MD755

Programmable Motion Sensor

for BrightSign® Solid State Digital Sign Controllers

Quick Start Guide

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Introduction

Features

The MD755 is a motion sensor designed exclusively for BrightSign interactive display controllers. No power supply is needed; simply plug the sensor into the player's GPIO port and boot your presentation. Here are some of the more popular MD755 applications:

- Trigger play lists and other presentations
- Dynamically control audio levels
- Power management of unattended displays
- Traffic-based playlist decisions
- Create branches in a presentation
- Activating mechanical attractions

Case Styles

To accommodate various installation requirements, the MD755 is available in three styles as shown in Figure 1.1.0. Apart from having different mounting or cabling options, each is functionally identical and has the same performance characteristics.

- 755-STD – Stick-on using either double sided foam tape or Velcro® adhesive strips.
- 755-FLG – Slotted tabs for installation using fasteners and support hardware.
- 755-PCB – Sensor board assembly for instalation within custom enclosures and panels.

755-STD

755-PCB

755-FLG

Figure 1.1.0
Sensor Styles

Detector Performance

The MD755 uses PIR (Passive infrared) technology to identify movement within a range of 5 meters or 16 feet. Detection accuracy and performance is enhanced through a design that can distinguish between actual movement and objects that appear to be moving because of their heat signatures.

Motion is detected when a body enters a cone-shaped hotspot having greater coverage side-to-side than top-to bottom as shown in Figure 1.1.2. This detection pattern makes it possible to better control and adjust what the sensor "sees". It also makes triggering more predictable since you're able to adjust the detection area.
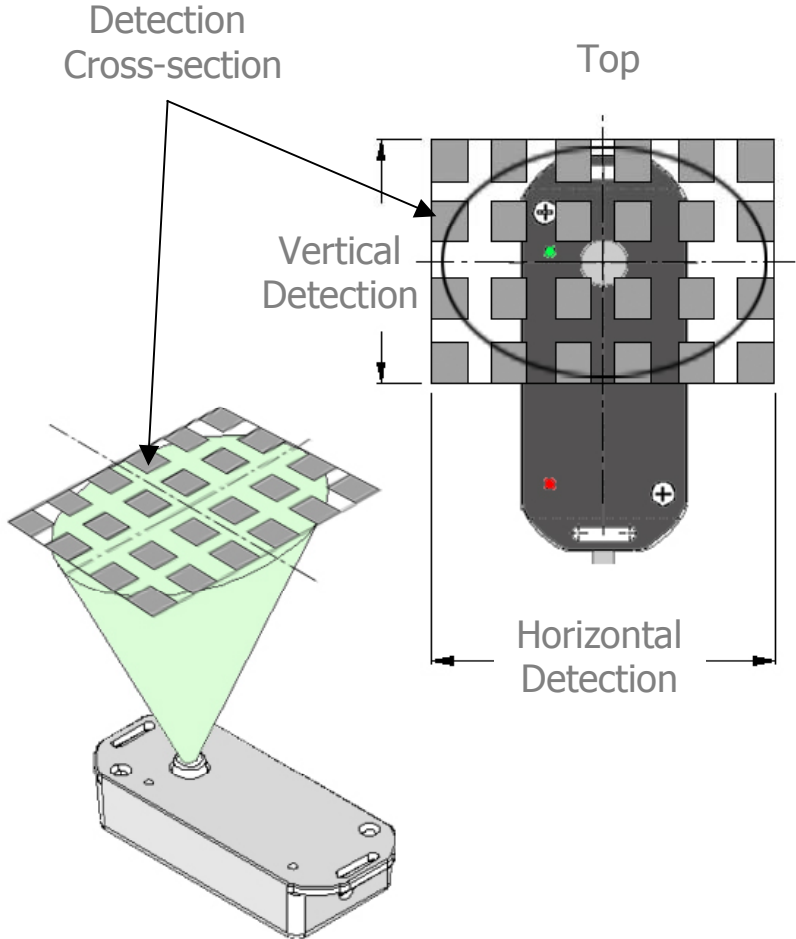
Detection
Cross-section

Top

Vertical
Detection

Horizontal
Detection

Figure 1.1.2
Detection Pattern

Detection Zone

When using the sensor in sunlit areas, detection may be affected by the light's far infra red components. In general, try to avoid placing the sensor in these areas. For more performance and environmental considerations, refer to the MD755 User Guide.

> ⚠️ **Note: The MD755 will not work if placed behind a transparent surface such as glass or clear acrylic. The sensor's lens must be directly exposed to the detection environment.**

