Contradictory Renderings: An Experimental Oriented Study of Perception of Contentual Deviation of Photorealistic Visualisations

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Abstract

This paper is based on a master thesis which is focused on statistically valid tests in the context of photorealistic visualisations (PRVs) and their perception in judgement processes such as architectural competitions.

Based on documented occurrences in dealing with PRVs in this field, we have to mention specific effects like mistrust in information of PRVs in public participations (WARREN-KRETSCHMAR & TIEDKE 2005), usage of certified visualisations (LORDIK 2012, MAY & VAN DEN HOUT 2011), lack of authenticity in PRVs (PAAR & REKITTKE 2010) or even the ban on PRVs from competitions by the municipality (STADT ULM 2012). Further analysis in this research field discusses the state of the art and the visual communication in landscape architecture in a manifold and sometimes in a contradictory way. These findings lead to the assumption that there is a dilemma among specific features of PRVs, their usage and the viewer's perception and expectation.

According to the author's knowledge this study represents the first work with this research focus. The aim of this empirical and experimental study is to research on contentual deviation (CDe) in PRVs in landscape architecture designs, their detection and reactions from viewers. Therefore it deals with influences and impacts of factors like atmospheric effects, different levels of CDes, their identification, the viewer's focus of attention and his/her professional experience.

The subsequent set-up of the practical experiment is based on the hypothesis that the viewer does not recognise any CDes in PRVs. That means that visualisations can have different information than inherent parts of the communicated design without anyone noticing it.

Photorealistic visualisations of four submissions of the competition "Schinkel-Wettbewerb 2014" (Architekten- und Ingenieur-Verein zu Berlin e. V.) are manipulated according to previously developed categories and prepared for an experiment. During the research work 57 students (Bachelor and Master level) of landscape architecture rate the manipulated proposals in a role-play as juries of the competition. They evaluate the plans and write their judgment on prepared surveys while their behaviour and reaction are observed and recorded separately. The essential object of investigation stays unknown to them until the end of the experiment (BORTZ & DÖRING 2006).

The study participants recognise 5 out of 105 CDes in the whole experiment. Renderings with high-level CDes and little intense atmospheric effects are more often identified. The

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students of higher semesters do not see more deviations than students in the beginning of their studies. There is also no difference if the probands concentrate more on the idea of the design or on visualisations. Finally the statistical analysis of all compiled data implies that following parts of the hypothesis are acceptable: CDes are not recognised regardless of the viewer's focus and professional experience. Slight CDes and CDes in PRVs with strong atmospheric effects are not likely to be noticed.

If deviations and manipulations are unlikely to be seen by students as it is shown by this experiment, can we conclude also that members of a professional jury miss a high number of them in architectural competitions? The answer is probably yes according to this study's results, which implies the level of professional experience (semester levels) did not have an influence. This raises questions in the context of competitions and their judgment structure.

1 Introduction

In 2013, the construction of the Claraturm in Basel (CH) was decided by a referendum. Two active parties were arguing about its realisation, mainly by using PRVs. Opponents of the project think the tower is changing the face of the city while supporters claim a relaxation of the apartment market in Basel. Within the debate a PRV came up which shows a strong visual impact of the building towards its surrounding. It turned out the displayed building was too large in comparison to the intended design by the architects, shown in Fig. 1. The mistake of the visualisation was discovered only by the investigation and recalculation of the visualisation. The referendum was eventually decided towards the supporters of the project (HANS-PETER WESSELS 2013).

Fig. 1: Visualisation with exaggerated building size; correct proportions shown in white lines (UBS Media Relations Schweiz) (left); Visualisation by the architects Morger + Dettli (right)

There are other documented occurrences in planning projects such as comments from farmers who disagree with information on high level renderings in a public participation about their familiar environment. They claim the simulation looks “too good” or is not accurate (WARREN-KRETSCHMAR & TIEDKE 2005). Researchers also found out that glossy and un-

authentic PRVs can convey misleading information which effect disappointment in the reality check with the finished construction (PAAR & REKITTKE 2010).

