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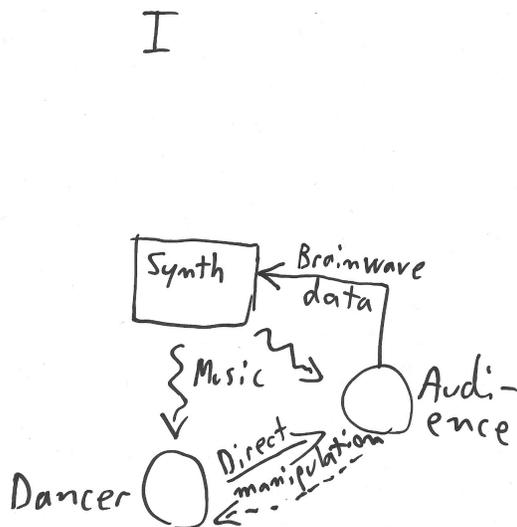
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## Brainwave Music Lab: Interactivity

In this paper I'm going to discuss the interaction of Brainwave Music Lab. My focus will be on interface, which is an important part of any interactive system. I'm going to use some terminology of computer games, and many of my references are from the texts of game designers and game researchers. That's because computer games are familiar environments for me, and also because interaction is a quite problematic concept in gaming industry, and so it has been researched a lot in that area.

I want to remind you, that Brainwave Music Lab is a work-in process. This means that everything I'm going to say is just speculation.

## Introduction



When I first got the idea of Brainwave music Lab, I had the basic concept quite clear in my head: I wanted to make an interactive performance, in which the brainwaves of an audience would be transformed to music in real-time. There would also be a performer: a

dancer who would react to that music with her action – of course, she would also have the freedom NOT to react to the music, but doing something else to communicate with the audience. I assumed that the audience's reactions to the music and to the dancer's actions would have an effect on their brainwaves, and this would somehow change the music their brainwaves would produce. So the performance would be some kind of biofeedback loop.

The biggest problem in the project was money. The EEG equipment that hospitals or researchers use, are far too expensive for our budget. At some point I realized that even if we managed to get a major discount, the price would still be so high that we could afford to maximum of one piece of EEG equipment. This would mean that we could have only one person at a time in the audience. I didn't mind. I think it is very interesting to have a one-person audience, because it makes it possible to have very intimate interaction between the performer and the audience.

The financial problem was finally solved with help of the computer gaming industry. The company called OCZ technology had begun to sell neural game controller that makes it possible to control computer games with neural impulses.<sup>1</sup> And because the controller is meant for consumers, it is also relatively cheap. Actually it is so cheap that we would be able to buy more than one of them. So now it would actually be possible to have a larger audience. It is probable that we will develop the project towards an experimental performance installation, during we could test many different situations related to brainwave music, like different amounts of people in the audience.

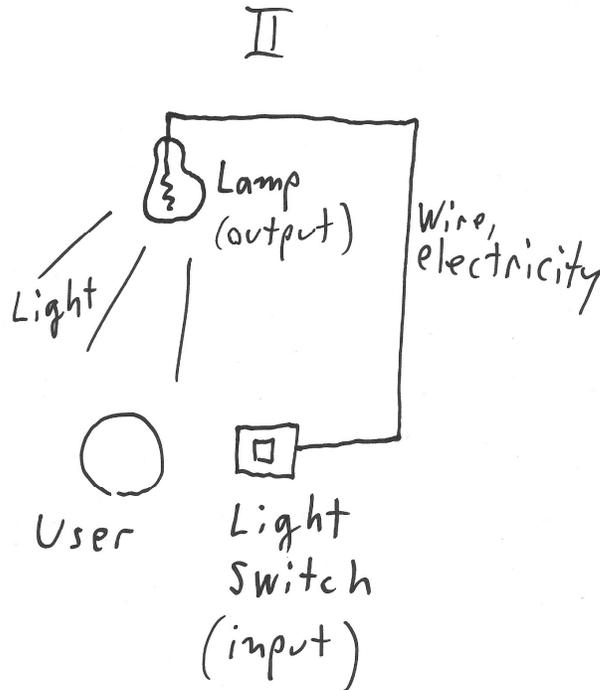
## **Interaction.**

What is interaction?