The MD755 can be installed a number of ways to suit your application. Like a camera, the area that the sensor "sees" can be controlled simply by adjusting which way it points. The amount of coverage will depend on how much distance the projected detection zone is allowed to cover. The table in Figure 1.1.4 gives the coverage area (x,y) at a given distance. For example, the sensor will cover an area of about 85" side to side and roughly 61" top to bottom at a distance of seven feet.
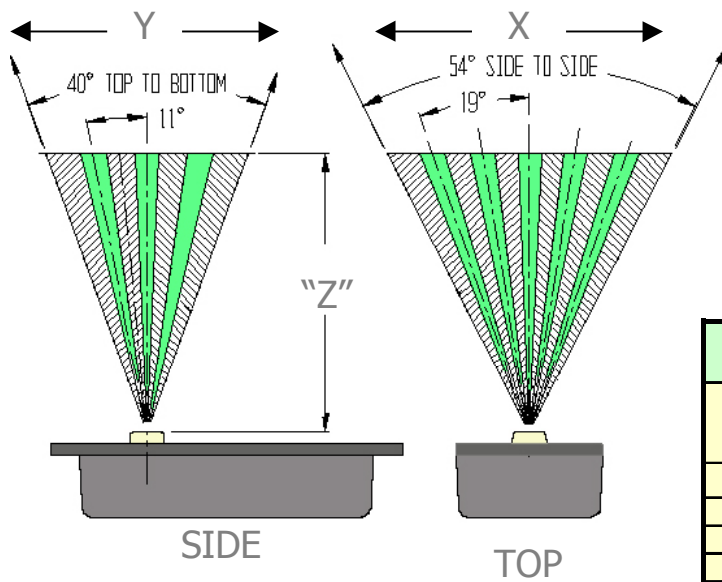
@ Distance of 94" (7')
85" Side to Side
61" Top to Bottom
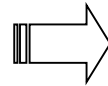
Detection Coverage					
Distance from Sensor (Z)		**X Coverage**		**Y Coverage**	
meters	feet	meters	inches	meters	inches
0.3	1	0.3	12.22	0.2	8.74
0.6	2	0.6	24.46	0.4	17.48
0.9	3	0.9	36.68	0.7	26.2
1.2	4	1.3	49.52	0.9	34.94
1.5	5	1.6	61.14	1.1	43.68
1.8	6	1.9	73.38	1.3	52.42
2.1	7	2.2	85.60	1.6	61.14
2.4	8	2.5	97.82	1.8	69.88
2.7	9	2.8	110.06	2.0	78.62
3.0	10	3.1	122.28	2.2	87.36
3.3	11	3.4	134.52	2.4	96.08
3.6	12	3.7	146.74	2.7	104.82
4.0	13	4.0	158.98	2.9	113.56
4.3	14	4.3	171.20	3.1	122.3
4.6	15	4.7	183.42	3.3	131.02
4.9	16	5.0	195.66	3.5	139.76

Figure 1.1.4
Detection Area Coverage

Sensor Placement

Figures 1.1.5 and 1.1.6 show some of the ways you can set up a BrightSign display using the MD755. Clearly, the setup for an application such as the tabletop-mount example will have a more compact detection zone as compared to the forward-looking installation.
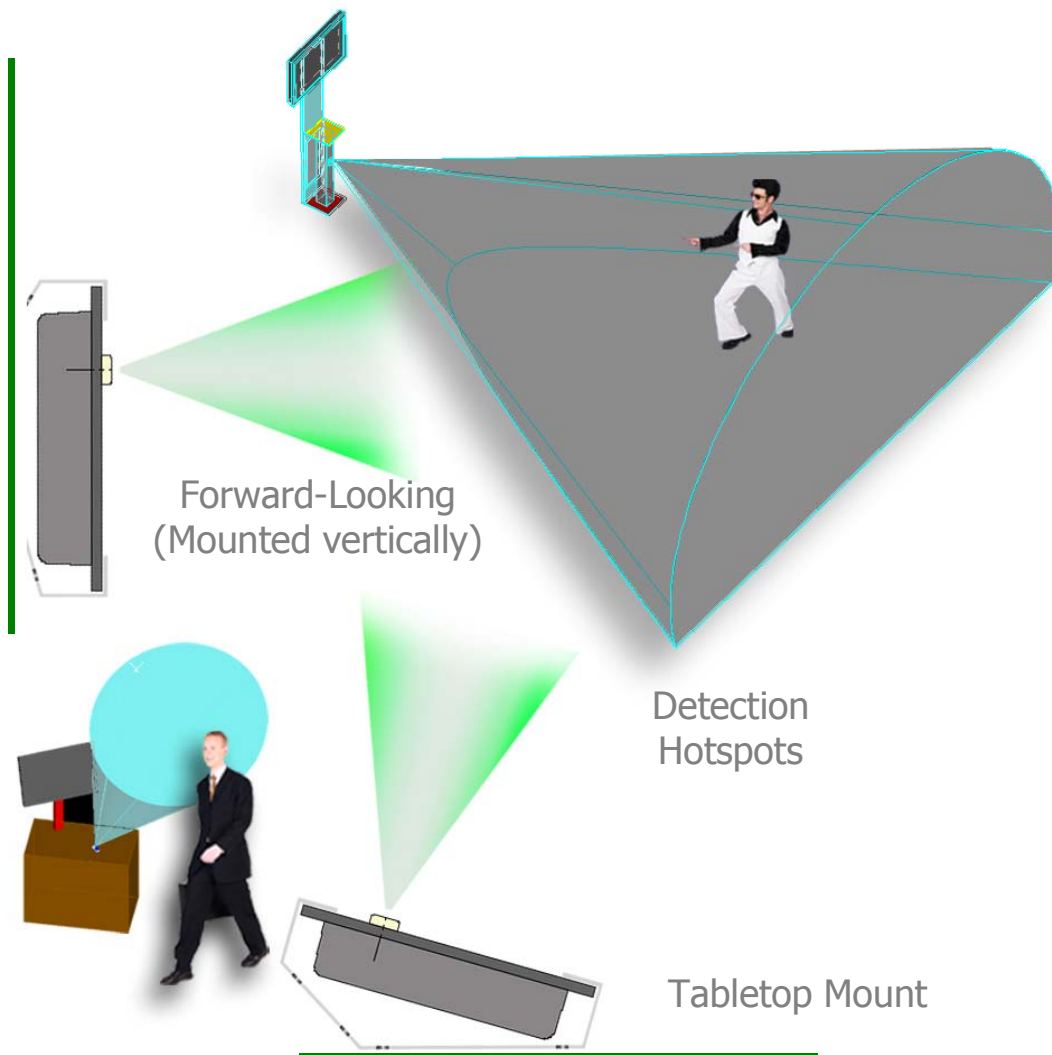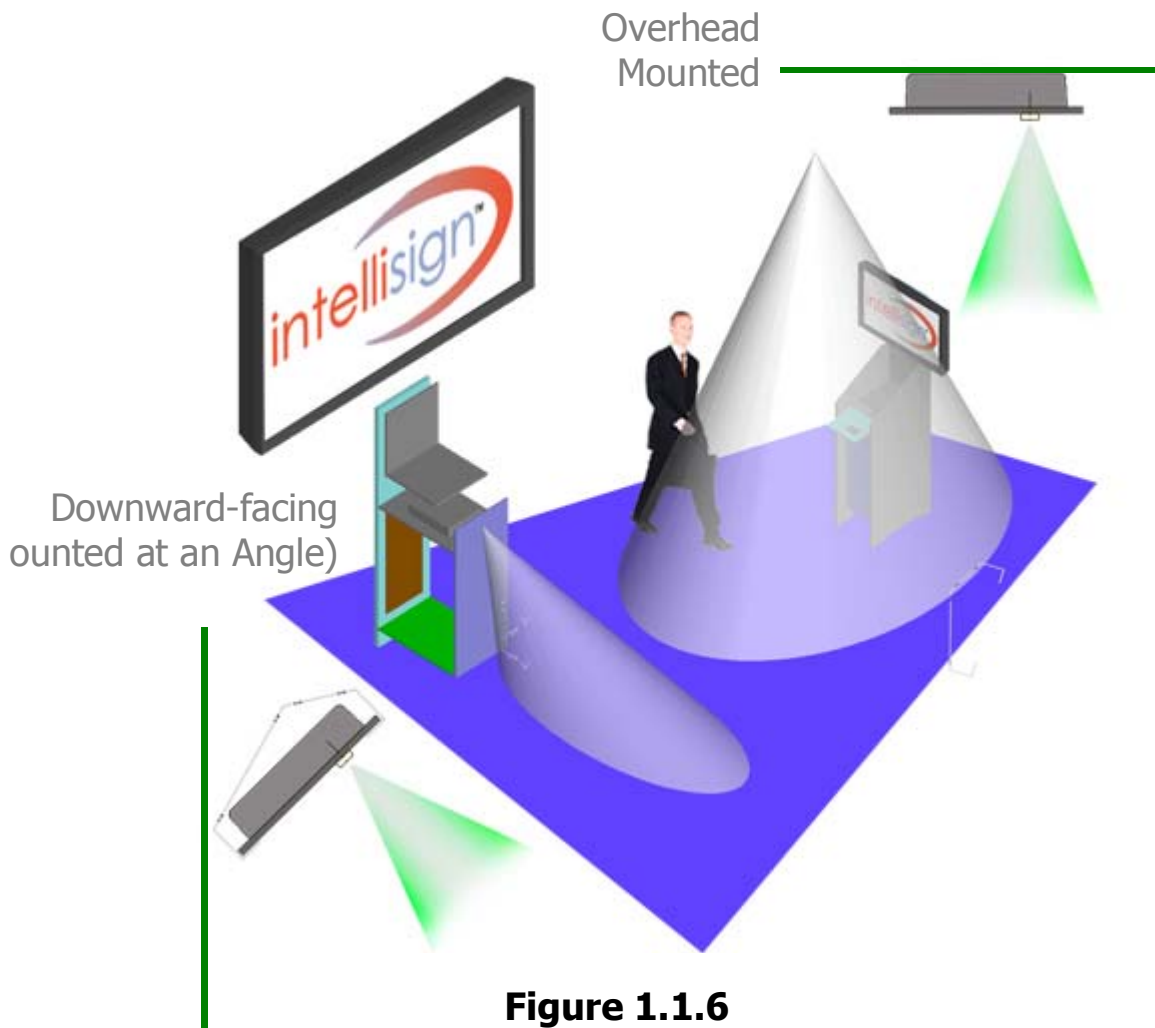