There are also other cases where the governance or municipality react to the usage of PRVs in professional practice. The building department of London demands planning offices to use "Visual Verified Montages" which insert the simulated planning into several predefined and "sober" photographs instead of completely rendered pictures (MAY & VAN DEN HOUT 2011). The municipality of Ulm avoids PRVs by banning them from some urban planning competitions such as the "Wohnquartier am Egginger Weg" (STADT ULM 2012).

The agglomeration of these examples shows how PRVs are dealt with in planning processes and how misleading they can be. This leads to the assumption that specific properties in PRVs make viewers perceive visual information in a way that they cannot process the inherent information effectively. As a consequence mistakes in the content are likely to be overlooked.

2 Empirical Experiment

To prepare the empirical experiment and further research work to the topic, specific hypotheses are developed (see chapter 2.1), which deal with the findings and conclusions of chapter 1. Subsequently an empirical and practical experiment set up in chapter 2.2 and includes strategies ho to confront participants with manipulated PRVs. Therefore a competition is manipulated as shown in chapter 2.3 and the experiment executed as it is displayed in chapter 2.4.

2.1 Hypothesis

For developing an adequate and examinable hypothesis a subdivision seems to be practical. Splitting the hypothesis in one work-hypothesis and three sub-hypotheses helps isolating effects of preliminary findings. To start the first research-work in this field (according to the author's knowledge) four hypothesis parts seem to be manageable but they represent only obvious subjects. The experiment is based on the presumption, that the viewer does not recognise any CDes in PRVs. Therefore the hypotheses are: the intensity of deviation, the focus of attention, atmospheric effects in PRVs and the viewer's professional experience does not have any influence on this statement. Table 1 shows the hypotheses in detail.

Table 1: Hypotheses

Hypothesis	Description
Work-hypothesis 1	CDes are not recognised no matter if the focus of attention is on the design or on the visual representativeness.
Sub-hypothesis 1.1	CDes are not recognised no matter the level of the deviation.
Sub-hypothesis 1.2	CDes are not recognised no matter the level of atmospheric effect.
Sub-hypothesis 1.3	CDes are not recognised no matter the professional experience of the viewer.

2.2 Experimental Design

The empirical experiment is designed to confront different experienced viewers with posters by using manipulated PRVs and with the aim to find out if they recognise the CDes or how they generally behave and react.

Before the preparation of the visualisations starts, all variables of the hypotheses are methodically operationalised and valuated as it is displayed in Table 2. They define the experimental structure and sequence of events. Analogical to the selection of hypothesis, the variables and their operationalisation represent an adequate and manageable scope and can surely be enhanced in further tests.

A pre-test of the operationalisation (see Table 2) gives insights about the further arrangement of the experiment and examine the usability of levels. The results in general show the timeframe needs to be defined to increase the viewer's focus. The actual topic needs to be unknown to the participants to avoid the specific and sole search for CDes instead of the typical behaviour such as what competition juries demonstrate. The pre-test shows also that participants who know the research topic in detail find CDes in PRVs where nothing is manipulated − nothing is wrong (compare BORTZ & DÖRING 2006; EID et al. 2010).

The participant's behaviour is recorded with a systematic and open observation which considers the viewer's behaviour towards the visualisations in a time related structure (BORTZ & DÖRING 2006; EID et al. 2010). At the same time the participants fill out a survey about several aspects of the designs. The outcomes should help finding out the impact of CDes on the judgement process as well as slightly guiding the viewer's focus of attention through varying surveys.