I start with my favorite definition by a game designer Greg Costikyan:

*But what does 'interaction' mean, really?  
Not much, actually. A light switch is interactive. You flick it up, the light turns on.  
You flick it down, the light turns off. That's interaction.<sup>2</sup>*

I like this definition of interaction by Costikyan, because it is clear and simple, and I like everything that is clear and simple. The only problem is, though, that I think he is wrong,



A light switch itself is not interactive at all. First of all, it is just a switch. A switch is nothing without a system – in this case, it would be a light system. But I don't think that even a light system is interactive – I would call it *reactive* instead. For example game researcher Garreth Schott makes this distinction. He suggests that reactive systems are bilateral processes by which one side responds to another. Instead, for a system to be truly interactive, it should be capable of producing meanings jointly with its user.<sup>3</sup> And no light system can do that.

But although Costikyan's light switch example is all wrong, I still like it because it is simple. So I can use it as an example of the next concept I'm going to introduce, that is an *interface*.

## Interface

All systems that a user can manipulate, were they interactive or reactive, must have an interface. Many different parts are included to a light system in addition of a light switch, like some wires, electricity, and a lamp. The light switch itself is a part of an interface of the light system, the part which makes it possible for the user to manipulate the system. Other part of the interface is the lamp, which indicates the effects of the user manipulation – in this case, light or no light – thus giving some feedback to the user of his or her use of the light switch..

Here's what Wikipedia says about user interface:

*The **user interface** (also known as Human Computer Interface or Man-Machine Interface (MMI)) is the aggregate of means by which people—the [users](#)—[interact](#) with the [system](#)—a particular [machine](#), device, [computer program](#) or other complex [tool](#). The user interface provides means of:*

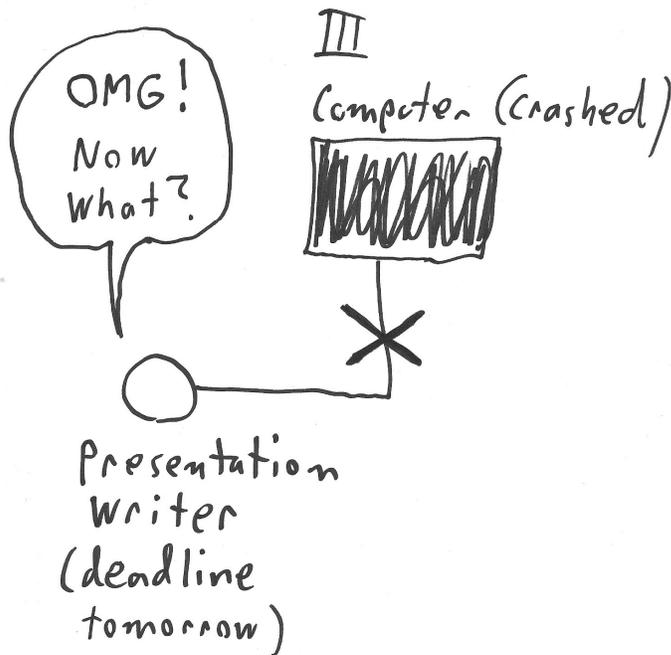
- *[Input](#), allowing the users to manipulate a system*
- *[Output](#), allowing the system to indicate the effects of the users' manipulation.<sup>4</sup>*

Of course, this brings up a question: if we want a truly interactive system with jointly produced meanings, shouldn't the system be able to manipulate the user as well? My answer is: yes! So to build a truly interactive system, the output shouldn't be only a feedback indicator, but rather an input for a system to manipulate the user.

Now that is very difficult to achieve in the relationship between human and computer, because computers are still quite stupid. Computer games, for example, are still just a bunch of scripted reactions.