Forward-Looking
(Mounted vertically)

Detection
Hotspots

Tabletop Mount

Figure 1.1.5
Sensor Setups

Overhead
Mounted

Downward-facing
ounted at an Angle)

Figure 1.1.6
Sensor Setups - 2

Connecting the Sensor

> ⚠️ **The MD755 is intended for indoor use. Disconnect power from the BrightSign controller prior to making any connections.**

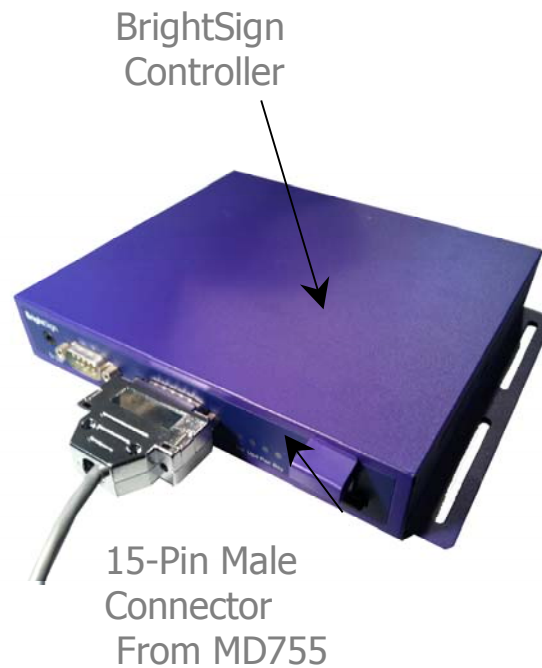**Step 1)**   Place the sensor at the desired location and face it towards the area to monitor.

BrightSign
Controller

15-Pin Male
Connector
From MD755

Figure 1.1.7
GPIO Connection

Step 2)   Plug the sensor into the controller's GPIO port connector.

Step 3)   Re-connect power and verify that the BrightSign controller boots properly and is supplying power to the MD755 (green LED indicator on).

Step 4)   Verify basic trriggering operation. (This doesn't require any particular presentation); Generate some motion near or arround the sensor. The red LED should turn ON indicating that the sensor has triggered. Likeise, verify that the sensor rearms under no-motion conditions.

