

PAPER • OPEN ACCESS

## Visual Perception by Drivers of the Advertisements Located at Selected Major Routes

To cite this article: Lesaw Bichajo 2017 *IOP Conf. Ser.: Mater. Sci. Eng.* **245** 042067

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

# Visual Perception by Drivers of the Advertisements Located at Selected Major Routes

Lesław Bichajło<sup>1</sup>

<sup>1</sup> Rzeszów University of Technology, Poland

leszbich@prz.edu.pl

**Abstract.** This article characterizes the research based on the analysis of the eye fixation points on the advertisements. The research has been realized in real road and traffic conditions. The group of 12 drivers was equipped with the glasses oculometric measurement system mounted on the driver's head. The participants were driving their private cars. The analysis was concentrated on the fixations on the advertisement tables located along the selected national roads in Rzeszów area (Poland). For better recognition if the advertisements have distracted the drivers the number of fixations on the advertisements has been compared with the fixations on the road signs. The active drivers have observed many visual attractors like advertisements, road signs and cars being ahead and on another lane. Passive drivers have low number of fixations on road signs and advertisements. Their fixations typically have been localized on survey and they probably used the peripheral vision in order to recognition of road sign shapes. The results show, that: the percentage of fixations on the advertisement and road signs is different for each participants; the highest percentage of fixated advertisements was on the section with small number of advertisements, but in the city area, when a group of advertisements was on the road, the participants selected some of them, yet no participant fixated all advertisements localized in a small distance between them; the single advertisement visible from the long distance strongly attracts the visual perception; the percentage of the fixated advertisements was higher than road signs.

## 1. Introduction

One of kind of the promotion of the products and services is the installation of the advertisement tables and billboards along the roads. Many of the advertisements are able to distract the drivers. American scientists have reported, that mean number of glances per participant per billboard was between 0.64 and 3.47 (mean, 1.66) and 10–20% of glances made at billboards were no shorter than 0.75 s in duration [1]. In Sweden Dukic and coauthors have found that electronic billboards attracted more and longer glances than regular traffic signs [2]. Belyusar and coauthors have reported a significant shift in the number and length of glances toward the billboards and an increased percentage of time glancing off road [3]. The law regulations in several countries (e.g. Austria, Italy, Norway, and Germany) have reduced advertisements localized along the roads. Because of the lack in Polish law of detailed regulations – there are many problems with the drivers distracted by advertisements.

## 2. The participants and methodology

In order to find an answer if the advertisements influence visual perception, on-road study was invented. This paper includes results of research done on national road sections located close to



Rzeszow city. The complete research consists of more sections of mentioned roads and another sections on local roads.

The research program assumed twelve drivers. The age of the participants was between 22 and 28 years, and there were 10 men and 2 women.

The designed route was not known by participants in order to avoid the problem of using rather the memory than the road observation in driving process. Everybody was asked to drive typically, but nobody was informed of detailed goal of research. But everyone was informed that his way of driving is not a goal of the research.

Current research was realized on (figure 1):

- national highway A4 with subsection named O1,
- national road DK94, divided into three subsections O2, O3 and O4.

The trips were done in authentic traffic conditions between hours 8.30 and 15.00, in the summer of 2016 year.

The section O1 was a part of new divided highway and there weren't any advertisements along analysed section. It was equipped with typical road signs and road marking. The number of road signs was 17 and was cumulated in road junction. Typical road view on this section is on figure 2.

The section O2 was a two-lane road equipped with road signs (18 pcs) and marking. The advertisements were as a single or cumulated in groups, summary 19 pieces. Road condition was good. There was small traffic during the research. Typical road view on this section is on figure 3.

The section O3 was a three or four-lane road equipped with road signs (10 pcs) and marking and pedestrian pavements. The advertisements (24) were as a single or cumulated in groups. There were more advertisements in comparison with earlier sections. The road condition was good. There was small traffic during research. Typical road view on this section is on figure 4.

