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TIME DILATION CONTROLS FOR CAMERAS

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TIME DILATION CONTROLS FOR CAMERAS

ABSTRACT

A computing device (e.g., a mobile phone, camera, tablet computer, etc.) may include a camera for capturing/recording video and may present a user interface at a display device (e.g., a presence-sensitive screen) from which a user can interact with the camera of the computing device to change or adjust time dilation effects (making a video record such that it plays faster than it actually occurred, or to record a video that will play slower than it occurred). For example, the user interface may provide a selector to adjusting a playback rate of captured video and a selector for adjusting a time dilation multiplier. When capturing video, the user interface may provide an indicator that shows the recording duration, and the playback duration of the video. This way, a computing device may provide a user with a concise way of controlling and visualizing time dilation effects.

DESCRIPTION

Cameras have become increasingly flexible in the kinds of content they can capture. It has become increasingly common for mobile phones to be equipped with cameras that are capable of capturing video in various lengths, formats, and speeds. It has also become increasingly common for mobile phones to be able to playback captured video at different rates. However, existing camera user interfaces do not provide a very good way to manipulate all of the various available controls. Furthermore, users may not be as familiar with advanced camera controls and as such, existing camera user interfaces may default to hiding the advanced controls into alternative modes, which significantly decreases the utility and usage of these controls. As such, it would be desirable for a camera user interface to provide a concise way of controlling

and visualizing time dilation effects (making a video record such that it plays faster than it actually occurred, or to record a video that will play slower than it occurred) in a simple and concise way.

The example computing device shown in Figure 1 provides a user with a concise way of controlling and visualizing time dilation effects. For example, the computing device may output a graphical user interface (GUI) that includes a selector for adjusting a playback rate and a selector for adjusting a time dilation multiplier.

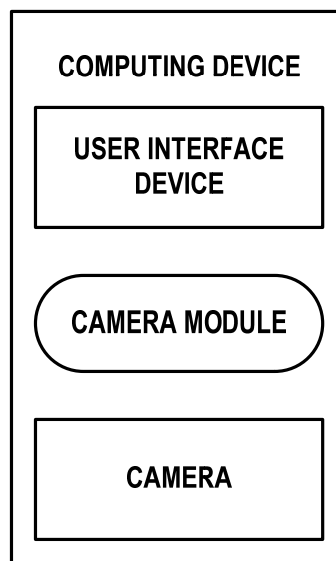


Figure 1

The computing device of Figure 1 includes a user interface device, a camera, and a camera module. The computing device may be any computing device that includes or controls a camera. Example computing devices include mobile phones, tablets, digital cameras, laptops, gaming systems, e-book readers, televisions, wearable computing devices, or any other type of mobile or non-mobile computing device suitable for controlling a camera.

The user interface device (UID) may function as an input device for the computing device and as an output device. The UID may function as an input device using a presence-

sensitive input screen, such as a resistive touchscreen, a surface acoustic wave touchscreen, a capacitive touchscreen, a projective capacitance touchscreen, a pressure sensitive screen, an acoustic pulse recognition touchscreen, or another presence-sensitive display technology. The UID may function as an output (e.g., display) device using any one or more display devices, such as a liquid crystal display (LCD), dot matrix display, light emitting diode (LED) display, organic light-emitting diode (OLED) display, e-ink, or similar monochrome or color display capable of outputting visible information to a user.

The camera captures still or video images. The camera may be a built-in (e.g., “internal”) and/or external component of the computing device, which the computing device may utilize to capture or generate still and/or video images. The camera may have various controllable features, such as a flash, focus, aperture, capture rate, color temperature, and the like.

The camera module is a combination of software, hardware, and/or firmware and provides the computing device with functionality for controlling the camera. For example, the camera module may cause the computing device to turn the camera on or off, and control particular features of the camera based on inputs received at the user interface device. computing device. Responsive to an input received at the computing device (e.g., at the UID), the camera module may cause camera to “snap” or capture a still image or start/stop recording of a video image.

The camera module may cause the UID to present user interfaces to facilitate interaction between users and the computing device. For example, when the camera is not capturing video, the camera module may cause the UID to present the graphical user interface (GUI) shown below in Figure 2.

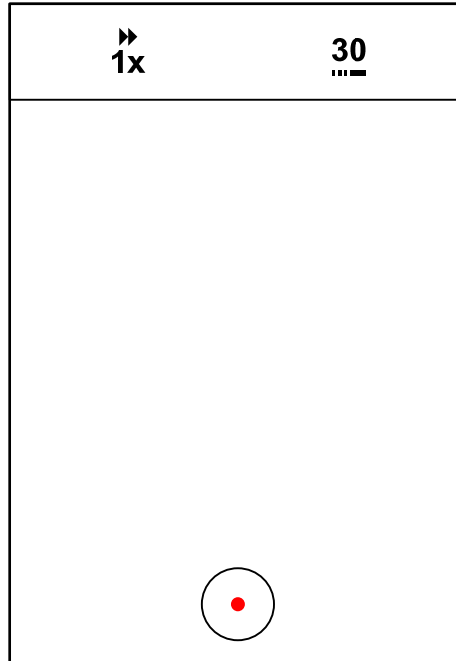


Figure 2

The GUI displayed while the camera is not recording video may include various controls for manipulating how the camera will record video. As shown at the top of Figure 2 (from left to right), the GUI may include a control for adjusting a time dilation multiplier (shown in Figure 2 as 1x written below two arrows), and a control for adjusting a playback rate (shown in Figure 2 as the number 30 written above some dashed lines). The GUI may include additional controls, such as a control for activating a flash or other light emitter.

