Ada:

the Intelligent Room

A multidisciplinary team based at the Institute of Neuroinformatics, ETH, Zurich, was responsible for Ada: the intelligent room, an interactive space conceived of as a human being that responded to visitors at Expo 02, the Swiss national exhibition at Neuchâtel, where it was launched, writes **Lucy Bullivant**.

Imagine a creature that lives, behaves, communicates and feels – and imagine that it is a room called Ada. Ada, the intelligent room, which is far away from any known creature, is a multimodal immersive interactive space developed for Expo 02, the Swiss national exhibition held at Neuchâtel, Switzerland. She was conceived by a multidisciplinary team of 25 people led by psychologist Paul Verschure,[1] working at the Institute of Neuroinformatics,[2] University ETH Zurich in Switzerland.

As an artificial organism, Ada has the ability to interact and communicate with her visitors, but that is because she is a project based on the latest research in neuroinformatics. As project leader Verschure explains, the intention was to trigger a public debate about the application and implication of brain-based technology on our future society. In the context of the growing number of dynamically modifiable components within large multipurpose buildings, Ada, with her high level of behavioural integration and time-varying and adaptive functionality, is a rare exercise in the creation of living architecture.

Named after Lady Ada Lovelace, one of the pioneers of computer science, Ada functioned continuously for 10 hours a day over six months, far longer than the average technical infrastructure found in most art exhibitions. But then the project totally depended upon her real-time interactions. She is a functional creature, programmed to balance visitor density and flow, identify, track, guide and group specific visitors, and play games with them. The experience is well sequenced: visitors approach a waiting area – a 'conditioning tunnel' – where they can witness a staged introduction to Ada's components and their functions. They then enter a 175-square-metre space, an octagonal room where all interaction with Ada occurs.

In a corridor around this space – the 'voyeur space' – visitors can observe the activities without interacting directly. Next they enter the Brainarium, a technical display room that shows the internal processing states of Ada, which has windows providing views into the interaction space. On the way out, visitors can pass through the Explanatorium, a room explaining and discussing the key technologies behind Ada and, if they want to see backstage, the Lab area, the operating room containing more than 30 custom-built computers.

Once visitors are inside the central interaction space, Ada locates and identifies them by using her senses of vision, audition and touch. A 360-degree ring of 12 LCD video projectors has given her advanced visual display capabilities, and these allow her to express her behavioural mode and internal emotional states to visitors. Ada does this by using the screens as a single virtual display; she can render 3-D objects in real time, and display live video. For instance, she records images of 'interesting' visitors and then displays them on the visual synthesiser.

Her 'skin' is made up of 360 floor tiles, each of which is made up of pressure sensors, neon tubes and a microcontroller. Using this extensive surface, Ada can track her visitors, test their responsiveness to visual and sensual cues, and interact with them through different types of games. Local visual effects can also be created with the RGB-coloured neon lights in each tile, rather like a chameleon. A ring of ambient lights sets the overall visual emotional tone of the space, while nine gazer lights with pan, tilt and zoom capabilities make up Ada's 'eyes' (although she does not take the form of a representational concept in this

> Ada locates and identifies them by using her senses of vision, audition and touch. A 360-degree ring of 12 LCD video projectors has given her advanced visual display capabilities, and these allow her to express her behavioural mode and internal emotional states to visitors.

Previous page, top left
Ada's main high-ceilinged space with vibrant illuminated floor tiles undergoing testing before the start of Expo 02. Visitors to the exhibition could stand and move about on the tiles fitted with pressure sensors and change their colours.

