Accordingly, instead of varying the pulse width to vary the brake value, the present invention includes a pseudo random number generator, a greater-than comparator, and a register. The pseudo random number generator generates a random number between 1 and 255. This value is continually compared to a register holding the brake value (0 to 255). For example, using a generator which generates 1 through 255, if one were to set it at 126then, there are half high values and half low values, and the output is the average of high to low. By providing a good random distribution of pulses, changing at arbitrary times, there is no period to the noise and therefore there is no resonance.

Turning to FIG. **13**, a random number generator circuit diagram and a quadrature counter circuit used in accordance with the present invention is shown. In the random number generator circuit, a programmable integrated circuit **51** is in communication with a comparator **52** which is further in communication with a register **53**.

The quadrature counter circuit portion of the circuit depicted in FIG. **13** is provided to determine at a given position whether the frames are moving in a forward direction or in the backward direction. Quickly turning to FIG. **12**, by offsetting the signals by less than a half period, the last known position can provide information about the direction of the given frame at a particular time.

Again referring to FIG. **13**, the voltage is detected by quadrature circuit **56** which is in communication with, for example, a 24-bit counter **57** which is communication with a second counter **58**. Those circuits are in communication with register **53** to receive counted information and interval timer **59** (integrated for convenience). Preferably, the interval timer is set to every 20 msecs. In this manner, the system is able to determine which direction the viewer is going and how far the viewer has come from information provided by the shaft encoder **41** (see FIGS. **6** and **7**).

In using a system in accordance with the present invention, it is common for a viewer to change the frame rate frequently, providing backtracks and stops. In such situations, it is preferable to provide a manner in which to avoid accidently slipping into a brake zone. Turning to FIG. **14**, three possible frame rate levels are denoted as being represented by parallel horizontal lines. The dotted line interwoven among the solid horizontal lines represents the stopping and starting of the user. As discussed above, the rotary encoder sends signals to be counted so that the position within the frame sequence can be detected. The important points for consideration here are boundary constraints such as the starting point and the ending point denoted by position **0** (zero) and position MAX. According to the present invention, by using the counted position, the accidental slipping into the brake zone is avoided.

Referring to the flow chart of FIG. **15**, a manner in which to avoid slipping into the brake zone when the user moves too slowly is provided. The present invention provides a method for determining the position of the viewer in the film sequence by starting at box **61**, such being flowcharted in FIG. **15**. In the first decision box **62**, the inquiry as to whether the position is greater than or equal to 0 is asked. If the answer is no, then the program asks whether the position is greater than MAX at box **63**. If the answer is no, then the system proceeds normally as indicated by box **64**. On the other hand, first referring to box **62**, if the answer is yes, other conditions are considered. The portion of the flow chart depending from a yes answer to box **62** is symmetric to the portion of the flow chart depending from a yes answer to box **63**. Therefore, only the portion relating to box **62** will be discussed herein, and the same meaning is applied to the portion relating to box **63**.

If a position less than zero is detected, the next question is whether the velocity is zero at box **66**. If the answer is yes, the program asks whether the last velocity was less than zero at box **67**. If the answer is yes, the brake is turned off at box **68**. If the answer is yes, the brake is turned on at box **69**. On the other hand, if at box **66** the answer was no, then the program sets the velocity to the last velocity at box **71**. If that last velocity was less than zero as questioned by box **72**, then the brake is turned off at box **73**. If the answer to box **72** is no, then the brake is turned on at box **74**.

Another aspect of the present invention, is that according to the present invention, an amount of braking can be assigned depending upon the speed. A certain amount of braking based on speed provides advantageous effect. For example, where simulated centrifugal force is to provide a haptic response to viewer input, braking is dependent upon content and velocity. In that case, the amount of braking is a function of variables which can be programmed into the system.

Moreover, in the event that the viewer's strength is tested to adapt the viewer input device to a particular user, then the brake is applied in an adaptive manner and is therefore velocity dependent as well as content-dependent. In such a case, feed back generates a speed limit.

In view of the foregoing, the present invention interactively provides the viewer with a haptic experience based on the content of the prerecorded image data being viewed at a particular moment in time. While the present invention has been described in terms of a preferred embodiment, those skilled in the art will recognize that the invention can be practiced with modification and alteration within the spirit and scope of the appended claims.

What is claimed is:

1. Aparatus for controlling a video display generated using pre-recorded video data, comprising:

means for enabling a user of the apparatus to provide an instruction to the apparatus regarding generation of the video display;

means for communicating with a device used to generate the video display, wherein the means for communicating enables the instruction to be communicated to the device, the device generating the video display in response to the instruction; and

means for providing a haptic sensation to the user in response to a characteristic of the video data that is used to generate the video display in response to the instruction.

2. Apparatus as in claim **1**, wherein the characteristic of the video data relates to the content of an image of the video display generated in response to the instruction.

3. Apparatus as in claim **1**, wherein the characteristic of the video data relates to the arrangement of the video data.

4. Apparatus as in claim **3**, wherein the characteristic of the video data is a transition between successive video data.

5. Apparatus as in claim **4**, wherein the characteristic of the video data is a transition between successive frames of video data.

6. Apparatus as in claim **3**, wherein the characteristic of the video data is the beginning or the end of a predetermined sequence of the video data.

7. Apparatus as in claim **1**, further comprising means for generating content data based upon the characteristic of the video data, wherein the content data can be communicated to the means for providing a haptic sensation for use in providing the haptic sensation.