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| **Tatsuo Unemi and Daniel Bisig** | **Visual Liquidizer or Virtual Merge #1** *(Installation)* |

*Topic: (Interactive Art, Swarm)*

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*Main References:*
[1] Rudy Rucker, "*Wetware*", Avon Books, New York, US, 1988

*Abstract:*
This is a visual interactive installation utilizing two cameras and one projector connected to one personal computer. The visual output is projected on the rear projection screen visible from both front and rear sides. In a science fiction entitled *Wetware* [1], an imaginary drug named *Merge* takes an important role. It relaxes connections among protein molecules, then the taker's body becomes liquidized, but it recovers back some minutes later. In this novel, a couple of lovers took it together to mix their bodies and felt tripping. *Wetware* is a coined word in the research of Artificial Life that is also pursuing computational models of complex collective behaviours of organisms. There are two well known algorithms named BOIDS for birds and fish and ANTS for ants and termites. This artwork will realize a virtual *Merge* using detection of visitors' images by ANTS and generation of scattering images by BOIDS. When two visitors take seats at the opposite sides of the screen each other, the images of their bodies start scattering and mixing some seconds later. Viewing from the each side, the figure of him/herself is displayed as in a mirror and the partner's figure is visible in normal. Dynamic images rendered by a visualization technique continues two or three minutes, then it gradually comes back to the normal figures. The system starts waiting for new visitors again after the visitors left.

The authors are hoping people merge each other more, not only in a private relation like lovers, to change the world where disruption and violence are rampant.

*An example setups of the installation.*

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# Visual Liquidizer or Virtual Merge #1

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## Premise

This article describes a detail of the authors' artwork entitled *Visual Liquidizer or Virtual Merge*, an interactive audio-visual installation inspired by an imaginary drug in a science fiction entitled *Wetware* by Rudy Rucker. This drug temporarily liquidizes the taker's body, which causes a type of tripping experience by mixing bodies of a couple of lovers. To provide the virtual experience of such kind to visitors, we designed a system that displays dynamic deformed figure of visitors using two types of swarm simulations for the image processing on the camera image and rendering on the display screen. Sounds are also generated to provide more impressive experience for visitors.

## 1. Introduction

The authors' latest artwork entitled *Visual Liquidizer or Virtual Merge* is an interactive audio-visual installation utilizing two cameras and one projector connected to one personal computer. The visual output is projected on the rear projection screen visible from both front and rear sides. Viewing from the each side, the visitor's figure is displayed as in a mirror from his/her side and the partner's figure is visible in normal as shown in Figure 1.

The idea of the concept is inspired from an imaginary drug named *Merge* in a science fiction entitled *Wetware* written by Rudy Rucker [1]. This drug temporarily liquidizes the taker's body, which causes a type of tripping experience by mixing bodies of a couple of lovers.

The technical idea is from two types of the author's previous works. The one is of SBArt [2] that generates unique 2D images and movies by means of genetic programming. It has a functionality of not only generation of the new image but also deformation of an existing image. The other work is on swarm. There are two well-known algorithms to simulate the complex collective behaviors of animals in the nature, that is, BOIDS for birds and fish and ANT for ants and termites. We have used BOIDS for our interactive installations since 2004, that is, Flocking Orchestra [3], MediaFlies [4], Flocking Messengers [5] and Identity SA [6], and ANT for Cycles [7] in 2010. This new artwork utilizes a combination of these two types of swarm. It realizes a virtual *Merge* using detection of visitors' images by ANT and generation of deformed images by BOIDS.

When two visitors take seats at the opposite sides of the screen each other, the images of their bodies start scattering and mixing some seconds later. The dynamic

moving image rendered by a visualization technique continues two or three minutes, and then it gradually comes back to the normal figures as the final stage. The system starts waiting for new visitors again after the visitors left.

The following part of this article describes details of the concept and the technical features.



*Figure 1. An example setup of the installation. This picture was taken by the author at the Open Campus of Soka University in 24th of August, 2014.*

## 2. Concept

As described in the previous section, an imaginary drug *Merge* is assumed to be able to relax the connections among protein molecules of human body. The taker's body becomes liquidized as the efficacy, but it recovers back some minutes later. In this novel, a couple of lovers took it together to mix their bodies and felt tripping. Each individual person is an entity physically separated from the others, but we sometimes feel spiritual connection with lovers, friends, family members, and so on. Any type of close communication between persons amplifies such feeling. The closer physical contacts such as hand shaking, hugging, kissing and so on cause the deeper communications from this point of view. It is possible to imagine that it would be more effective if we could physically mix our melted bodies with of the others. Human relation is one of the most important aspects to measure happiness of people. It is somewhat difficult but might be ideal to have as many peaceful relations as possible, rather than conflict or separation. This installation provides not real but virtual

situation as if the bodies of two persons become melting and mixing so that the visitors would feel spiritually closer connected with others.

The novel's title *Wetware* is originally come from a coined word in the research of Artificial Life [8] that is pursuing models of complex biological phenomena using any type of scientific constructive methods. The majority of the research projects are based on software that examines computational models for simulation and system implementation, but hardware approaches by mechatronic construction are also not few because it is sometimes much more efficient than software typically when the model requires solving so-called multi-body problems. Wetware is neither software nor hardware, but a research medium using organic or non-organic chemical materials to examine the reaction processes that shows any type of complex phenomena such as reproductive process of molecular structures.