The time dilation multiplier may allow the user to select the ratio of the rate at which video is captured to the rate at which the video is played back. To adjust the time dilation multiplier, a user may tap or otherwise select the control shown in Figure 2. In response to the user selecting the time dilation control shown in Figure 2, the camera module may cause the UID to present the GUI shown below in Figure 3 that includes a slider from which the user may select a time dilation multiplier. Example time dilation multipliers include, but are not limited to 1/8,

1/4, 1/2, 1, 2, 5, 10, 30, 60, 120. A multiplier of one (1x) will cause a video to play back at the same rate it was captured. Similarly, multipliers less than one (e.g., 1/8, 1/4, 1/2) will cause the resulting video to playback slower than real-time, and multipliers greater than one (e.g., 2, 5, 30, 240) indicate that the recording will playback at faster than normal time.

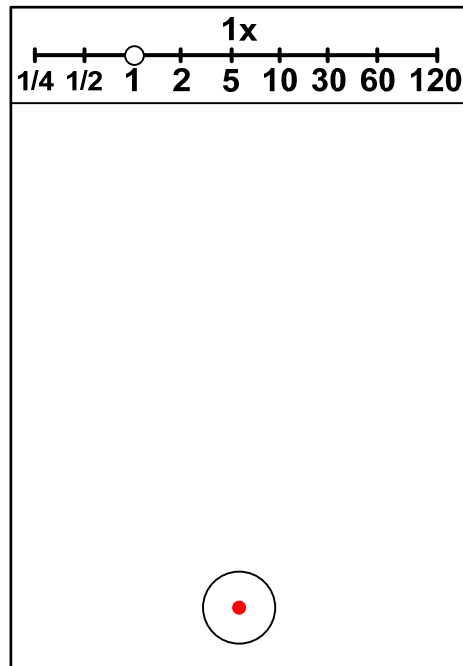


Figure 3

The playback rate control may allow the user to select at what rate the captured video will be played back. To adjust the playback rate, a user may tap or otherwise select the playback rate control shown in Figure 2. In response to the user selecting the playback rate control shown in Figure 2, the camera module may cause the UID to present a GUI similar to that shown above in Figure 3 that includes a slider from which the user may select a playback rate. Example playback rates include, but are not limited to 10 FPS, 15 FPS, 30 FPS, 60 FPS.

Based on the above, it can be observed that the relationship between the playback rate, the capture rate, and the multiplier may follow the below equation:

$$\text{capture rate} = \frac{\text{playback rate}}{\text{multiplier}}$$

When recording is triggered, the camera module may cause the camera to capture video in accordance with the set playback rate and multiplier. As one example, if the multiplier is set to 10x and the playback rate is set to 15 FPS, the camera module may cause the camera to capture video at a rate of 1.5 FPS. As another example, if the multiplier is set to 1/8x and the playback rate is set to 30 FPS, the camera module may cause the camera to capture video at a rate of 240 FPS. By allowing the user to select the playback rate and the time dilation multiplier, the camera module may provide the user with a concise way of controlling time dilation effects.

When recording video, the camera module may provide the user with one or more recording indicators. For instance, the camera module may cause the UID to display a GUI that shows the recording duration and/or the playback duration of the video being recorded. As one example, the camera module may cause the UID to output the GUI shown below in Figure 4 that includes a record time counter to the left of the red dot at the top of the GUI and a playback time counter to the right of the red dot at the top of the GUI.

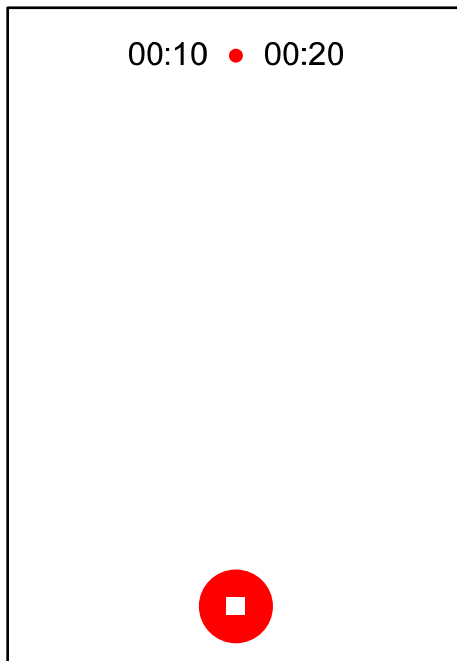


Figure 4

In the example of Figure 4, the playback rate may be set to 60 FPS and the time dilation multiplier may be set to $1/2x$. As such, the camera may capture video at 120 FPS and the value of the playback time counter is double the value of the record time counter. The indicators shown in Figure 4 are merely one example and other indicators are possible. For example, the GUI may include a record time counter, omit the playback time counter, and scale the size of the red dot according to the selected time dilation multiplier. By displaying the recoding indicators, the camera module may provide the user with a concise way of visualizing time dilation effects.

The controls described herein may be included in a primary camera mode or app of the computing device. In other words, as opposed to forcing a user to switch camera modes or camera control apps to control time dilation functionality, this disclosure describes how a primary or native camera control app may provide time dilation controls in a concise manner.

By providing the dilation multiplier control and the playback rate control described herein, a camera module may enable a user to more efficiently use time dilation effects when capturing video. Additionally, where the time dilation controls are included in a primary or native camera app, the controls described herein may enable less advanced users to use time dilation effects when capturing video.