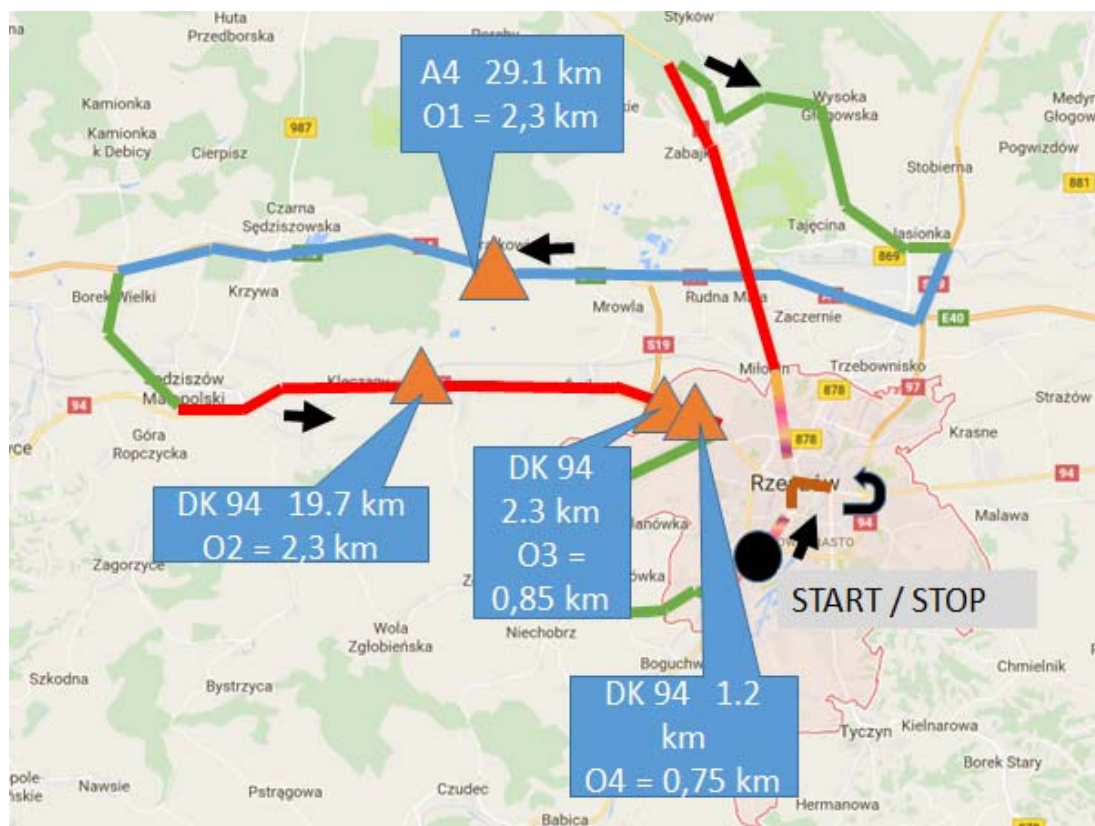


Figure 1. Locations of analysed national road sections



Figure 2. Typical road view on section O1



Figure 3. Typical road views on section O2



Figure 4. Typical road view on section O3



The section O4 was a divided road with road signs (17 pcs), marking and pedestrian pavements not aligned to the survey. There were less number of advertisements in comparison with earlier section – 4 pieces and were as a single. The road condition was good. There was small traffic during research. Typical road view on this section is shown on figure 5.

During the trip drivers eye movements were registered with oculometric mobile system Tobii. The eye-tracker registers observed scene and pupil position. The pupil position is recognized by using infrared lamp. In post-process the computer software analyses pupil position and merges a video recording with eye position visualizing it e.g. as a red dot. The software produces also statistical data about fixation duration, where the fixation is defined as a maintaining of eye position on object through minimum 0.3 s. More information about this methodology has written Tarnowski in [4].



Figure 5. Typical road view on section O4

Before or after every stages of research, a calibration process were done using typical procedure of fixation 9 points indicated by electronic markers.

### 3. Results and discussions

In order to compare percentage of fixated road signs and advertisements there were analysed fixation points of each participant. From all fixations, only the ones, localized on road signs and advertisements were selected. The statistics of number of roads signs and advertisements and percentage of their fixations are shown on figure 6.

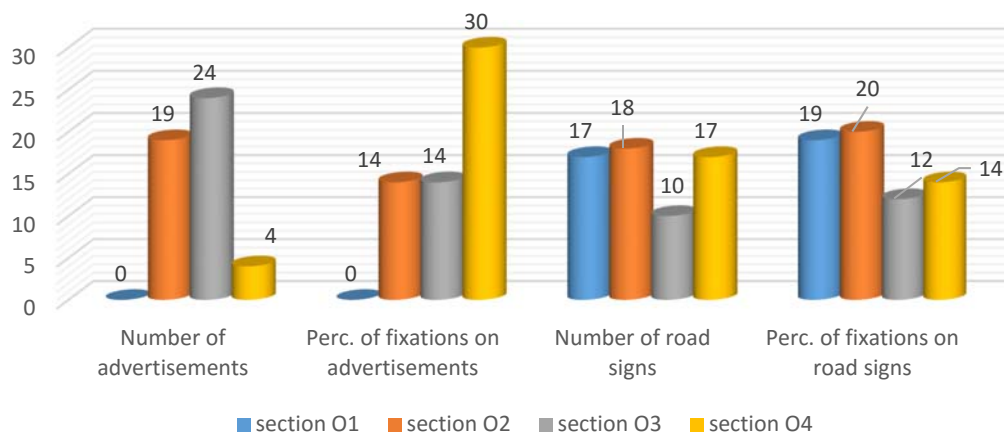


Figure 6. Number of advertisements, road signs and VMS and percentage of fixations on them

