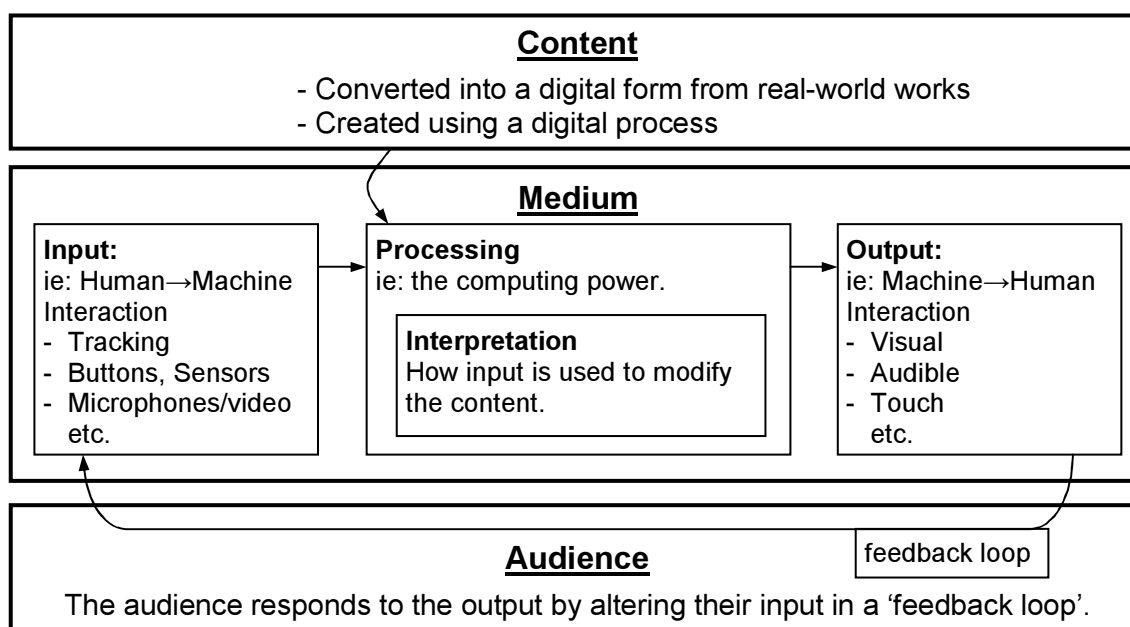


Background on Digital Technology and its use in Art

As a very general description, when an audience interacts with digital technology, it can often be thought of as a process of:

1. **Input:** The audience does something that is recorded by sensors (such as buttons, dials switches, microphones and tracking) and converted into digital input information. For example, if a person uses a touch screen, the position of their finger on the screen is recorded as input.
2. **Interpretation:** The input information is interpreted according to some set of rules, which may be quite standard, or may be defined by the artist. For example, the position of the finger on the screen may be used as the position to draw a mouse cursor, or it may be used to change the volume or pitch of a soundtrack.
3. **Processing:** Some form of computer generally takes this input, applies a given interpretation on it and combines this with some given content to create a result that is ready for output. The content is generally created by an artist, and can be a real-world work that has been converted into a digital form. Using our example, a piece of music could have been composed, performed, recorded and then converted into a digital form. This digital music could then be processed by a computer according to the input and interpretation above, such that moving you finger up and down increases and decreases the volume, and moving your finger left and right increases and decreases the pitch.
4. **Output:** The result of the processing above is then output in some way so that the audience can see, hear, feel, smell or taste it. In our example, the processed music could be output through speakers as sound and/or vibration. Other outputs include computer, TV and projector screens.

The diagram below summarises how this process works.



The technology used in the input and output steps can be drawn from a large library of different tools. Along with the interpretation, these technologies create a medium through which information can be received and transmitted. Content must then be generated that is appropriate for the medium.

The Medium can be thought of as the metaphor or paradigm through which users interact with the content. More traditional examples of mediums can be found in books, television, CDs and PlayStation.

The Content is the material that applies the medium to a given topic. Working from the examples of mediums above, examples of content would be: text and images about rugby, in the medium of a book; video and audio about whales in the medium of television; music by Anika Moa in the medium of a CD; and interactive images, video and audio of the game Halo in the medium of a PlayStation game.

