

# APPLICATION NOTE



## Hints, Tips and Tricks for using Motion Detection

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### Summary

The term "Motion Detection" describes the process of analyzing image content to determine activity or movement of objects. This application note will describe how motion detection works, some basic setup techniques, and provide some examples on the best uses of Motion Detection.

### INTRODUCTION

#### The Basics of Motion Detection

Activity detection is simply the comparison of two "snapshot" samples of a camera's video output. Motion Detection enhances Activity Detection processing through the identification of movement of patterns. Patterns have three primary parameters: *time*, *direction* and *size*.

#### Activity Detection

The most basic element of Motion Detection is Activity Detection. Activity Detection involves any change in the image from one "snapshot" sample to another. Within the multiplexer, a snapshot image is divided into a grid of 240 cells; 15 columns by 16 rows. Each cell, representing a specific area of image, can be enabled or disabled. When a change in intensity occurs in the same enabled cell in two different video "snapshots", then activity is present. A threshold setting is used to specify how much change in intensity needs to occur to be detected. A size parameter can also be added to specify how many cells must detect activity to generate an activity event. Due to the limited amount of filtering, Activity Detection is the most sensitive form of Motion Detection.

#### Motion Detection

Motion Detection builds off of Activity Detection by adding another layer of processing. With true Motion Detection, it is possible to detect different types of directional motion within an image. It takes more than simple activity, constant activity, or delayed activity to generate a true Motion Detection alarm. If a multiplexer does not provide the capability to determine directional motion (left

to right, top to bottom, etc.), then it does not have true Motion Detection.

True Motion Detection uses three parameters: time, direction and size. Time is predetermined whenever Motion Detection is enabled since more than two samples are required to determine "motion" rather than activity. Motion is movement of an object in a given direction.

The "All Motion" setting requires an object to move in the same direction for at least 3 samples before an alarm event is triggered. Random motion is filtered out. The other motion settings, "Vertical Motion", "Horizontal Motion", "Left to Right", "Right to Left", "Top to Bottom", and "Bottom to Top", also require the object to move in the same direction for at least 3 samples with even tighter restrictions on the specific direction. In addition, a size parameter can be added to further restrict motion alarms. Size is defined in cells and requires that each sample have at least the specified number of cells detect activity. Size is used to filter out small objects.

### SETUP TECHNIQUES

Motion Detection setup requires planning. The following list of techniques will help in this planning process.

#### Least is Best

The first rule of thumb for setting up an installation with motion detection is "Least is Best". If Activity Detection will do the job, then use it. The more filtering, the more likely a wanted event will be filtered out. The trick is to find the least amount of filtering while eliminating false triggers. The following examples illustrate this point.

**Example 1:** A camera is mounted over a door and you want to alarm whenever someone is near the door. Two possible solutions are to use vertical motion or to use Activity Detection with a size parameter. The following diagrams demonstrate

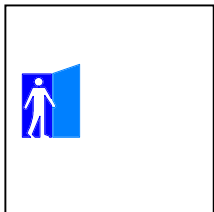
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what the camera “sees” as a person walks towards it. Looking at the center of the body, a slight vertical motion exists which may trigger vertical motion. Much more obvious is the increase in size. Using Activity Detection with a size parameter will give much better results in this scenario. See also “*Camera position is critical*” below for another possible solution.



Person Approaching 1      Person Approaching 2      Person Approaching 3

**Example 2:** A camera views an entire room with the entrance on the left side of the image. You want to alarm whenever someone is in the room. “Left to Right” motion detection is one possible solution since the subject will always be entering from the left. A better solution is to use “All Motion”. “All Motion” will give more consistent results and will continue to alarm as long as the person is moving in the room.



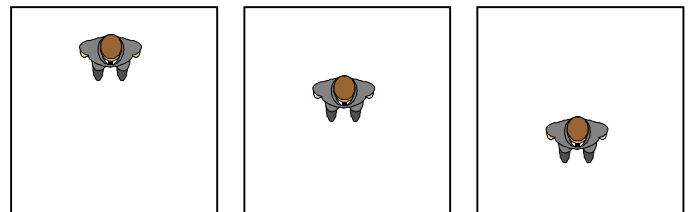
Door on the Left

## Camera position is critical

The second most critical decision is camera position. For horizontal or vertical motion detection to work properly, insure that objects are moving across the image by adjusting the camera position, lens, or mounting angle. Diagonal motion tends to cause missed or unwanted alarms. A straight on view tends to hide the direction of the motion, as in example 2.