> **-The red LED should turn OFF after 10 seconds after all motion has stopped.**
>
> **-If Step 4 failed to trigger or rearm, it is most likely because the player was started using incorrect GPIO-2 Settings. Refer to the MD755 User Guide: Part 2 –Sensor Reset.**

Step 5)   Verify BrightAuthor triggering

- Create and publish a simple BrightAuthor presentation containing Button Events B0 and B5 and publish it to your BrightSign player. An example of a basic motion-triggered presentation can be found in on page 17.

- Restart the controller after the test presentation has been published. Refer to the BrightAuthor User Guide for information on uploading content.

Step 6)   Find the best position for sensor.

- While the presentation is running, experiment with placing the sensor at different locations and various angles. Although the coverage data given in Figure 1.1.4 is fairly accurate, trial and error is often the best way to fine-tune the sensor's placement.

When you're satisfied with the sensor's triggering, complete the installation using one of the methods explained in the following sections.

Installing the Sensor

The MD755 can be mounted a number of ways. Regardless of method, cabling should always be secured to keep it from being pulled. This is especially important near the mounting point. A zip-tie with an adhesive mount is recommended as shown in Figure 1.1.8.

Velcro Adhesive Strips
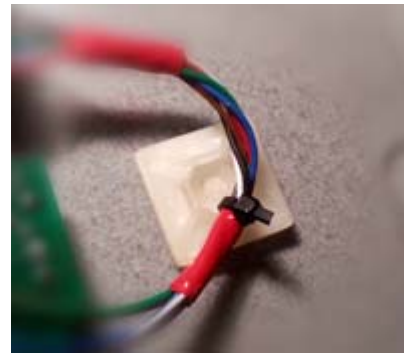
Zip-Tie with Mount

Figure 1.1.8

Adhesive Tapes

The quickest way to get up and running is to attach the sensor to a clean, suitable surface using the supplied Velcro strips or double-sided tape. This allows it to be easily attached and removed and is suitable for temporary displays such as trade show exhibits. If you have a flange style enclosure (MD755-FLG), the stick-on adhesives allow you to experiment with placement before deciding on a permanent location and securing it with fasteners.

Circuit Board Mounting (MD755 –PCB)

The MD755-PCB is available for custom behind or above panel installations such as kiosks, information booths, and display pedestals. Apart from a more personalized look, installing the sensor within your enclosure will conceal the sensor while protecting it from being damaged or vandalized. The sensor board assembly (MD755-PCB) includes the board, interconnect cabling, and mounting hardware.

Refer To MD755-User Guide for complete installation details.

Motion Triggers

Pushbutton Emulation

BrightAuthor has a variety of Interactive Events that you can incorporate into your BrightAuthor presentations. Each interactive event responds to unique "trigger" inputs. For example, the familiar Timeout Event uses an *internal* clock to trigger a media transition. Other Interactive Events rely on *external* triggers received via the controller's I/O ports. For more information on BrightSign interactive functions, refer to the BrightAuthor User Guide.

GPIO Events

The MD755 uses BrightAuthor GPIO Events to implement the motion triggers that cause the media transitions. This event uses a familiar push-button analogy when referring to the action of the GPIO triggers. Hence, the MD755 also uses this easy to understand convention.

There are three dedicated GPIO channels for triggering playlist items and one input line used to control the sensor:

- GPIO-0 : "Button 0" – Button "Down" emulation
- GPIO-1 : "Button 1" – Repetitive Pushbutton
- GPIO-2 : "Button 2" – Used for Sensor Reset
- GPIO-5 : "Button 5" – Button "Up" emulation

Button 0 – "Down"
Buton 1 – "Down"
Button 5 – "Up"

FIGURE 2.0

For example, to trigger a media transition when motion is first detected, use a Button 0 event. The following sections explain the behavior of each MD755 motion trigger.
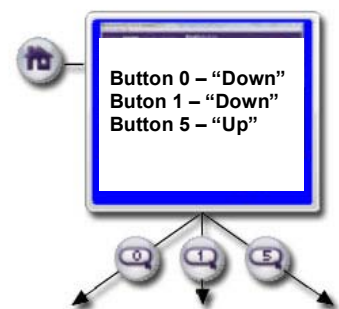
GPIO-0 Button "Down" Emulation

The MD755 uses GPIO-0 to send an emulated button "push" to the controller. In BrightAuthor, the trigger is handled by the corresponding Button 0 event. A "Down" trigger is generated on the initial detection of motion as shown in Figure 2.1. A more detailed diagram showing all of the MD755 motion triggers in relation to the detection signature is shown in Figure 2-A.

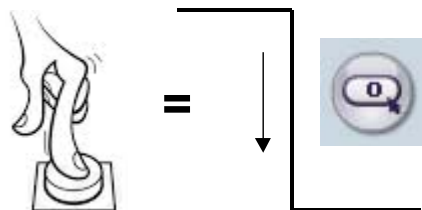The most common application for the GPIO-0 trigger is to start a media clip's playback.

FIGURE 2.1

GPIO-5 Button "Up" Trigger

In BrightAuthor, use Button 5 to trigger playlist items at the *end* of the sensor's hold time cycle, which is also the moment the sensor re-arms. In other words, Button 5 triggers the moment Button 0 is "released".

Buttons 0 and 5 can also be applied to the same media item to achieve a various results. Refer to the MD755 User Guide for application examples.
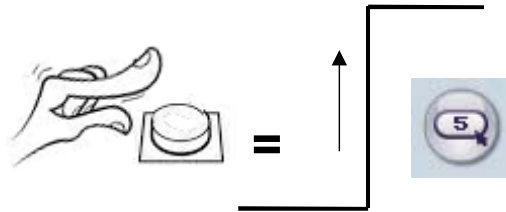

FIGURE 2.2

GPIO-1 Repetitive Trigger

The GPIO-1 trigger is a real-time representation of any motion that is detected around your display. Mechanically, it emulates the actions of repeatedly pressing, holding, and releasing a pushbutton.