Thus, artists can exercise their creativity in three ways: through creating the content; through designing an appropriate medium; and through designing the interpretation – the method by which the audience can interact with the content via the medium.

Quite often, digital technology is used, but the resulting work is not interactive. In this case, the audience will not be able to do anything that changes the output. This can be thought of as the same process, but without the input stage and often without the interpretation.

Also note the ‘feedback loop’ that connects the output back to the input. This represents that idea that output from the technology can influence the audience, which in turn influences their input in an endless feedback loop.

Different types of input include: Mouse: Ball, Mouse: Optical, Mouse: Force Feedback, Keyboard: Standard, Keyboard: Rubber, Keyboard: Fabric, Keyboard: Virtual, Microphone, Infra-Red Scanner, Tablet, Touch Screen, Joystick, Joystick: Force Feedback, Game Pad, Space Ball, Swipe Card, Cyber Glove, 3D Haptic Control: Cube, 3D Haptic Control: Robotic Arm, Dial and Slider Control, Digitised Sensor Input, Digitised Sensor: Bend, Digitised Sensor: Audio, Digitised Sensor: Dial, Digitised Sensor: Rotation, Digitised Sensor: Slider, Digitised Sensor: Movement, Digitised Sensor: Gyroscope, Digitised Sensor: Accelerometer.

Different types of output include: Visual Displays (see below), Audio, Mouse: Force Feedback, Joystick: Force Feedback, 3D Haptic Control: Cube, 3D Haptic Control: Robotic Arm. Visual Displays include: Projector: Multimedia, Projector: Slide, Projector Screen: Front-Lit, Projector Screen: Back-Lit, Projector Screen: Stereo, Head Mounted Display: Opaque, Head Mounted Display: Semi-Transparent, Head Mounted Display: Miniature, TV Screen (CRT), TV Screen: Rear Projection, Computer Monitor, LCD Screen, LCD Screen: 3D, Plasma Screen, Hand Held Screen, Reflected co-located screen.

While you may recognise some of these technologies, some will likely be completely new to you. The primary aim of the first workshop will be to explain what these technologies are and how they can be used.

Depending on the desired result, almost any type of input can be combined with almost any type of output. Examples of some combinations that have been particularly useful can be found at:

www.hitlabnz.org/index.php?page=projects and
www.mindspacesolutions.com/html/solutions.html

An Example of Input and Output Technology – Augmented Reality

One type of technology that the HITLabNZ has specialised in developing is that of Augmented Reality (AR). AR makes virtual, 3D objects appear in the real world, attached to real objects. Users look through an AR Visor to see virtual objects like planets, volcanoes, the human heart or dinosaurs. These can be attached to cards, the pages of a book, the chest of their friend or even on the floor or wall to provide a 3D animated replica that fills the room. AR can also be highly interactive, letting users erupt a volcano, build a human heart or pull planets out of the solar system for closer inspection.

AR is both an input and an output technology. Three mediums that currently use AR are:

Book. This is usually presented as text on one page and a virtual object on the facing page. The book is mounted on a turntable for freedom of movement while remaining secure. The kiosk can also use an optional slider, which interacts with the virtual objects. The slider is generally used to move virtual objects through space or animate them over time.

Workspace. This is a tabletop, often monitored with an overhead camera. The user can move cards containing virtual objects around the surface of the table. Many interactions are possible, such as objects colliding with other objects, objects entering into certain “hotspots”, or objects changing (or affecting other objects) according to their distance from objects or hotspots. In addition, cards can be treated as paddles, so they can be used to scoop up objects and place them somewhere else. A paddle can also be used as a “magic lens”, which can alter the object within its view. Alterations can include enlarging objects, seeing through the outer surface of objects to reveal internal structures, or overlaying different information on the surface of the object.

Mirror. The user walks up to a back-projected image on a large screen. A camera is incorporated into the screen looking out at the user and this image is displayed on the screen. This makes the screen into a mirror, in which the users can see their reflections. When users pick up real objects such as hats, masquerade masks or attachable cards, the real objects are replaced by virtual objects. The user can experiment with using different objects in different ways and learn about these objects in the context of their body and the real world.

