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Development of a Dynamic LED System with Motion Recognition Using Kinect

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Abstract

In this paper, we present a dynamic LED lighting system for using motion recognition, and implement a demonstration system using Kinect and XC2287. The presented system consists of the motion recognition system using Kinect and a dynamic LED lighting system using XC 2287. By capturing images from the hand movement, a specified motion can be recognized. Based on the specified motion, we can control the dynamic LED lighting system. For example, we can handle turning ON/OFF of the lighting system, changing color sequences, or adjusting the intensity of the light. The implement system with Kinect for motion recognition and XC2287 board for LED lighting control shows the applicability of proposed system.

Keywords: Dynamic LED System, Automotive LED lighting, LED, Motion Recognition

1 Introduction

Automotive lighting system is changing from static to dynamic control, which provides more various functions to control in-vehicle lighting system. This dynamic LED lighting system is applied to the AFLS (Adaptive Front Lighting System), AHB (Auto High Beam), LTL (Laser Tail Lighting) and greatly improves the user's safety and convenience. In [1]-[4], some control systems using hand motion have been proposed. For example, a robot can be controlled through some pre-defined motion patterns of hand or a remote mouse can be control by using hand motions [1][3]. Since the demand of applying motion recognition in controlling has been

increased. Recently devices which are related to recognize multiple actions such as Kinect, Leap Motion, Real Sense are launched. As the result, a wider range of types of research is expected to be in progress.
In this paper, we use the Kinect to recognize user's hand movements. Hand motion patterns can be used as certain functions such as control on and off of the dynamic lightning system, adjusting brightness or change of color sequence. A lighting system which controls color and brightness of XC2000-based vehicle dynamic LED is designed and implemented.

2 Dynamic LED System through Motion Recognition

In this paper, we use a Kinect sensor to recognize certain hand motion patterns. These patterns then are classified to equivalent signals to control a LED lighting system.

2.1 Dynamic led outline through motion recognition

Fig.1 shows a structure diagram of the proposed system.

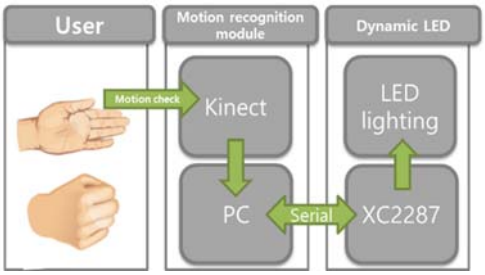


Fig. 1 The basic structure of LED control system through the motion recognition

The entire system is divided into Motion recognition and a Dynamic LED modules. As shown in the figure, the motion recognition module consists of a PC (Personal Computers) and Kinect sensor. Dynamic LED module consists of XC2287 board to control the LED lighting system.

2.2 Motion Recognition

Fig.2 shows the motion recognition algorithm. In order to recognize hand motion patterns, an algorithm is implemented in the following sequence.

1. Kinect sensor recognizes Start or Stop gestures.
2. If Start gesture is detected, we calculate the center point of hand.
3. Generate an image to record the consequent motion of hand center.
4. If Stop gesture is detected, we classify the motion image with some motion patterns in database and output a pre-defined control signal.
5. Send the control signal to control board using serial communication.

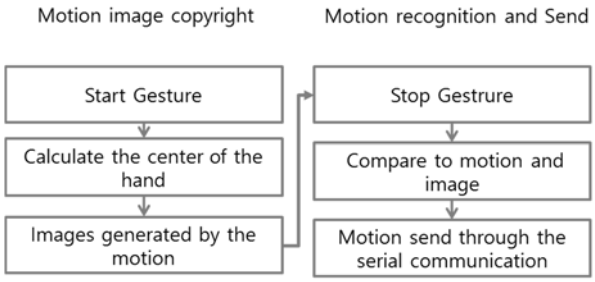


Fig. 2 Motion recognition algorithm

Fig.3 shows the shapes used in recognition and reference picture of motion. Based on an obtained image in camera, we can recognize motions using kinect. It changes the sequence of LED by the motion pointing left and right, also LED brightness by the motion pointing up and down. In other words, changing the RGB value of the LED that is transmitted from the motion recognition module send a control signal to XC2287.

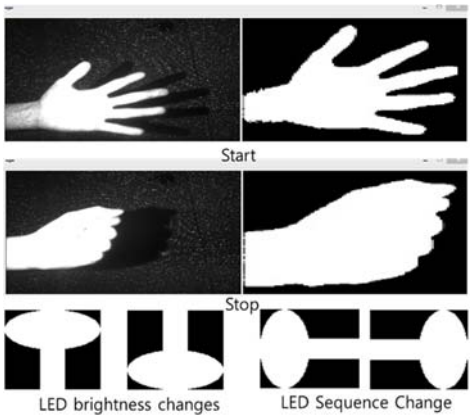


Fig. 3 Pre-defined motion patterns used in LED lighting control system

3 Experiment

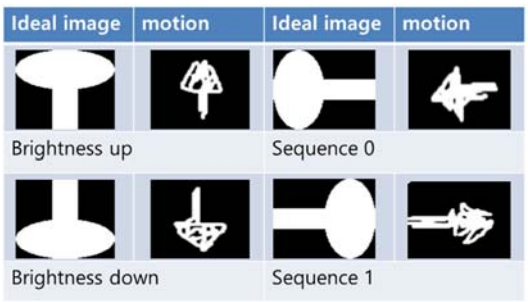
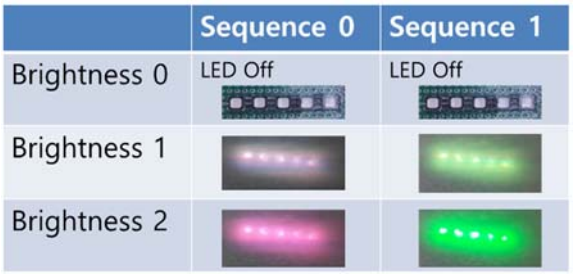


Fig. 4 Motion image classification

Fig.4 shows the change of LED according to each motion. Each motion is mapped into corresponding pre-defined imageFig5 shows the appearance of the LED out-

puts for each state. For example, if LED brightness is 0, LED is off.

Fig. 5 Result of LED output



4 Conclusion

In this paper, we present a motion-based LED lighting control system. The presented system consisted of the motion recognition system using Kinect and a dynamic LED lighting system using XC 2287. By capturing images from the hand movement, a specified motion was recognized. Based on the specified motion, we controlled the dynamic LED lighting system. A demonstration system shows the validity and applicability of proposed method.

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References

[1] E. Machida, M. Cao, T. Murao and H. Hashimoto, Human motion tracking of mobile robot with Kinect 3D sensor, *SICE Annual Conference Proceedings of IEEE*(2012), 2207-2211.
[2] P. Smith, M. Shah and N. da Vitoria Lobo, Monitoring head/eye motion for driver alertness with one camera. *Pattern Recognition, International Conference on IEEE Computer Society*(2000), 4636-4636
[3] A. A. Argyros, M. I. Lourakis, Vision-based interpretation of hand gestures for remote control of a computer mouse. *In Computer Vision in Human-Computer Interaction*(2006), 40-57
[4] K. Abe, H. Saito and S. Ozawa, 3-D drawing system via hand motion recognition from two cameras. *Systems, Man, and Cybernetics,* IEEE International Conference on IEEE(2000), 840-845

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