Unlike the other triggers, GPIO-1 has no hold or release time, that is, the duration of the trigger pulse is as long as that of the motion itself. With no hold time, each detection pulse is treated as an individual trigger as shown in Figure 2.3.
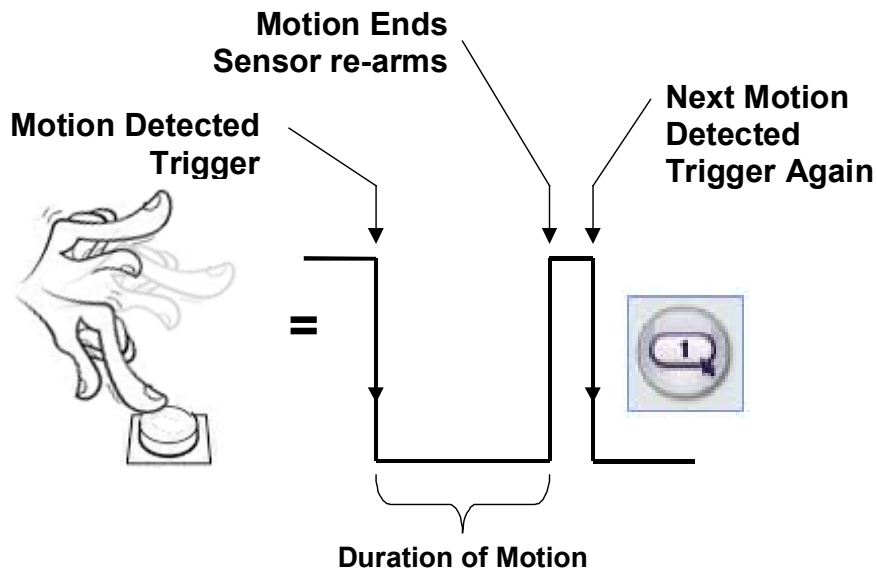

FIGURE 2.3

If there is non-stop movement in the area of the sensor, the trigger will produce a single continuous button "down" emulation, making it unreliable for use as a primary trigger.

However, since GPIO-1 is directly related to every occurrence of detected motion, the signal can be considered a reasonable indication of the *amount* of traffic around your display. The signal could also be coarsely related to the *number* of visitors that have passed by.

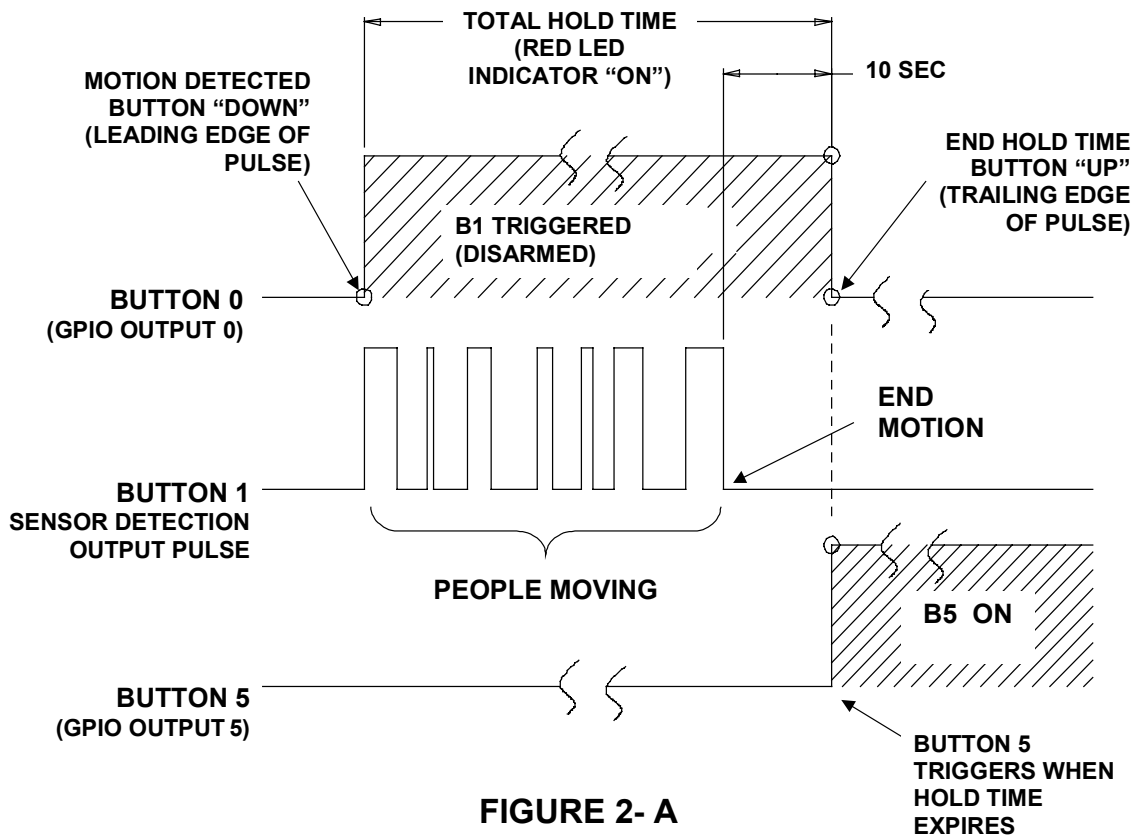However you interpret the GPIO-1 trigger, it can be cleverly applied in presentations that use logic to

FIGURE 2- A

conditionally decide what content to display. Example 6 - "Counting Motion" applies variables along with conditional events to gauge motion across a specified time period, and will determine an appropriate transition clip.

The output of GPIO-1 is always available, regardless of whether or not the sensor is triggered, enabled, and/or has entered the hold state.