I got an idea of an example about true human – computer interaction from a colleague of mine, who was concerned about using live video capture in a performance, because it would make the computer crash very easily. That made me think, that maybe crashing would be the only way for a computer to be really interactive, to get itself free from the

scripted code that some programmer has made it to perform. When there is too much information for its memory to handle, when it just can't take it anymore, the computer crashes, does something it is not supposed to do in only way it can, getting the user often in real trouble! Isn't that true interaction with jointly produced meanings?



Another solution for interaction in human-computer environments is of course to have more humans to do the interaction part with each other, and to let computer be just the platform for that interaction to happen. Like chat rooms, multiplayer games, Facebook etc. This is also my solution in Brainwave Music system. There the music works actually as an indicator, a system output that is just reactive.<sup>5</sup> But we will also have a dancer, a living human being, who can let herself be manipulated by the audience's brainwave music, but is also able – if she wants – to manipulate the audience with her actions.

So the dancer will be a part of the interface of the brainwave music system, and this makes the interface a little complicated.

## Identification

In a computer game, the player usually have an avatar, a digital figure that he or she can move in the game world. As a media artist Grahame Weinbren puts it, an avatar is nothing more than a cursor, just a part of interface, without any will of its own, total slave of the player ((within the program's limits of course)). He claims that this makes it very easy for the player to identify with his or her avatar, even so that a player often refers to the avatar as "I": Like for example." I will go to the cemetery and kill all the zombies." So identifying with the avatar is much more straightforward than identifying for example with a protagonist character in a Hollywood movie or Aristotelian drama, where the characters have their own thoughts, emotions and goals totally independent from the audience.<sup>6</sup>



What about identification in brainwave music system? The dancer will probably have some characteristics of both avatar and Aristotelian protagonist. It is possible to TRY to control her actions with the music in the same way you would control Avatar – I remind you that the equipment we are using to measure the brainwaves was originally planned as game controller, that is, for controlling avatars. BUT: the dancer is a real human being with her own purposes and emotions, and she will also be able to choose NOT to follow the impulses of the brainwave music. In that sense she might have some qualities of an Aristotelian protagonist, although there will probably not be any other structures of Aristotelian storyline. And I must add that unlike some movie character, the dancer is also able to challenge and manipulate our one person audience, taking a direct contact to him or her.

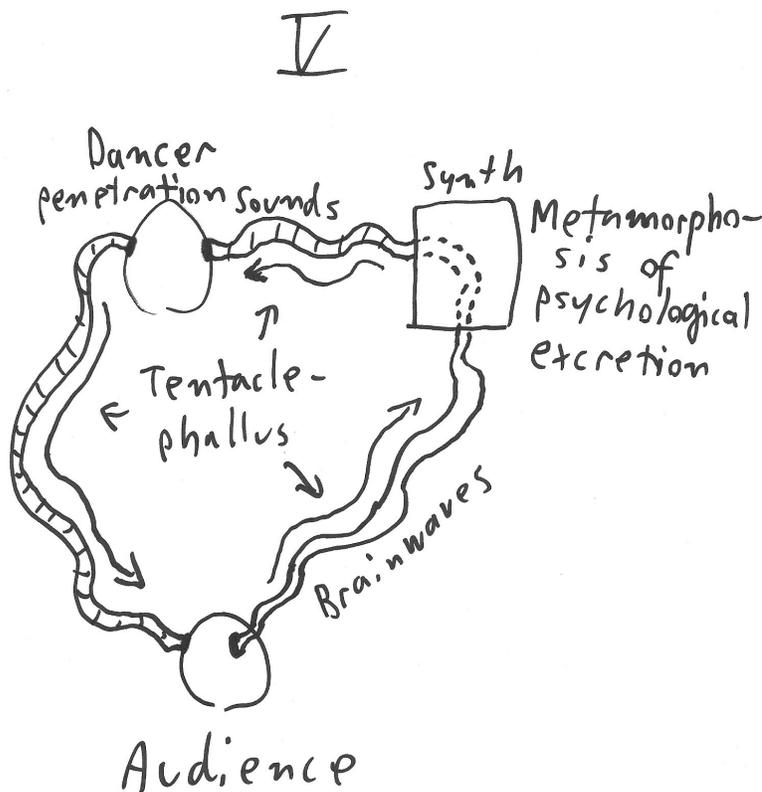
So IF there will be any identification, it might have some characteristics of both identifying with an avatar and identifying with a protagonist. But it is also possible that there won't be any identification whatsoever, because the familiar identification structures of video games and movies will be broken anyway. Maybe the relationship will be under constant change and negation, fluctuating between avatar, alter ego and other.