Table 2: Description of the variables and their operationalisation

Variable	Description	Operationalisation
Contentual deviation (CDe)	Gradual difference of an attribute towards its requirement. The substance of the visualisation differs from other parts of the plan in the meaning of different perspective proportion or changed design specifications.	5 levels from 1 (no deviation) to 5 (extraordinary deviation). Compare Fig. 2
Atmospheric effect	Features of visualisations like colour and light effects, relatable objects (people) and human activities. These effects primarily evoke an emotional reaction of the viewer (compare Ballstaed 2012).	3 levels from A (weak atmospheric effect) to C (strong atmospheric effect). Compare Fig. 3
Experience	The viewer's total amount of experience with professional visualisations.	4 levels of bachelor and master programme of landscape architecture (2nd-6th semester bachelor; 4th semester master)
Focus of attention	The viewer's directed information	Focus on visual aspects of the poster or the quality of the design

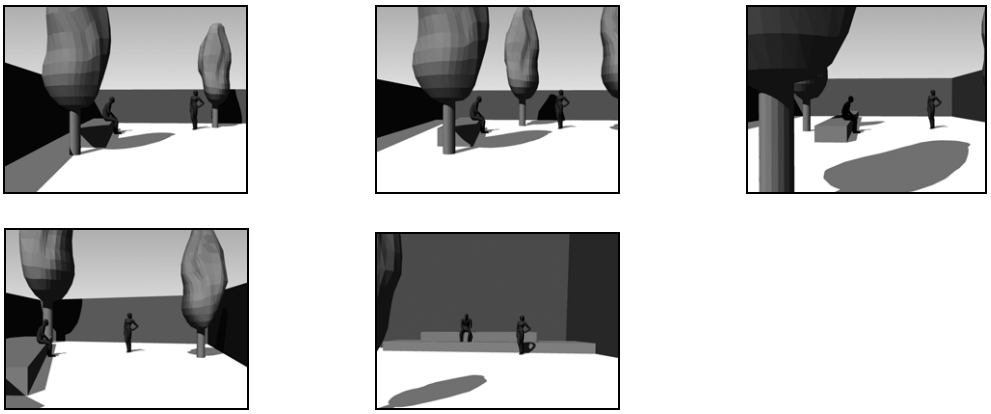

Fig. 2: Levels of contentual deviation from "not at all" (top left, level 1) to "very much" (bottom right, level 5)

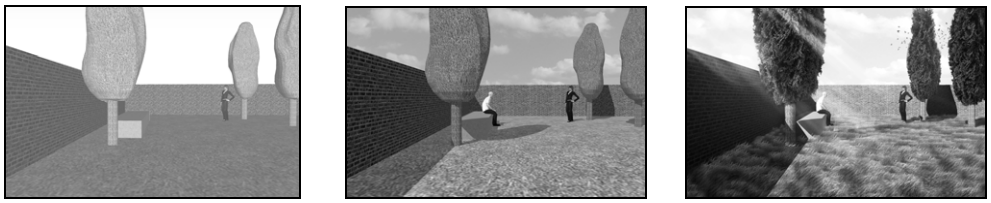

Fig. 3: Levels of atmospheric effect from "weak" (left, level A) to "strong" (right, level C)

2.3 Preparation of Schinkel-Wettbewerb

The planning competition "Schinkel-Wettbewerb" (ARCHITEKTEN- UND INGENIEUR-VEREIN ZU BERLIN E.V.is carried out annually for young professionals in planning professions such as architecture, urban planning and landscape architecture. In 2014 it enfolded Spandau, which is a quarter in Berlin next to the confluence of the rivers Havel and Spree. The promoters demanded conceptual designs for the neglected urban structure and an open space sequence along the riverside depending on the specific profession. The proposals required an overview plan as well as adequate details as seen on http://www.aiv-berlin.de/schinkel-wettbewerb/dokumentationen/534-aiv-schinkel-wettbewerb-2014.

For the preparation of the experiment four prizes winning submissions and also used PRVs, were chosen to be manipulated according to previously developed-levels (see Fig. 2 and Fig. 3). The CDes of the PRVs were changed to differ from the overview plan. Fig. 4 gives a detailed overview of all used PRVs. The combination of PRVs are structured in such way, that every manipulation level is shown. Fig. 5 shows a specific manipulation example, were the perspective proportion and design parts are changed gradually. Contrast and colours were also adjusted to match the level of atmospheric effect. Two visualisations of different submissions were even interchanged (Fig. 6). All categories were chosen to be present in equal numbers for statistical validity.

