Overview of Show and Exhibit Control

by Garry Musgrave, CTS-D

Originally published: January, 1997
Last updated: January 2001

Courtesy of: Conceptron *Associates*

Abstract

Exhibits and themed attractions increasingly rely on automated audio-visual components. Often, these must interact with the visitor, work together, or be synchronised to program material. A variety of technologies and systems are available. Although they are all viable, it is important to select the correct solution for a particular project.

CAVEAT: Any article written about show control technology has a limited life – this technology can change significantly in a year. A two-year old article may be out of date – we will try to update this article periodically (check the mast head for the update date).

Definition

Show control refers to any automated system that controls presentation devices in response to events. These events are usually either time-based (e.g.: time-code from a running audio or video program) or on-demand (e.g.: a visitor pressing a button or otherwise activating a sensor). Typical examples of the latter might be: motion detectors, optical sensors, capacitive sensors, pushbuttons (including host start), or a ride car tripping a limit switch. Typical controlled presentation devices are: lights, motors, projectors, audio and video storage devices, media routing and switching devices, and even other control systems.

There are a variety of methods and technologies that can be used for show or exhibit control. There is no one perfect controller – the choice depends on the specific application.

Embedded Controllers

For control of a self-contained exhibit, an embedded controller is often a good choice. These were originally designed to be built into "*smart*" products – their compact size and low power consumption allow them to be easily built-in. They are a good choice when the control is relatively simple, and the exhibit should either continuously loop or respond to an external trigger. You can choose from a variety of formats:

PIC – a single chip, operates from a battery, multiple digital and serial inputs and outputs, programmable from an external PC; extremely inexpensive (generally under $100 US); a variant, the **STAMP**, is programmable in BASIC;

SBC's – **S**ingle-**B**oard **C**omputers – contain a complete diskless computer with I/O; easily programmable from external PC or laptop; wide variety of input/output options; relatively inexpensive (generally under $1K US);

PC/104 – a particular standard for single-board computers – 3.5" x 5", operate on 5VDC, contain complete PC motherboard with basic input/output control, many peripherals available; relatively inexpensive (generally under $1K US);

There are several other dedicated systems that are similar to SBC's, but are generally larger and have increased or special capabilities; one example is the **Mensch computer** with an array of features (two PCMCIA slots, joystick port, plus speaker and headphone output) for under $400 US, or about $900 with keyboard and LCD display. There is also a product from **ICL (PC On A Stick)** that contains a 386 PC with 2Mb of flash disk and up to six serial ports – operates from a 9V battery, is 4.25" x 1.25" in size, and costs well under $400 US!

PLC's

Programmable **L**ogic **C**ontrollers are an inexpensive, but versatile solution to many exhibit control problems. They were originally intended for industrial control, and are used in assembly line and factory automation. These consist of a main unit, with optional expansion modules that simply attach. Both can contain a large number of inputs, relays, plus analog and serial outputs. They are programmable using an external PC, and can be a good choice for looping or demand situations. They are particularly suited for situations where the program must respond differently to different combinations of inputs (e.g.: do this if the visitor trips the motion detector, but do something else if a button was pushed first, and yet something else if a mode switch is set).

DVD and Laser Disc Controllers

No discussion of exhibit control would be complete without reference to this specialised type of controller that is often used. These are black boxes designed to control one or more DVD, Laser disc, or hard-disk video players via serial control. They usually allow a looping program (called an attract sequence) to play when the exhibit is idle. When a button or touchscreen is activated, they cause the video player to play a particular portion of the disc or hard drive. Many also have basic auxiliary control (such as a few relays) that can be used to turn on lights or motorised elements to complement the video clip. Some have auxiliary inputs that allow mode setting, programmable loop delays, etc. There is a variety of these devices available, with varying capabilities and costs.

Kiosks

Kiosks and other self-contained interactive presentations are a special case. The choice of controller depends on the program material. If the presentation is pure video, a DVD controller and one or more DVD players (or a hard-disk video player) will be used. If the presentation is multimedia only, a dedicated multimedia computer will be used. Occasionally a presentation consists of both video and multimedia material (with graphics often overlaid on the video). In these cases, a dedicated multimedia computer may still be used in conjunction with video sources controlled via the computer's serial ports. If a touchscreen and multiple video players are used with this latter type of presentation, a multi-port serial card will need to be provided.

A special kiosk application involves access to the internet – sometimes called a public internet access terminal. Like a multimedia kiosk, a dedicated computer is used either with a touchscreen or an industrial trackball. A few local pages are provided (i.e.: accessed from the hard disk of the local computer) with links to various internet sites – usually relating to the topic. Key requirements: internet browsing must be restricted only to permissible sites; an attract screen is often required – the system should automatically reset to this attract screen when abandoned by a visitor; and the interface must be bullet-proof (i.e.: the visitor must not be able to minimise or resize the browser or access any other aspects of the host computer). This is all accomplished by using a special kiosk browser software application. There are a variety of these available, and they differ widely in features an ability to customise the user interface.