Previous page, bottom left
The site of Expo 02 was a platform over the lake of Neuchâtel. Ada was housed in the wooden building under the roof structure on the left. Artificial plastic reeds in the lake bed flashed at night around the perimeter.
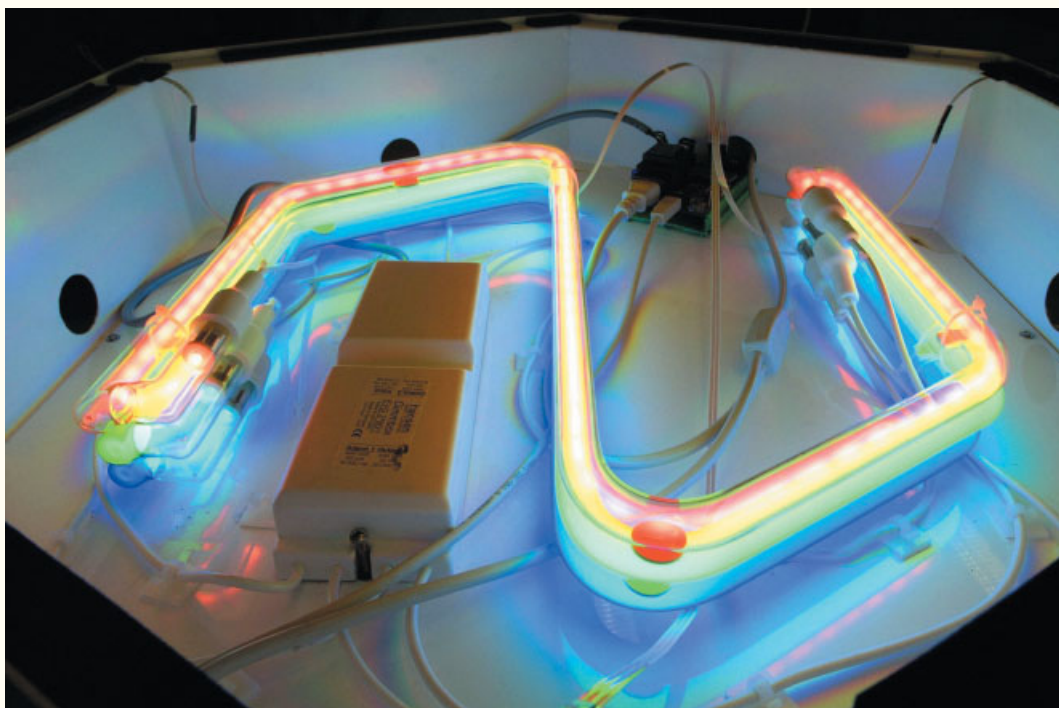
Previous page, bottom right
Promotional shoot for Ada in progress, just before the opening of Expo 02.

Top
A training session for the Ada exhibit guides before the start of the exhibition. Ambient light created an atmospheric setting in the space.

Middle
Inside one of Ada's patented floor tiles, showing the red, green and blue neon tubes, the small control board and the internal cabling.

Bottom
Ada tracked single visitors by lighting up the tiles on which they were standing.

Opposite, top
Ada tracked multiple visitors by lighting up floor tiles, and focusing attention on them with her light fingers.

Opposite, bottom
The 'conditioning tunnel' at the main entrance to Ada. Here, visitors were introduced to her individual elements via a sequence of illuminated wall panels.

also able to perform a simple form of baby talk which imitates what she hears from her visitors. Ada also has a number of movable light fingers for pointing at individual visitors or for indicating different locations in the space.

To convince even the most sceptical visitors that Ada shares the properties of a natural organism, the design team made sure the operation of the space was coherent in real time, understandable to most people and offered a sufficiently rich range of possible interactions for visitors to feel the presence of 'a kind of basic unitary intelligence'. The four basic behavioural functions Ada incorporates – tracking, identifying, grouping and playing with visitors – represent a set of interconnected, interdependent, simultaneously evolving internal processes. This stems from the fact that the underlying software is a mixture of simulated neural networks, agent-based systems and conventional

sense as most robots generally do on some level). Two sets of microphones in the ceiling allow Ada to detect different types of sounds, and where they are generated – a pretty challenging prospect in a noisy and echo-filled space with people constantly milling about, as the design team admits.

Ada's capability in terms of sound effects derives from a synthetic musical composition system called Roboser, that creates a 12-voice behavioural mode controlled soundscape. She is

procedural or object-oriented software. Continuing system upgrades incrementally increased Ada's capabilities throughout the four-month exhibition, so that she interacted with visitors, expressed herself and grew – just like human beings.

The public reaction to the exhibit was overwhelmingly positive, with visitors commenting on their deep and playful experience of Ada. According to the team: 'The different modalities of Ada were balanced so that visitors were drawn into a holistic perspective of artefacts and themselves.' ∆

90