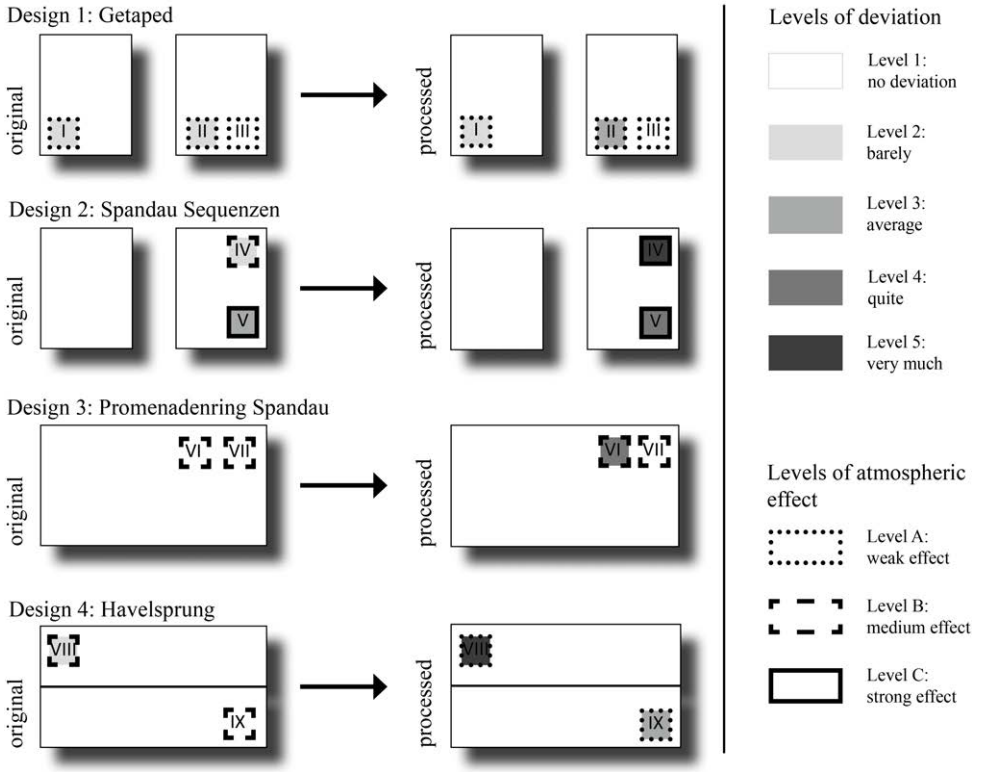

Fig. 4: Original PRVs of the design posters (left) were manipulated (middle) according to the levels of deviation (CDe) and atmospheric effects (right)

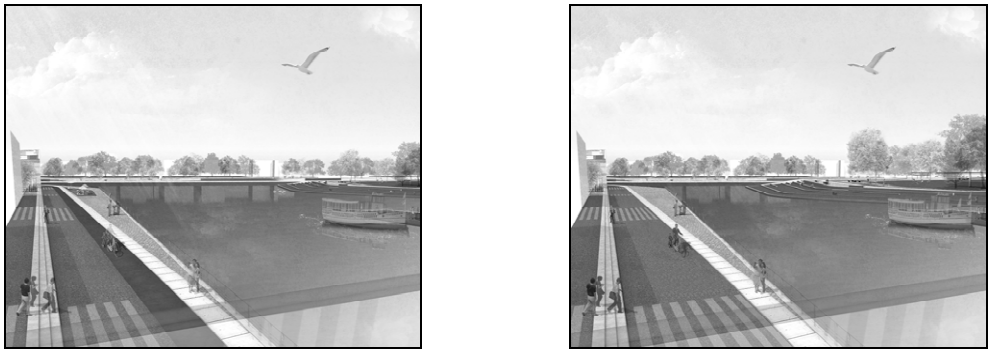

Fig. 5: PRV "Blick vom Hafen auf die Spreemündung" from proposal "Promenadenring". Original visualisation (left); Manipulated visualisation. Deleted promenade and enlarged riverside in the background. Category 4C (right) (THIEME et al. 2014).