The research results of this field is useful not only to understand what life is from a scientific point of view but also to develop a method to build an artificial system that behaves too complex to predict by human observers. It sometimes brings us a wide variety of generative methodologies suitable for design, art, and entertainment. Typically, it provides a design method by which the product looks as if some unknown living things cause the phenomena behind.

Swarm model is one of those mechanisms. It is a model of collective behaviors of organisms such as fish, birds and ants. It is natural that the simulation of melting and mixing process should be simulated using a model of physical dynamics, but we use swarm simulation to provide the visitor occasion to feel that the materials would be living, namely the visitors' bodies.

The authors are hoping people merge each other more, not only in a private relation like lovers, but also with people from difference cultures, to change the world where disruption and violence are rampant.


## 3. Technical Features

The hardware setups consist of one personal computer of recent product with relatively powerful graphics board with cameras and projectors. The projector should be of an ultra short focus placed on the table or a normal one mounted on the ceiling. This specification is necessary in order to avoid a conflict between the projection beam and the camera's sight. It is possible to use any type of hi-resolution display or screen to show the visuals, but a rear projection screen is the most effective because it realizes the combination of mirror image of the viewer and normal image of the partner from both sides. The authors think this style is better than the case two visitors view the screen together from the same side. Usually, people are familiar with a mirrored image of him/herself, but a normal image for the others.

The details of swarm simulation and rendering algorithm are described in another paper by the authors [9]. The following part of this section presents two alternative methods to capture the visitors images and then method of sound synthesis.

To organize the visual that consists of deformed visitors' body overlapping with the stable background, the system needs to extract the part of targets from captured image in real time. One commonly used method is by background subtraction. It is easy if the background image is stable and the contrast with the target is high, but difficult if there are moving objects other than target in the scene. For a long time exhibition for one day for example, it sometimes raises a problem of stability on lighting. The sunlight is often the biggest interference since it changes in time and

weather condition. Even if the sunlight from the outside could be totally shut out, there remains possibility that reflection of room lights on the visitors body alters the light condition. Another method for more stable installation is to use Kinect depth sensor [10]. It detects the distribution of distances between the camera and the objects in the captured image area. We don't need worry about the changes of lighting condition because the side effect is very small except the case the light includes much of infrared light, but the drawback is the restricted range of observable distance. Because the sensor was originally designed for visual interaction of TV game assumed being played in home, the range is from 0.8 to 4.0 m. It is suitable for a typical setup for single person for each side as shown in Figure 1 in the above section, but difficult to adapt to a further range for a large size of audience. We developed the software adaptable for both web camera and Kinect sensor so that the installation is adaptable for a wide range of situations in the exhibition site. The open source library of Open Kinect project [11] was useful for our development.

The sound effect is very important to amplify the impression. Because the visuals look like dynamically flowing liquid, we gathered sampled sounds of different types of water flows and mixing them that reacts against scene changes. Sound of stream is for the beginning and ending, Bright sounds of bubbles and heavy sounds under the water are mixed for the melting and mixing stage. As described in [9], parts of original images are temporally reunited so that the visitor can recognizes their body is flowing even after some minutes elapsed. The system attaches a sound of drain at the horizontal position of reunion by stereo speaker system. In addition, voices and environmental sounds are recorded in real time to render the sound for reunion with modulation of the pitches and echoes. The sound from the outside is recorded when its loudness exceeded the predefined volume. The recorded sounds are used repeatedly until the predefined time passed. After some minutes of mixing, the melting image turns back to the original just as the drug's efficacy has expired.

## References

[1] Rudy Rucker, "*Wetware*", Avon Books, New York, US, 1988.

[2] T. Unemi, SBART 2.4: an IEC Tool for Creating 2D Images, Movies, and Collage, Leonardo, Vol. 35, No. 2, pp. 171, 189-191, MIT Press, 2002.

[3] Tatsuo Unemi and Daniel Bisig, "Flocking Orchestra - to play a type of generative music by interaction between human and flocking agents." in C. Soddu ed. Proceedings of the eighth Generative Art Conference, Milan, Italy, December 15-17, pp. 19-21, 2005.

[4] Daniel Bisig and Tatsuo Unemi: MediaFlies - An Interactive Flocking Based Tool for the Remixing of Media, Proceedings of the 19th International FLAIRS Conference, Melbourne, FL, USA, 2006.

[5] Tatsuo Unemi and Daniel Bisig: Flocking Messengers. in C. Soddu ed. Proceedings of the 9th Generative Art Conference, Milan, Italy, pp. 272-280, 2006.

[6] Tatsuo Unemi and Daniel Bisig, "Identity SA - an interactive swarm-based animation with a deformed reflection." in C. Soddu ed. Proceedings of the 10th Generative Art Conference, Milan, Italy, pp. 269-279, 2007.

[7] Daniel Bisig and Tatsuo Unemi, "Cycles - Blending Natural and Artificial Properties in a Generative Artwork." in C. Soddu ed. Proceedings of the 13th Generative Art Conference, Milan, Italy, pp. 140-154, 2010.

[8] Chris Langton ed., "*Artificial Life*." Addison-Wesley, 1989.

[9] Tatsuo Unemi and Daniel Bisig, "Visual Deformation by Swarm – a Technique for Virtual Liquidizer of Objects." in C. Soddu ed. Proceedings of the 17th Generative Art Conference, Rome, Italy, 2014.

[10] Microsoft, "Skeletal Tracking," Natural User Interface, Microsoft Developer Network, http://msdn.microsoft.com/en-us/library/hh973074.aspx#ID4ENB

[11] OpenKinect, http://openkinect.org , 2011-2013.