect the emon you chose to control with the node you assigned to control it.

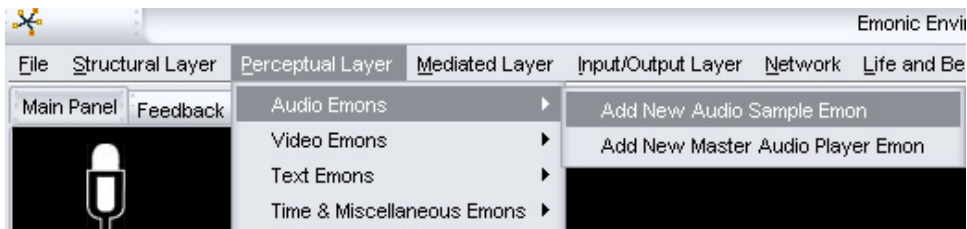
5. Putting together a new session in the Emonic Environment

let's build a little Emonic Environment session from scratch:

1. Start the EE, from the File menu, pick "New Network".



2. Add new audio by clicking "Perceptual Layer", select "Audio Emon", "Add New Audio Sample Emon"



You should now hear a sound and have 3 squares of different colors on your screen. Roll your mouse over the squares, and see how for each one of them a different information is displayed in the bottom of the screen. The 3 squares are 3 different types of emons: an AudioSample emon, a MasterBeat emon, and a MasterAudioPlayer emon (for a detailed description of what these do, see section 3.).

Briefly:

- The AudioSample emon defines what sound will be playing.

- The MasterBeat emon provides the beat at which the AudioSample is playing
- The MasterAudioPlayer defines through which of your speakers the AudioSample is playing.

(Note: You could also add each of the emons manually, by clicking `<image="Add-New-System-Emon-Icon.jpg">` and `<image="Add-New-System-Emon-Icon.jpg">`. Instead we provided a shortcut for a quick creation of the initial network.)

Notice that the 3 squares have lines running between them, each line going from full color to white. These lines are connections between the emons, and the color defines the direction of the connection - the full color end is the FROM and the white end is the TO. Therefore, MasterBeat emon is connected to AudioSample emon which in turn is connected to the MasterAudioPlayer emon.

Try destroying the connections by right-mouse-clicking on one of the connections and selecting "Delete". The sound should now stop. To make it go again, middle-mouse-click on the FROM emon and then middle-mouse-click on the TO emon. You should now have sound again. If you don't hear the sound, make sure you connected them in the right direction.

The beat you hear now repeats every second or so. Why? Because the MasterBeat emon provides the beat to whoever is connected to it. A beat is like a command "do whatever it is that you know how to do". The AudioSample type of emon knows how to play audio. Therefore, each time it receives a beat, it plays the sound file associated with it.

To substitute the sound file being played, select the AudioSample emon and press Ctrl-X. To record a new one, press "r" together with the channel to record on (e.g., press "r" and while holding it, press "1". while they are pressed, your microphone is recording, when you let one of the keys go, the recording stops).

6. Scenarios

6.1. Creating an endlessly repeating beat (audio)

- Create a new network
- Add a new node
- Add an action to the node that controls playback of audio (choose the "Restart Audio" property in Action Designer)
- click OK.

6.2. Adding video, synchronized to the audio defined in scenario #1

- open up the node properties window and click on the Actions tab.
- Add another Action to the list, this time one that controls playback of video (choose "Restart Video" in Action Designer)
- Click OK.

6.3. Making video go in and out of sync with regards to the audio

- create the network in scenario #1.
- add an additional node
- add Action to the 2nd node of "Restart Video"
- connect the two nodes
- move action

6.4. Video pulsating, increasing and decreasing its size (Z-axis)

- add a new action to a new or existing node, specifying Spatial Position Emon as the Emon target, and Far-close angle as the EmonProperty to control.
- set Match Node Value as the type of change.

6.5. Video becoming more transparent when further and less transparent when closer (adding 2nd synchronized Action)

- Add 2nd Action to the node defined in Scenario #4, with the Action defining Opacity of a Visual Sample Emon.

6.6. Interaction between nodes: increase-decrease size 4 times, then bring in a new image.

7. FAQ

7.1. What do all the names of the emons mean?

An *emon* is a unit of meaningful abstraction of audiovisual content that acquires meaning when connected in an active network to other *emons*.

The *Emonator* is a hardware/software gesture controller in an evolutionary fashion and used for audiovisual control.

7.2. Are you attempting to replace Max/MSP, Reaktor, TV?

No. We do however aim to provide you with something these interfaces seem to lack, namely, life (evolution) as expressed by the evergoing change of the source media and its structures.

7.3. What does the Emonic Environment mean for file sharing?

It means good. Essentially a side objective of this project is to render copyright meaningless in the context of active creation. The Emonic Environment uses no source media without modifying it in one way or another. Furthermore, each exchange of EE networks between users results in all of their media becoming available to all the other users of the same server. Thus we hope to facilitate propagation of Source Creative Media(tm) in a new powerful way.