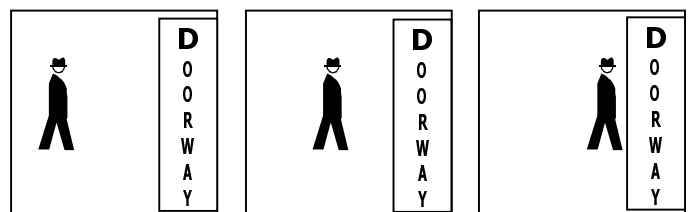
**Example 3:** A camera is mounted over a door and you want to alarm whenever someone approaches

the door. To detect when a person is approaching the door “Top to Bottom” motion is required to differentiate it from a person leaving or “Bottom to Top” motion. The camera must be mounted high enough so that it looks “down” upon the person approaching to give the following sequence of images. If the camera is mounted too low, the person will increase in size, but not appear to be moving. The ideal placement of the camera provides the following type of movement in the image and also insures a good picture of the approaching person.



Looking “Down” 1      Looking “Down” 2      Looking “Down” 3

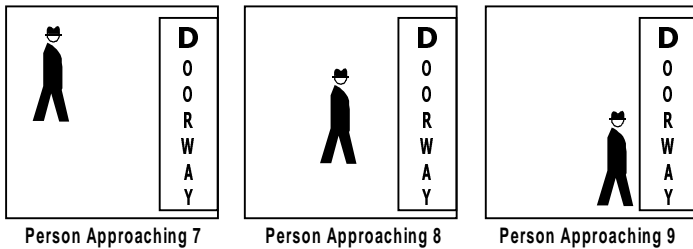
**Example 4:** A camera is mounted to monitor a doorway and you want to alarm whenever someone approaches the door. Using “Left to Right” Motion Detection is the best solution. Be sure the camera is mounted so that the movement of the person is across the image as in the following diagrams.



Person Approaching 4      Person Approaching 5      Person Approaching 6

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If the camera is mounted so that the person's movement is diagonal across the image, Motion Detection may filter out some of the alarms, perceiving the motion to be "Top to Bottom" rather than "Left to Right".



## Increase Sensitivity

For best results with Motion Detection, reducing the threshold level to around 5 can increase the sensitivity. The added filtering of Motion Detection will not cause false alarms, as would be the case with Activity Detection.

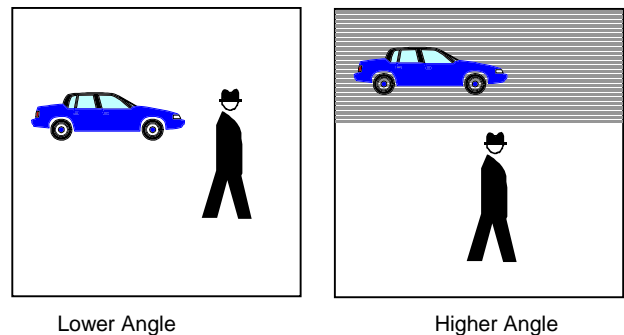
## Working Together

Motion Detection requires time to detect the motion. In some instances, an object may be at the edge of the image when the motion alarm occurs and the culprit is missed. Cameras with a narrow field of view can cause this. Using these cameras in conjunction with another camera in the adjoining room can work quite well. The first camera generates the motion alarm and using the "Alarm Camera Sets" option the alarmed camera and the camera in the adjoining room are both displayed on the main monitor. When planning an installation with Motion Detection, think of the system as whole and take advantage of every camera.

## Two objects in the same image

Since Motion Detection is looking for movement of objects, two moving objects in the same image could cause false or missed alarms. One way to reduce this affect, is by using the "Enable/Disable Activity Zones" menu. Keep in mind that Motion Detection requires time and therefore distance across the screen.

**Example 5:** A camera is pointed at a walkway with a street behind. Motion in the walkway is of interest but not in the street. Disable the area of the screen that views the street. Remember that camera position is critical. If the street is simply further away than the walkway, objects on the walkway or on the street may appear in the same area on the image. Placing the camera at a higher angle will help differentiate the walkway from the street and then the street can be disabled as shown in the gray area below.



## Other Considerations

When using Motion Detection it is important that all cameras are multiplexing. "Alarm Only" multiplexing priority and "Alarm Only" VCR output mode should *not* be used with Motion Alarms. If a situation *requires* this type of setup, only 1 camera should be alarming at a time and the "Alarm Hold Time" should be kept short.

## SUPPORT

**Call us, we are here to help.** If you have a question or would like help in configuring your ATV multiplexer, please contact our technical support people at (888) 288-7644, outside the US, call (425) 885-7000 or email us at [tech@atvideo.com](mailto:tech@atvideo.com).