Fig. 6: PRV ”Ausschnitt neues Spandauer Eck” from proposal “Havelsprung”. Original visualisation. (left); (HÖVELMANN et al. 2014); Visualisation interchanged with “Blick vom Hafen auf die Spreemündung” from “Spandau Sequenzen”. Lead to category 5A (right) (HAMACHER 2014).

2.4 Performance of the Experiment

For executing the experiment the manipulated submissions were printed and exhibited. The experiment was presented as a role-play for landscape architecture students at different stages of their studies (bachelor semester 2/B-LA 2, 4/B-LA 4 and 6/B-LA 6; master semester 4/M-LA 4) and as a group work (2-6 persons). The group members were expected to experience being jury of a competition. After a 10 minutes briefing about the competition and the individual aspects of the proposals, the groups were asked to rate the four proposals in five aspects as well as to rank them in their overall quality. The questions on the surveys follow the competitions announcement and treat the urban connection between riverside and surrounding, the consistency of the riverbank sequence, the cultural quality of the proposals and the quality of the designed open spaces. The last question relates to the work-hypothesis 1. For guiding the focus of attention the groups are divided into two test groups. Test group 1 focuses on design aspects and test group 2 focuses on the representativeness of the visualisations. The basic subject of investigation as well as the division in test groups stays unknown to the participants to avoid unwanted effects (compare chapter 2.2, pre-test).

3 Results

57 students of landscape architecture (20 students B-LA 2; 10 students B-LA 4; 24 students B-LA 6; 3 students M-LA 4) participated at the experiment in June 2014. In the average each group, which consisted in 2 to 6 students, needed 19 minutes for inspecting the designs and filling out the survey. Finally 15 groups participated: 7 groups (26 participants) were in test group 1 and 8 groups (31 participants) in test group 2.

Only five times a group came to a point where group members had problems on one hand locating the visualisation on the overview plan and/or on the other hand finding elements due to the manipulations. These issues were never mentioned in the written form by the groups. This could be documented by the observer only and is done specially in the case of manipulation detection per group.

For the statistical interpretation the number of groups were multiplied with the number of shown PRVs with CDes from level 2 to 5. Consequently the maximal quantity of recognizable deviations are 49 in test group 1 and 56 in test group 2.

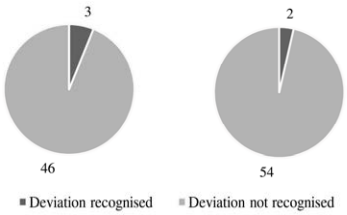

Fig. 7: H1 Results considering participants who are concentrating on the quality of the design (test group 1, 49 PRVs with CDes; left) and the visual representativeness (test group 2, 56 PRVs with CDes; right)

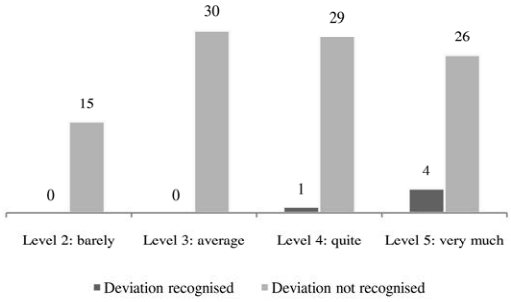

Fig. 8: H1.1 Results considering PRVs with different levels of deviation for all 15 groups (See Fig. 4 for the distribution of CDes)

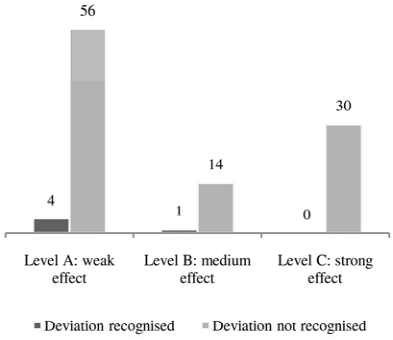

Fig. 9: H1.2 Results considering PRVs with different strong levels of atmospheric effects for all 15 groups (See Fig. 4 for the distribution of CDes).