GPIO-2 Sensor Enable/Disable

By default, the MD755 will automatically rearm ten seconds *after* the release of a motion trigger "button". See the timing diagram in Figure 2-A. This default works well for most applications since the hold time is long enough to suppress ret-riggers, but short enough so as to not miss other triggering opportunities. However, hold time also accumulates as motion continues to be detected. Consequently, the sensor may never get a chance to rearm.

Refer to the complete MD755 User Guide for more details.

Trigger Timing

From Figure 1-J, we see that each trigger has a unique timing that is derived from the detection pulse signal. The detection pulse is also available as GPIO-1 and marks every occurrence of detected motion and is available to use as a trigger via Button 1.
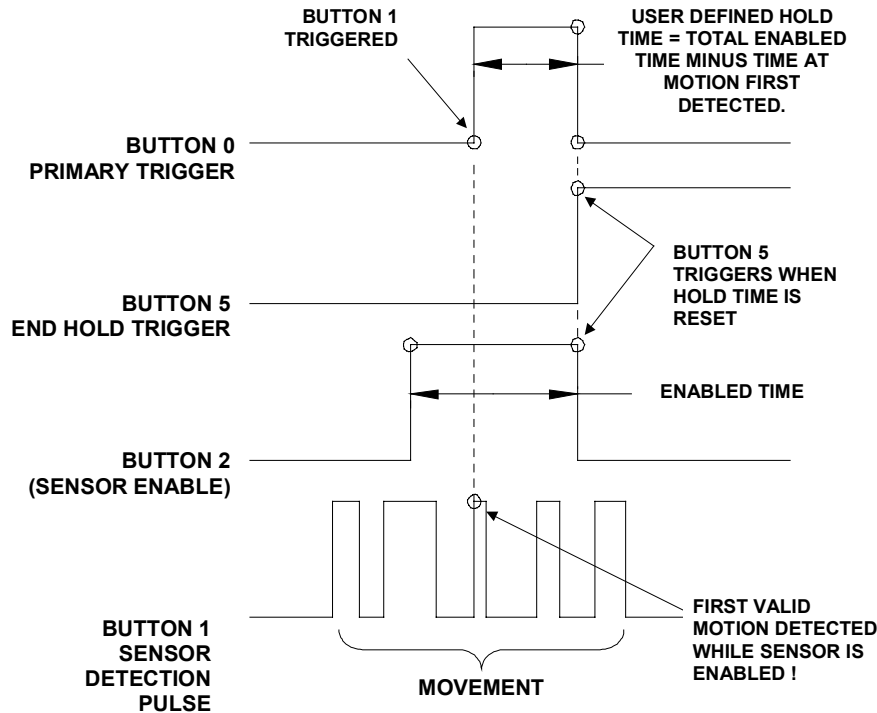
BUTTON 1
TRIGGERED

USER DEFINED HOLD
TIME = TOTAL ENABLED
TIME MINUS TIME AT
MOTION FIRST
DETECTED.

BUTTON 0
PRIMARY TRIGGER

BUTTON 5
TRIGGERS WHEN
HOLD TIME IS
RESET

BUTTON 5
END HOLD TRIGGER

ENABLED TIME

BUTTON 2
(SENSOR ENABLE)

FIRST VALID
MOTION DETECTED
WHILE SENSOR IS
ENABLED !

BUTTON 1
SENSOR
DETECTION
PULSE

MOVEMENT

FIGURE 1- J

Default Hold Time

The moment the MD755 detects motion, it enters an initial hold state. If no further activity is detected beyond the initial trigger, the sensor will re-arm in ten seconds. However, continuous motion will cause the sensor to accumulate time thereby prolonging its hold time indefinitely. This feature in intended to prevent playback interruption. The default hold time can be user adjusted. Refer to the complete MD755 User Guide for more details.

LED Indicators

When testing your presentations, it helps to have the sensor nearby in order to see the LED status. A red LED indicates that the sensor has been triggered. The red LED will remain on until the hold time counter has expired.

By controlling the enable time in BrightAuthor, you can define your own hold time delay. Example 5 explains a practical way to overcome the limitations of the sensors built-in 10 second hold time.

Combining Motion Triggers

Event triggers, including those used by the sensor, can not be applied to the same clip twice. However, all three MD755 triggers as a group can be applied simultaneously as shown in Figure 2.0, provided that none of their settings conflict. One setting in particular is that which defines how a button should respond when "pressed" and is explained more in the following section.

A group of different motion triggers can work together to independently monitor their respective GPIO ports and trigger accordingly. Using multiple motion triggers is especially useful for dynamically toggling the value of settings. For example, Use Button 0 to set a transition's variable, while Button 5 can be used to "un-set" it.

Triggering BrightSign Playback with Motion

How it Works

The MD755 has three unique triggers that can be used in a presentation. In this example, we'll apply Button 0 and Button 5 to start and stop certain playlist items.

