

† †† † ††† †

† 464-8601
†† 464-8601
††† 464-8601

E-mail: †maedat@murase.is.i.nagoya-u.ac.jp, ††takatsugu.hirayama@nagoya-u.jp, † † †ddeguchi@nagoya-u.jp,
†{kawanishi, ide, murase}@i.nagoya-u.ac.jp

あらまし ADAS

キーワード ITS

Study on the Improvement of Visibility by Projecting Flickering Light from Headlights

—Comparison between Field and Laboratory Settings—

Takashi MAEDA[†], Takatsugu HIRAYAMA^{††}, Yasutomo KAWANISHI[†], Daisuke DEGUCHI^{†††},
Ichiro IDE[†], and Hiroshi MURASE[†]

[†] Graduate School of Informatics, Nagoya University Furo-cho, Chikusa-ku, Nagoya-shi, Aichi 464-8601 Japan

^{††} Institutes of Innovation for Future Society, Nagoya University Furo-cho, Chikusa-ku, Nagoya-shi, Aichi
464-8601 Japan

^{†††} Information Strategy Office, Nagoya University Furo-cyo, Chikusa-ku, Nagoya-shi, Aichi 464-8601 Japan

E-mail: †maedat@murase.is.i.nagoya-u.ac.jp, ††takatsugu.hirayama@nagoya-u.jp, † † †ddeguchi@nagoya-u.jp,
†{kawanishi, ide, murase}@i.nagoya-u.ac.jp

Abstract Despite the fact that a variety of ADAS (Advanced Driver Assistance Systems) are developed, there are still many fatal car accidents involving pedestrians, where many of them occur at night. Recently, headlights are becoming capable of selectively projecting light on a pedestrian in addition to the normal forward projection. However, it is still not known how the light should be projected to effectively improve the visibility of the pedestrian. We have been analyzing effective flickering light patterns for improving the visibility in a laboratory setting. In this report, we report the analysis in the field, and discuss the difference according to experimental environments.

Key words Headlights, flickering light, visibility, ITS

1. はじめに

2. 関連研究

ADAS

[1]

ADAS

[5]

Itti

[6]

Navalpakkam

[7]

Wakayama

[8]

[3]

ADAS

HID High-Intensity

Discharge

LED

LED

LED

[2]

[3] [4]

[2]

Thurstone

2

[9]

2.

3.

4.

5.

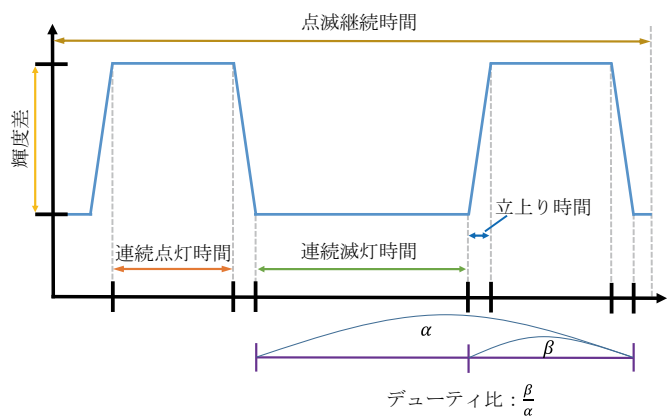
6.

[2]

LED

LED

[10]



1

		0.125	0.250	0.500	1.000
	0.250	○	○	×	×
	0.500	○	○	○	×
	0.750	×	○	○	○

4. 実験

4.1 実験参加者

20 9

4.2 実環境における視認性評価実験

4.2.1

1

3. 歩行者への点滅光照射

3. 9

1

1

2.

LED

[10]

LED

4.2.2

4

50 m

2

3

4

2 3

4.2.3

2

3 0.250 0.500 0.750
4 0.125 0.250 0.500 1.000
1.000

1

[11]