In comparison of the density of the advertisements and road signs (in pieces per kilometre) with the percentage of fixated objects it can be observed, that the road signs density corresponds with the percentage of fixated signs. For the advertisements this relation was not true (see figure 7).

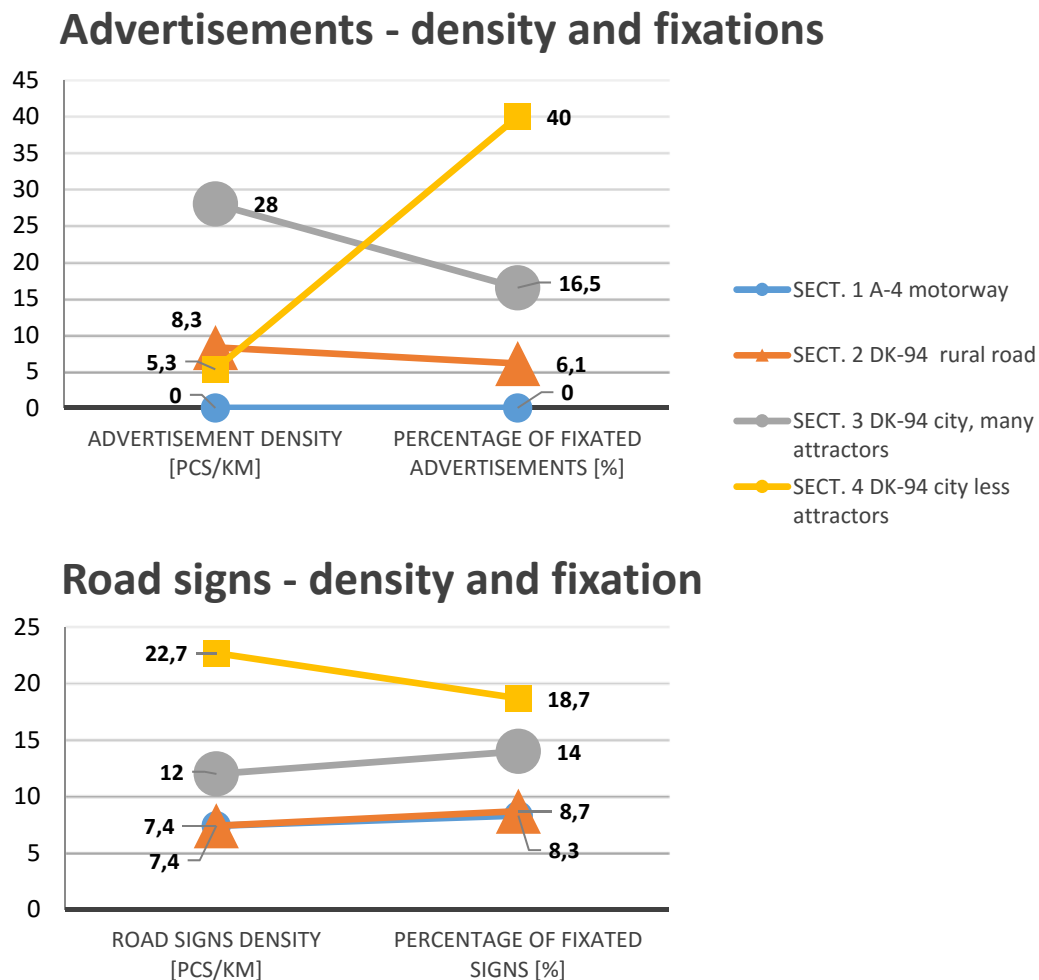


Figure 7. The comparison of density and fixations for advertisements and road signs

Analysing the results for each participant it was possible to find active drivers and passive drivers. Active drivers have observed many visual attractors like advertisements, road signs and other cars being ahead and on another lane. Passive drivers had low number of fixations on road signs and advertisements. Their fixations points were localized typically on survey. It is possible, that their perception based on peripheral vision what enables to recognize the shape of road sign. However this type of perception makes reading impossible. The statistical data for most active and passive drivers illustrates figure 8.