7.4. When will the Emonic Environment be available?

It is available for download now. New versions are released with average frequency of one minor revision a week. Future versions of the EE will have an automatic update feature that will alert you to the availability of a new version. In the meantime you can find out what version you have by clicking on the 'Everything Else' menu and choosing the 'About' option.

7.5. How stable is the Emonic environment?

Alpha versions available for download may or may not be stable. We have also produced stable* versions when necessary.* stable defined as 'run without crashing for a week straight'.

7.6. I'm an artist. Why should I be interested?

For all the wrong reasons; if you are looking for a sequencer it's not it. It will allow you to create art, but practices of art mastery as defined in the European tradition are meaningless here. The idea, put simply, is that you are NOT in control. Instead, you are playing (or some would say 'creatively fighting') with the machine, exposing new combinations of media, looking at the resulting structures, interrelationships of structural and media properties, and trying to make sense out of it, only to be again led into the endless change of what you've just created. It's fun, and it certainly changed our view of what artist's role will be in the years to come.

7.6. I'm a music fan. Why should I be interested?

You probably know everything about programs like ACID, Ableton Live, FruityLoops, Max/MSP, Reaktor for audio, Jitter and NATO for video, and many others. They are all excellent programs and allow you to do lots of interesting audiovisual manipulations. These programs, however, don't offer you a way to get beyond the media that you currently have (e.g. they don't go on the net and find some new media for you).

Furthermore, once you used one of these programs to create a piece, that piece is fixed. What's bad with a fixed piece? It's great if your objective is producing a CD record; if however you want to create something that is alive, changing every time you run the program, something that will lead you to explore new combinations of media, solo or in a joint venture with other users, you won't get much help from these programs. This is where the Emonic Environment comes in.

7.8. I'm a developer. Why should I be interested?

If you have a program that performs audio or video manipulation you can interface it with the Emonic Environment (using OSC or TCP/IP). Why would you want to do so? Simple - by hooking our systems together you will be able to bring evolutionary change, multi-user control, and many other new features into your program and we will be able to give our users an ability to perform new exciting types of audiovisual manipulation provided by your program.

7.9. I run a music label. Why should I be interested?

Running the Emonic Environment is a new way to give the much needed exposure to the artists you represent. By engaging with the materials initially created by your artists, people become used to see you as their media provider. Your role is thus more essential than ever, for you are no longer a middleman but a creative filter associated in public's mind as active source of new media that they can play with.

We are currently working on a distribution model that you might find quite different from what you've seen before but beneficial to you and the artists. Contact us for more details.

7.10. I run an mp3 site. Why should I be interested?

Up to now people were able to download songs from you. How about giving them more? By running the Emonic Environment server (available in both built-in and standalone versions) you will be able to give your visitors ability to do something with all these songs other than just listen.

7.11. I'm a couch potato, I love my TV. Leave me alone.

OK. Do you own a cell phone? If yes, you might be interested in checking out our upcoming project, Cellular Emonic Tone, that allows the control and input of media through cell phones and multiple users.

7.12. Why should I trust you that the EE is clean from viruses?

The Emonic Environment is developed by the Interactive Cinema Group at the MIT Media Lab. We take your privacy seriously and do not perform any non-advertised operations on your computer or within your computer network. The only information currently provided by your copy of the Emonic Environment back to us is the IP address of your server, should you choose to run one. If and when the software is modified to gather any additional information, you will be:

- notified during the update procedure
- an option will be provided to turn off providing such information
- this FAQ will be modified accordingly. Furthermore, the source code for the EE is about to be released into the public domain in the future, so that you can see for yourself.

7.13. I want to contribute to the EE development. How can I?

If you have skills (primarily coding or design) that are relevant, or can think of some other way to help us, we would very much appreciate your help. Given that the EE sources are not yet public domain, you would have to contact us - `emoninfo at media d o t mit d o t edu`.

It might be of interest to you that we are designing an API that will allow people to write their own processing units for the EE.

7.14. Can I get the source code?

Not yet. It is fairly well structured but not sufficiently well documented to make it public. We do however have an intention to make it open-source at some point.

7.15. I'd like to use the EE in a non-profit context. Can I?

Generally yes, but there are a few things that should be negotiated first. Please contact us at `emoninfo at m e d i a dot m i t dot e d u`

7.16. Where can I learn more about the EE, apart from this manual?

For a detailed description of various features of the Emonic Environment, please see the Tutorial and the EmoniForuml.

For a higher-level academic view of the Emonic Environment and its general theoretical framework, please see the publications related to it. These can be

found at `media dot mit dot edu slash ~pauln slash research slash publications dot html`.

If you are interested in general progress and interests, please see the EmoniBlog
If you want to see the ongoing development logs, please see the EmoniBug.