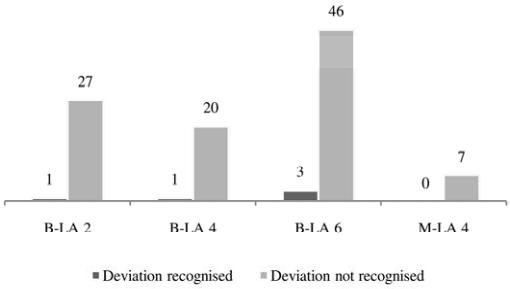

Fig. 10: H1.3 Results considering PRVs with deviations for student groups with different professional experiences.

It was unexpected that the participants spent comparatively little time on the inspection of PRVs. About 10 percent of total time was used for it, independently from the group-focus (compare chapter 2.4). From 105 PRVs (15 groups; 7 PRVs with CDes each) with deviation only 5 were recognised. The rate of recognition of CDes was not even higher at questions which explicitly concern the illustrations (test group 1) in comparison to the test group with different surveys (test group 2; Fig. 7). The groups detected CDes only for the levels 4 and 5 (Fig. 8). CDes in PRV with little intense atmospheric effects are more often recognised (Fig. 9). The students of higher semesters do not perceive more deviations than students in the beginning of their studies (Fig. 10) – related to the number of participants.

The statistical analysis of the data was done with a t-test and matched with the hypotheses (compare BORTZ & DÖRING 2006; EID et al. 2010). The outcome is that work-hypothesis 1 and sub-hypothesis 1.3 are corroborated and sub-hypothesises 1.1 and 1.2 are not.

4 Conclusion and Outlook

For sure this study can only give first impressions and indications. Nevertheless the acquired results are so clear and obvious in the eyes of the authors that there are some things to be recorded besides further research possibilities in this field: PRVs, which represent one of the strongest communication tools in the profession, do not seem to be scrutinised in decisive planning decisions. They even seem to be ignored in case of doubt. It is bewildering and frightening that almost only deviations in interchanged illustrations, which had nothing to do with the planning, were recognised in the experiment. Considering the time participants spend on photorealistic visualisations it seems to be that PRVs played a minor role in the examined judgement process. This result is unexpected because it didn't explain the effects PRVs have in the field of planning and is contradictory to the analysis results shown in chapter 1.

Furthermore there can be a transmission of the results towards regular planning competitions, based on two arguments: On one side because of discovery that student's foreknowledge did not affect the recognition of mistakes and it is not expected to occur with growing experience. On the other side because half of the jury associates are part of the “Sachjury” (Eng.: subject panel). They are not necessarily trained in reading plans and at least are comparable with the professional experience of students.

How many competition decisions were made, based on misguiding information, especially of CDes? Indications, which were also mentioned in chapter 1, point towards some issues of misguiding information which were even instrumentalised in extreme cases.

Taken as a whole this study gives the sign, that role and perception of PRVs in the profession needs to be scrutinised more intensively than today. PRVs demand through their visual power and distinctiveness − their greatest benefit − an adjusted approach at their application as well as their creation is needed, if we want to sustain this tool for the profession. Especially the creation process has to change from the visualisation comprehension (incl. exaggeration, excesses and omissions) into a process of creating correct simulations (one-on-one simulation), because mistakes in PRVs are demonstrably not recognisable. This is for sure an essential reason for the profession-wide confusion in dealing with PRVs.

The final conclusion of the results on one hand is to promote more competence in visualising. It could be a preliminary check from a separate surveyor or certified visualisation experts which are integrated in competitions. But on the other hand: Why do PRVs actually have mistakes?

In the current level of knowledge these research results seem to be applicable to other professions like architecture or urban design, because of the easily repeatable experimental design of this study. However they should be explicitly repeated and representatively changed in the research structure.

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