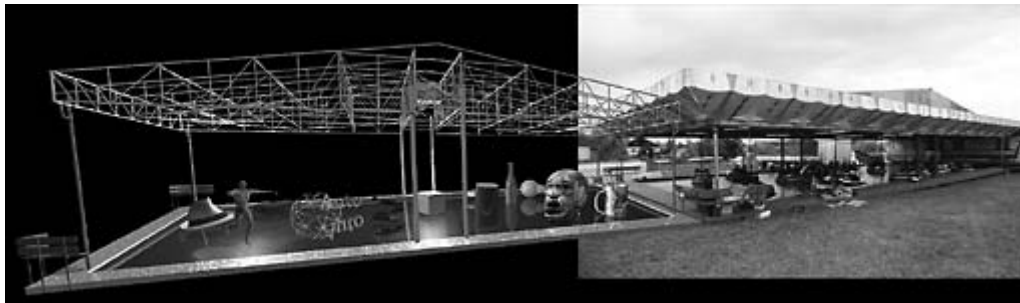


**AUTODROM\*\***  
**CRASHCOURSE**  
**Real World/Virtual World**  
**Stadtwerkstatt**





AUTODROM\*\* — a multimedia experimental array and installation, a lot of fun, an entertaining experience. A crash course in the collision of two worlds at the intersection of Reality Road and the Cyberspace Expressway. AUTODROM\*\* — the man-machine interface, a two-way feedback loop interlinking mankind and the virtual world.

The human-controlled machines moving along an actual test track have their equivalent in virtual space in the form of 3-D characters. An additional computer-generated factor has been engineered into the behavior of these figures — the power failure for a specified period resulting from a collision with one of them, analogous to machines in the real world.

### **Real Space**

The Autodrom — referred to as bumper cars in the US or the dodg'ems in Britain — is a familiar sight at amusement parks, carnivals and fairs. It constitutes the point of departure of our experimental array.

The Autodrom consists of a driving surface made of steel panels, the so-called plate, and a steel grid, the current collector lattice, mounted above it. The bumper cars equipped with a steel mast which slides across the lattice constitute the connection between the plate and the grid. DC current flows through the car once the driver has deposited a plastic chip. The electric motor is activated by means of a pedal and the bumper car gets underway.

What is forbidden in traffic on public streets is completely permissible at the Autodrom: unrestrained bumping, ramming, cutting off and crashing into other cars. The Autodrom is a driving school sans fender-benders as well as an electrified dance floor. But the biggest kick has always been the collisions. The Autodrom — driving school and meet-market.

### **Motion Capturing**

The bumper cars are captured optically by video cameras mounted along the length and width of the Autodrom. Each car is identified by a multicolored reflector. Each camera is connected to a processor such as an SGI Indy, so that one Indy takes the x-axis and one the

y-axis. Picture recognition software localizes the bumper cars by means of their respective reflectors. Position data on all bumper cars is transmitted 30 times per second [i.e., 30 HZ] to a graphic processor. Thus, the motion of the bumper cars can be ascertained in space and time.

### **Virtual Space**

Analogous to the real space of the Autodrom is a virtual three-dimensional Autodrom. Here, virtual characters move about instead of bumper cars. AUTODROM\*\* users are thus really and virtually present.

The position data from the Indys is fed through a network connection to a graphic processor — either an SGI Onyx or, at least, a Maximum Impact. The network protocol used here is TCP/IP socket-based. By means of its own real-time-capable rendering software, the software running on this processor depicts the characters according to the coordinates transmitted from the Indys. And here is where we have inserted our main character Pac-Head, a computer-generated head behaving according to a separate set of rules.

### **Pac-Head**

In contrast to the curving and circling movements of the bumper cars, Pac-Head moves in a straight line, either forward or backward, along either the x or y axes. The Pac-Head operates according to the principle of randomness, and moves at approximately the same speed as the bumper cars, a little over 7 mph. However, the behavior of the bumper cars also effects the steering of the head. It takes place through a neuronal network which takes into account various factors such as the number of vehicles in motion and the ascertainable potential for aggression in the case of a collision. The Pac-Head — the driving force, the king of the road — chases the bumper cars and, as soon as it catches one, gobbles it up.

### **The System's Feedback Loops**

#### **\* Scanner**

Just as real bumper cars have their symbolic equivalents in virtual reality, the Pac-Head as a virtual existence has an analogous form in the real world — the scanner, whose cone of light reproduces virtual movements in the real space of the driving surface.

#### **\* Sound Transmission — Acoustic Signal**

In order for the AUTODROM\*\* drivers to ascertain the location of the Pac-Head, it is represented acoustically in real space. Speakers are set up at the four corners of the driving space; properly controlled, they can spatially position a sound signal. These signals constitute the acoustic world of the Pac-Head.

#### **\* Crash**

The system responds as soon as there is a collision involving the Pac-Head and a character [the symbolic equivalent of the bumper car] as well as the scanner [the symbolic equivalent of the Pac-Head] and a bumper car. That occurs in the following manner: the scanner's cone of light comes in contact with one of the light cells mounted on the bumper cars, where upon the power supply to the vehicle is cut off and it comes to a halt. The Pac-Head simultaneously devours the character in virtual space, which in turn can be heard at high volume in the Autodrom.

#### **\* Projection**

A rear-projection screen mounted along one end of the Autodrom hall displaying the virtual Autodrom in real-time serves as a control display for the AUTODROM\*\* drivers. This is the optical interface making it possible to follow the course of virtual events — a theatrical performance, in which the Pac-Head and the characters play out their games. This display opens up the interplay between real and virtual events in the AUTODROM\*\*.

### **\* The Drivers**

They are really and virtually present. The vehicle is the robot in which the human being is the processor. The course of events is the process which is determined by the behavior of individual drivers with respect to one another. The individual does not act in isolation, but rather in conjunction with other individuals — a chaotic process of random and intended encounters. The human being, in his freedom of movement, is reduced to a single cell which can maneuver in a range with preset boundaries together with other cells on an equal footing — an interaction of man/machine and of man/virtuality. The individual drivers each have a virtual equivalent, a character, an actor who can adopt a role according to his symbolic equivalent in virtual reality.

Through this system, additional functions can now become implicit which make it possible for drivers to achieve additional effects in reality as well as in virtual reality. The spatial radius of operations of the Autodrom driver in the matrix of a limited area is equivalent to the operative range of a computer mouse. Thus, in our experimental array, 12 bumper cars that have been set up for operation are equivalent to 12 mice simultaneously in action on a single user interface, each operating on the same footing — a theatrical performance in which each member of the audience can play a role. Another interactive game from the Rolling™ Art Section of the Stadtwerkstatt/Rivingtonschool.

Commissioned by Ars Electronica. Realized in part within the Ars Electronica Research & Residence Program.

### **Team**

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