Starting Playback using Button 0 Events

The presentation shown in Figure 3.1.2 takes advantage of the reciprocating behavior of Buttons 0 and 5. On startup, the BrightSign plays the "Intro" clip until the sensor detects motion. The detection signal will in turn trigger the Button 0 event and the transition to the "Main" clip.
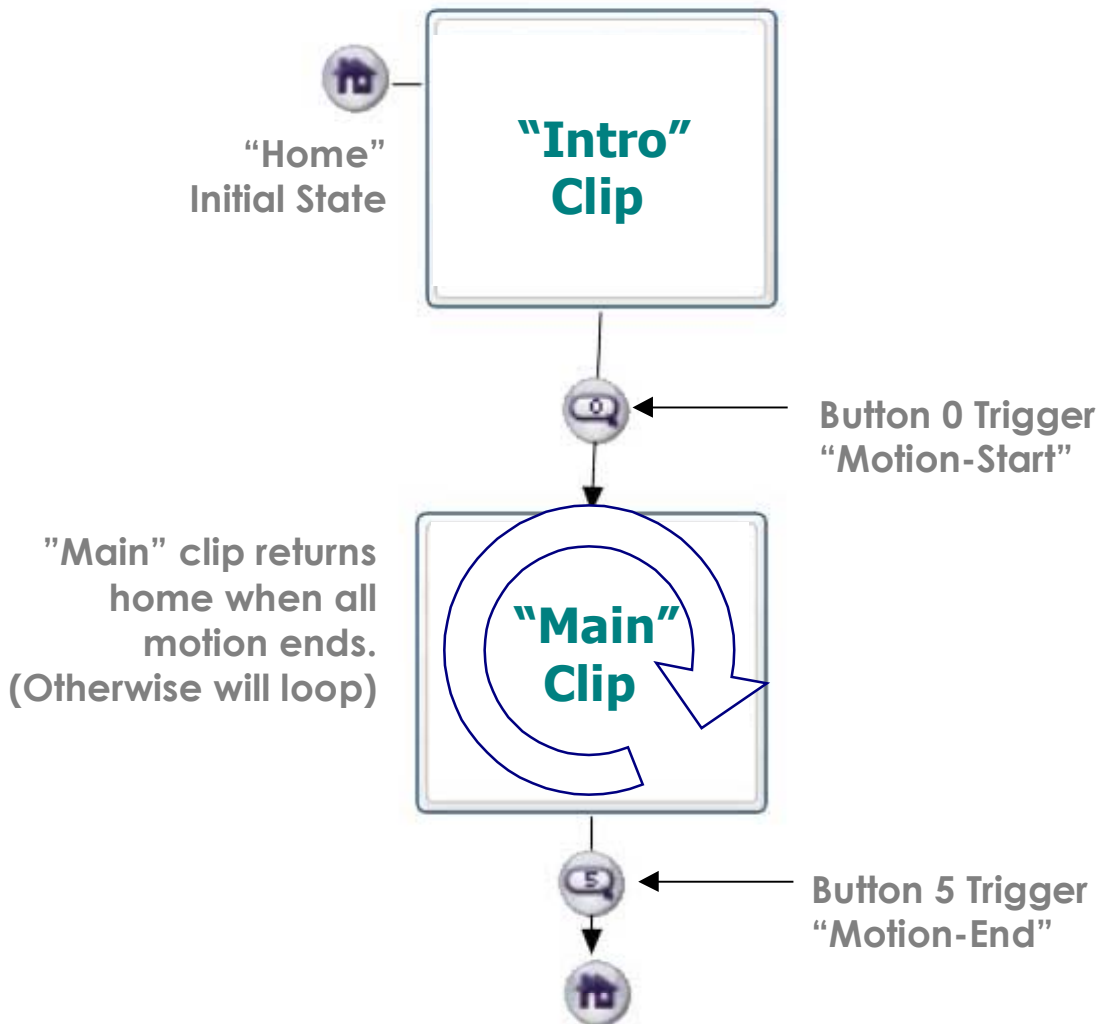
"Home"
Initial State

"Intro"
Clip

Button 0 Trigger
"Motion-Start"

"Main" clip returns
home when all
motion ends.
(Otherwise will loop)

"Main"
Clip

Button 5 Trigger
"Motion-End"

Figure 3.1.2
Simple Two -Trigger Presentation

Interrupting Playback using Button 5 Events

Following the Button 0 transition, this would be the presentation's final action if no other event transitions were specified; a video clip would loop indefinitely, and an image would resort to its default timeout setting. In this case however, the clip's playback is interrupted when motion ceases and triggers Button 5 which in turn will return the presentation to its initial (Home) state.

Practical Design

If you plan on using this triggering strategy in your particular application, you'll most likely run into a few problems since the authoring does not anticipate varying amounts of viewer traffic. For example, if there's no initial motion, the presentation will "hang" on the opening clip. On the other hand, non-stop motion will prevent the sensor from ever re-arming. In either case, a few simple refinements need to be added to better handle these common situations.

There's another caveat in this example presentation; continuous movement within the detection zone will prevent Button 5 from rearming and thus will not return the presentation to its initial home state. Therefore, a practical presentation should always include alternate media transitions to ensure proper presentation flow as shown in Figure 3.1.4.
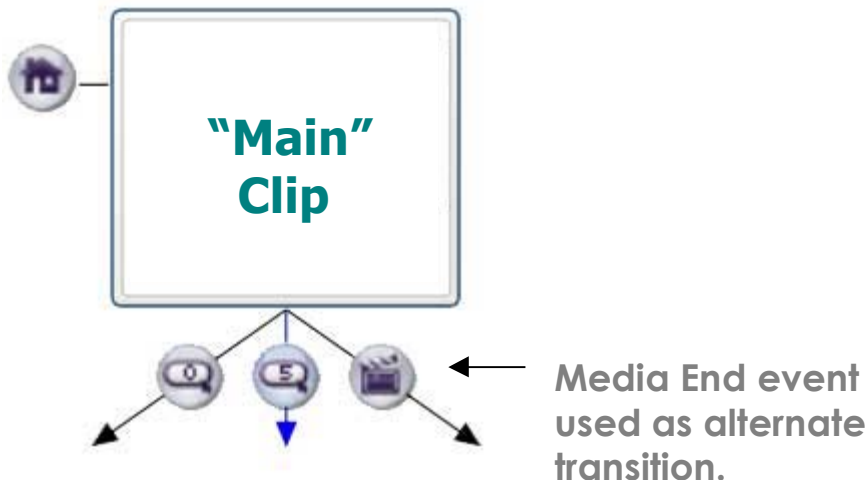

Figure 3.1.4
Alternate transitions

BrightAuthor has a variety of built-in event transitions. For videos, these transitions can easily be handled by "Media End" events. When images are used, the "Timeout" event can be used to transition after a set amount of time has expired. The MD755 User Guide has several useful application examples that incorporate these functions.

The Interactive Playlist Editor

You must set the Playlist type to "Interactive" when using the MD755.