Show Control Systems

Ultimate control is achieved with a show control system consisting of a programmable core and a collection of hardware modules connected together (generally via some form of networking) to control a large number of devices of varying types, as part of a complete presentation or show. Often, a specialised software package is used to program them. A good choice if you have a large, complex control need; particularly if the program will change periodically (e.g.: a planetarium show).

Within this group are a variety of systems designed for specific applications. A few examples:

- **boardroom** controllers (e.g.: **Amazing Controls**, **Crestron**, and **Panja**); can sometimes be used for interactive displays;
- **audio-visual** control systems (e.g.: **DATATON**); can lend themselves to general-purpose control;
- systems designed specifically for **themed attractions** (e.g.: **Alcorn McBride**, **Avenger**, **Gilderfluke**, **MediaMation**, and **Triad**);
- **live show automation** systems (e.g.: **RSD**);

- **planetarium** control systems (e.g.: **East Coast Controls**, **Omni Q**, **Sky-Skan**, and **Spitz**);
- **videowall** controllers (e.g.: **Electrosonic**, **Imtech**, and **GVC**).

This is not intended to be an exhaustive list, merely representative – there are other categories, as well as other manufacturers. Some of these systems cross over into other categories. While all the named systems are excellent controllers, no one of them is the ideal solution for every application. Again, the key to selecting a system is to evaluate its capabilities vs. the requirements of the particular project.

Communication Between Controllers

Often controllers must "*talk*" to other controllers. There are a variety of ways in which this can be done:

RS-232 a basic serial protocol; not very sophisticated, and may be limited in distance without additional hardware; an acceptable choice for simple communication needs;

RS-422 a slightly faster and more noise immune method; a virtual standard for the control of some broadcast equipment (such as VCR's);

RS-485 a much faster and more noise immune method; often used internally in larger systems as part of their proprietary inter-communication scheme;

LAN generally uses TCP/IP protocol; simple to implement, and an excellent choice under certain conditions;

MIDI MIDI Show Control is useful for communications between various control systems, particularly for live show automation;

MediaLink a very flexible networking scheme that is most useful for live show control;

There are several other protocols and communication systems. Some are special purpose such as **V-LAN** for video control; **AES-24, AudioNet**, and **IQ 2000** for audio control; and **IEEE-1394** (**FireWire**) – designed primarily for compressed digital video and audio distribution, this can also be used for control.

Presentation Device Control

There are almost as many ways of communicating between a controller and the presentation devices as there are devices. Here are some examples:

Relays can be used for basic ON/OFF functions (e.g.: simple motors and lights). More elaborate lighting control can be done with **DMX-512**, **MIDI**, or even **0-10VDC** analog. Precision motor control can involve analog voltages, TTL, pulses, or serial commands. Video projectors, routing switchers, video and audio sources, computer systems, and other devices can be controlled by **RS-232** serial commands. Film and 35mm slide projectors are often controlled with a black-box interface that might take a variety of control inputs. Audio devices can be controlled by serial commands, **MIDI**, or a specialised protocol.

Common Pitfalls

The most common mistake we have seen is selecting the wrong system for the needs of the project. This often results in unexpectedly long programming time or expensive custom add-ons to make the system work properly for the intended use. These custom add-ons are a potential source of problems since they are often unproven (i.e.: *you* are the guinea pig) – and often unnecessary, if a system with the needed capabilities was selected in the first place. Often, these kluged systems prove erratic or don't work exactly as envisioned, resulting in a compromise of the exhibit experience. This situation usually occurs when a vendor or manufacturer (or "*consultant*" who also sells equipment) tries to shoehorn their particular product into your project.

Summary

Of the various systems discussed, which is the best control system for a project? It depends! All of the technologies and systems discussed can be applied in almost any given situation – with varying degrees of success. The trick is to select the right tool for the job. Each control solution has strengths and weaknesses (although vendors generally don't mention the latter). The key is to analyse the control needs of the project, and to select the technology that will most efficiently accomplish the goals (immediate ***and*** future), bearing in mind programming and budget.

Conceptron Associates *provide a total solution to the audio visual, presentation, and media design aspects of your projects. We are completely independent of any audio-visual manufacturer, A/V equipment vendor, or A/V contractor. As consultants, we design and specify video, presentation, multimedia, audio, and show control systems. Our audio visual design projects have included: exhibits, planetariums, mixed-media theatres, expositions, museums, theme parks, science centres, conference facilities, sports arenas, and institutions. Our principal has over 20 years of audio-visual design and consulting experience, including pioneering experience with interactive theatres. We can be reached at* ***(800) 871-4161*** *or on the web at http://www.conceptron.com/.*

Copyright © 1997, 2001 Conceptron Associates – All rights reserved.