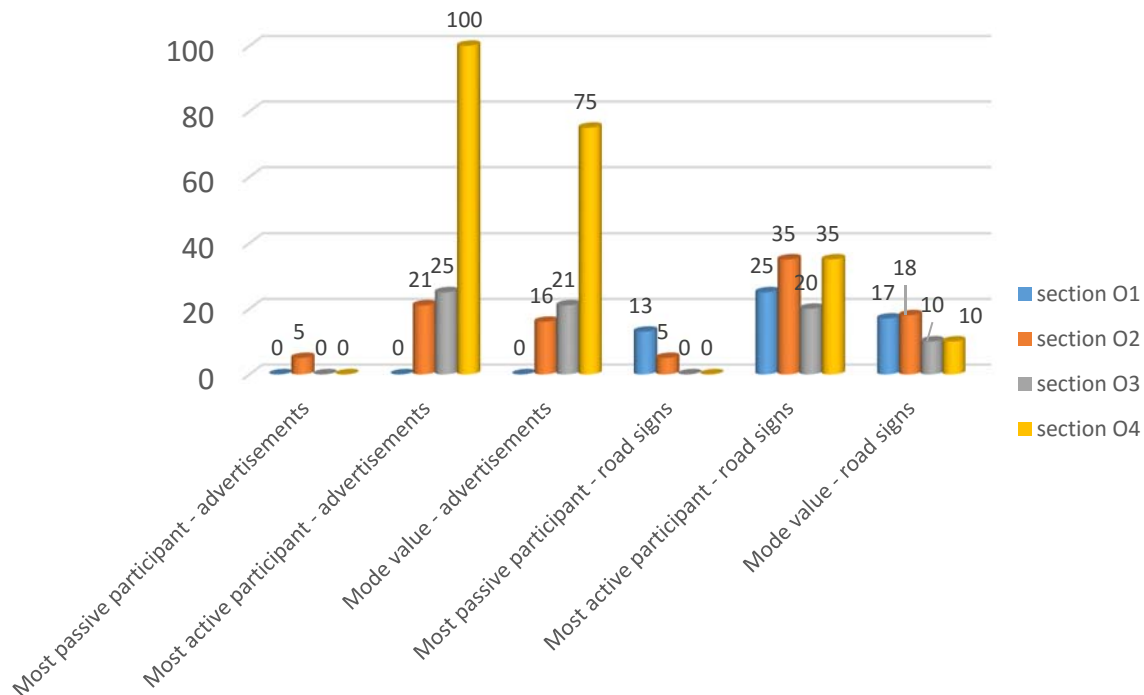


Figure 8. The percentage of fixations on selected objects for most active and most passive participant and mode value for all participants

#### 4. Conclusions

After the analysis of eye-tracker recordings and statistics of fixations on advertisements and road signs it is possible to draw following conclusions:

- three groups of drivers were found:
  - who fixated only the surface – it suggests, that they used peripheral visual perception to recognize road signs (but as it's known – this kind of perception disables reading),
  - who fixated many advertisements and road signs,
  - who fixated selected objects (advertisements, road signs, road marking and other cars),
- the highest percentage of fixated advertisements was on the section with small number of advertisements in the city area,
- single advertisement visible from long distance strongly attracts the visual perception (e.g. on section O4); this observation is similar to the results of B. Wallace research [5],
- no participant fixated all advertisements localized in a small distance between them.

#### References

- [1] J. S. Decker, S. J. Stannard, B. Mcmanus, Shannon M. O. Wittig, V. P. Sisiopiku, D. Stavrinou, "The Impact of Billboards on Driver Visual Behavior: A Systematic Literature Review", Internet: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4411179/>, [April 2015]
- [2] T. Dukic, C. Ahlstrom, C. Patten, C. Kettwich, K. Kircher, "Effects of electronic billboards on driver distraction". *Traffic Injury Preview*, vol. 14, pp. 469-76, 2013.

- [3] D. Belyusar, B. Reimer, B. Mehler, JF Coughlin: "A field study on the effects of digital billboards on glance behavior during highway driving", *Accidents; Analysis and Prevention* vol. 88, pp. 88-96, 2016
- [4] P. Soluch, A. Tarnowski, "About eyetracking research methodology" *Lingwistyka Stosowana (Applied Linguistic)*, vol. 7, pp. 115-134, 2013
- [5] B. Wallace, "Driver distraction by advertising: genuine risk or urban myth?" *Proceedings of the Institution of Civil Engineers Municipal Engineer*, vol. 156 Issue ME3, pp. 185-190, 2003.