When the playlist type has been set to interactive, BrightAuthor switches to the authoring environment shown in Figure 3.1.1. This mode will enable BrightAuthor's interactive functionality and provides a customizable toolbar from which a variety of commands can be added and conveniently accessed.
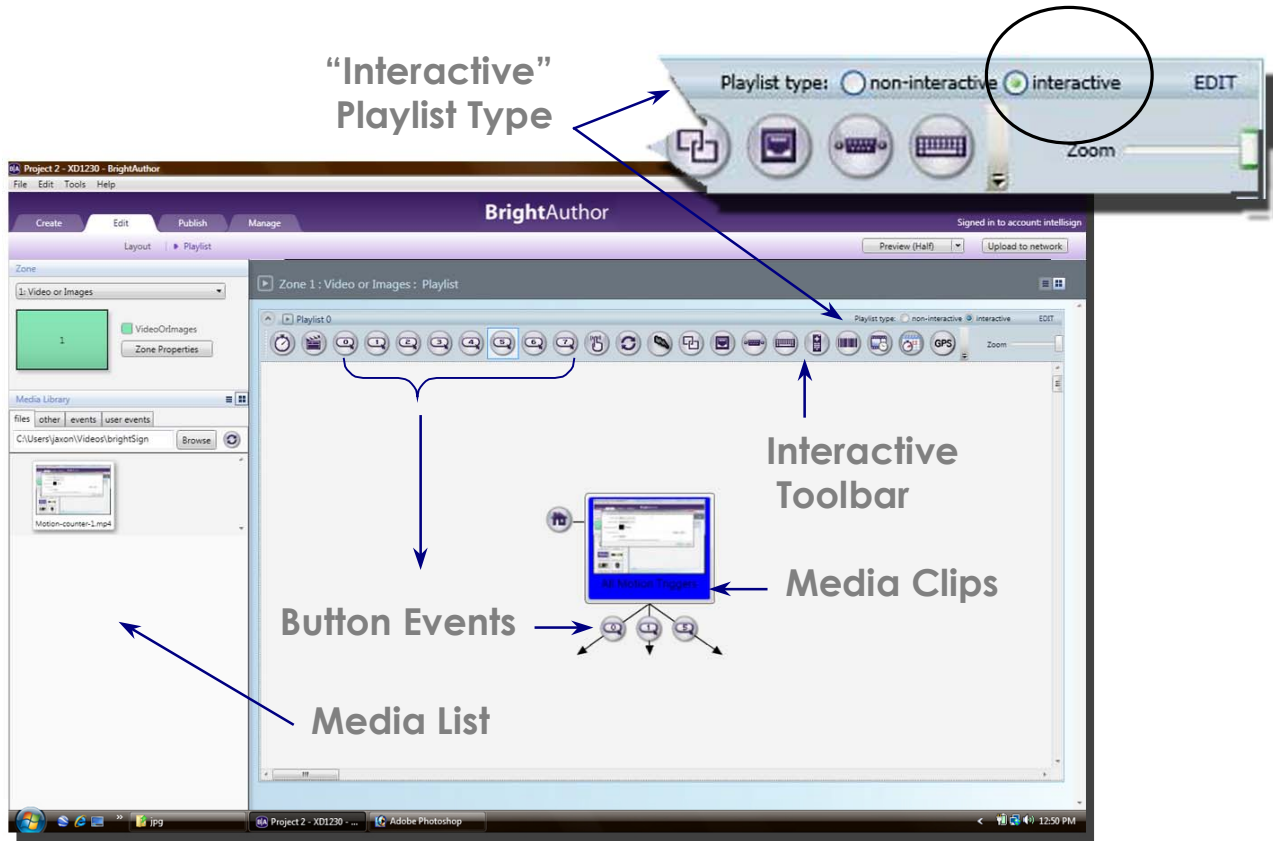

Figure 3.1.1
Interactive Playlist Editor

Creating the Playlist

The presentation shown in Figure 3.1.2 consists of two media clips, "Intro" and "Main". In both cases, motion (or no motion) will trigger the transitions from one state to the next. Button 0 serves as the "motion-start" detector trigger while Button 5 acts as a "motion-end" trigger.

Step 1)   Create a new BrightAuthor presentation.

- From the main menu, click "Presentation Settings".

- Enter the settings that match your particular BrightSign model and the display's resolution.

- All BrightAuthor playlists that use the MD755 must be set to "Interactive" as shown in Figure 3.1.1. When finished the presentation setup, you're ready to start adding content.

Step 2)   Add your content

- From the media list, drag a suitable video or image file into the editing window. This will be your initial media clip.

> Refer to the BrightAuthor User Guide for information regarding acceptable media types.

- Add a second clip to your presentation. This will be the media clip the presentation will transition "to" when triggered by motion.

Step 3)   Add the motion triggers

- Click on the GPIO 0 event icon in the toolbar as shown in Figure 3.1.1. The icon you select becomes the active function which will be applied.

- Apply the GPIO event transition to your media clip by dragging a path *from* the bottom of the clip's thumbnail *to* the top of the second cip's thumbnail. This creates a button "0" transition path between the two clips as indicated in Figure 3.1.2.

> By default, BrightAuthor uses the "to" and "from" transition option when adding events. Refer to the BrightSign User Guide for **transition options.**

- Similarly, add the GPIO 5 button event and a return transition the initial (Home) state.

Step 4)   Publish the video to your BrightSign player using your preferred upload method.

Step 5)   Re-start the BrightSign controller.

Comments

- On startup, the first clip will loop indefinitely until motion is detected and triggers the transition to the "Main" clip.

- When all motion stops, playback of the "main" clip will be returned to the initial state ("Intro").

- The red LED will turn ON when the sensor has been triggered and remains on for an additional ten seconds after all motion has ceased.

Additional Resources

For updated video tutorials, product data, and other application examples, visit our tutorial page at:
www.intelli-sign.com