The reason I'm interested in such an old-fashioned concept like identification is this: If our one-person audience really identified with the dancer in any way, even momentarily, it would mean that he or she would have an experience of becoming part of the brainwave music system's interface – in other words, the border between the viewer and the work would disappear or become diffuse.

### **Body Image**

There is also another factor that makes this border diffuse, and it is related to *body image*. Helena Erkkilä, a Finnish performance art researcher, published recently her doctoral thesis about body image, Lacanian psychonalysis, and Finnish performance art. In this book she refers to ideas by Elizabeth Grosz and Paul Schilder about excretion and body fluids, like urine, sweat, blood, or sperm, as well as psychological excretion, such as

voice, speech, and gaze. They suggest that these different body products will continue being a part of one's body image even when they are outside of the body.<sup>7</sup> What I'd like to add is that brainwaves can be understood as psychological excretion as well as voice or gaze ((thus the electrodes, through which the brainwaves are led from a skull to a neural impulse measurement system, can be seen as temporary psychological body holes.)) The synthesizer would transform the brainwave data to music, thus making the metamorphosis of the psychological excretion from brainwaves to sound waves to take place.



This would mean that the one-person audience's body image would be extended to the area of an interface, and even further into the brainwave music system. This weird extension of the audience's body penetrates the ears of the dancer, as well as the ears of the audience's own, like a weird tentacle-kind-of phallus. So the body of the audience would be everywhere in the brainwave music system, and this makes it impossible to say, where exactly would the border between the audience and the work be.

Doesn't this sound exactly like cyborgian ideal – to unite man and machine as self-contained system?

Another way to look at the brainwave music system is to think of it as a strange hyper-mirror, which reflects the audience's body image in many different ways. So this might actually be cyborg-narcissistic ideal. But is a mirror interactive? I think it might rather be reactive, but in a very peculiar way: User can't really manipulate a mirror, but mirror can manipulate its user.

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## References and Notes

<sup>1</sup> There is also a similar, seemingly even more sophisticated equipment by Emotiv, but so far we haven't been able to test it.

<sup>2</sup> Costikyan, Greg: "I Have No Words & I Must Design: Toward a Critical Vocabulary for Games". In: *Computer Games and Digital Cultures. Conference Proceedings*. Edited by F. Mäyrä. Tampere University Press, 2002, 11.

<sup>3</sup> Schott, Gareth: "Agency in and around Play". In: *Computer Games – Text, Narrative, and Play*. Edited by Carr, Buckingham, Burn & Schott. Polity Press, 2006, 133

<sup>4</sup> [http://en.wikipedia.org/wiki/User\\_interface](http://en.wikipedia.org/wiki/User_interface) (accessed 8 June 2009)

<sup>5</sup> One could of course argue that music manipulates a listener to a great extent, and I agree with this. However, in Brainwave Music Lab the music is created by the listener, so in this case it is not a tool for the system to manipulate the listener, but merely a tool for the listener to manipulate the dancer and him/herself.

<sup>6</sup> Weinbren, Grahame 2002. "Sonic – c'est moi! Pelihahmoon samastuminen ja virtuaalitalan pakkomielteiden hallinta". Translated to Finnish by Sonja Kangas & Erkki Huhtamo. In: *Mariosofia*. Edited by Erkki Huhtamo & Sonja Kangas. Gaudeamus Kirja 2002, 227-230

<sup>7</sup> Erkkilä, Helena. *Ruumiinkuvia! Suomalainen performanssi- ja kehoitaide 1980- ja 1990-luvulla psykoanalyysin valossa*. Kuvataiteen keskusarkisto, 2008, 97-98.