1

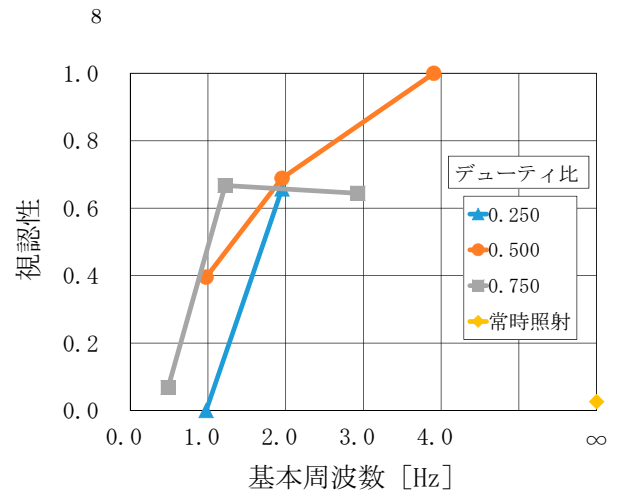
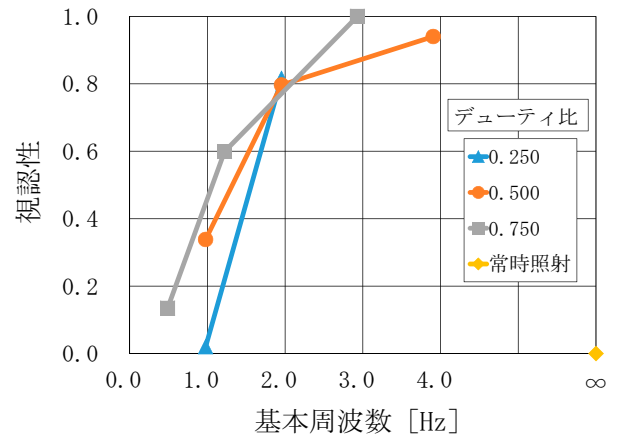
1

2

- 1 Microsoft Kinect for Xbox 360
- 2 SONY VPL-FX37 6,000 lm
- 3 IPF 341HLB 6,500K
- 4 FLIR Systems Grasshopper3 1,920×1,440
26 fps



7



9

8 9

4

3.0 Hz

0.750

0.500

4.0 Hz

$$36 = {}_9C_2$$

4.4 視認性評価方法

1.

Thurstone

[12]

0

1

1

4.5 実験結果

4.2.3

4.3.3

4.1

9

5. 考察

8 9

[13]

4.4

CFF: Critical Fusion Frequency

3.0 Hz

0.750

0.125

3.0 Hz

0.042

4.0 Hz

0.125

3.0 Hz

0.500

0.125

0.750

1

6. む す び

0.750

3.0 Hz

0.500

4.0 Hz

謝 辞

文 献

- [1] “ ” 27 ”
https://www.itarda.or.jp/materials/publications.php?page=4
2017 2018/1/19
- [2] “ ”
2017-CVIM-207-35 2017
- [3] “ ” D vol.J99-D no.1 pp.56–66
2016
- [4] Y. Imaeda, T. Hirayama, Y. Kawanishi, D. Deguchi, I. Ide, and H. Murase, “Can a driver assistance system determine if a driver is perceiving a pedestrian? –Consideration of the driver’s visual adaptation to illumination change,” Proc. 12th Int. Joint Conf. on Computer Vision, Imaging and Computer Graphics Theory and Applications (VISIGRAPP 2017), vol.4, pp.611–616, 2017.
- [5] A. Kimura, R. Yonetani, and T. Hirayama, “Computational models of human visual attention and their implementations: A survey,” IEICE Trans. Information and Systems, vol.96-D, no.3, pp.562–578, 2013.
- [6] L. Itti, C. Koch, and E. Niebur, “A model of saliency-based visual attention for rapid scene analysis,” IEEE Trans. Pattern Analysis and Machine Intelligence, vol.20, no.11, pp.1254–1259, 1998.
- [7] V. Navalpakkam and L. Itti, “Search goal tunes visual features optimally,” Neuron, vol.53, no.4, pp.605–617, 2007.
- [8] M. Wakayama, D. Deguchi, K. Doman, I. Ide, H. Murase, and Y. Tamatsu, “Estimation of the human performance for pedestrian detectability based on visual search and motion features,” Proc. 21st IAPR Int. Conf. on Pattern Recognition, pp.1940–1943, 2012.
- [9] “ ” D vol.J95-D no.1
pp.122–130 2012
- [10] “LED ” vol.79
no.11 pp.1159–1164 2013
- [11] “ ”
2016 D-12-20 2016
- [12] L.L. Thurstone, “Psychophysical analysis,” American J. Psychology, vol.38, no.3, pp.368–389, 1927.
- [13] L. Itti and N. Dhavale, “Realistic avatar eye and head animation using a neurobiological model of visual attention,” Proc. SPIE, vol.5200, pp.64–78, 2004.