Naturalistic Driving
A New Method of Data Collection

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Abstract. In a typical naturalistic driving study, the subjects’ own cars are equipped with devices that, over a longer period of time, continuously monitor various aspects of their driving behavior in an unobtrusive way and without the presence of a test supervisor. This includes aspects of vehicle movement, driver behavior, and the direct environment. Naturalistic observations of pedestrians and cyclists can be carried out using site-based fixed cameras.

Naturalistic observations provide information that is difficult or even impossible to obtain through current research methods. For example, analyses of crash statistics or in-depth crash investigations cannot provide much information about behavioral issues preceding a crash or about near misses. Observations by means of instrumented vehicles or simulators do not encourage the test subjects to behave in a normal (naturalistic) way, since they are generally well aware of the experimental conditions.

Experiences in the US have indicated that the naturalistic approach may give a reliable picture of the driver's normal behavior and makes it possible to observe and analyze the interrelationship between the driver, vehicle, road and other road users under normal conditions, in conflict situations and in actual collisions.

The PROLOGUE project aims to assess the feasibility and usefulness of a large-scale European naturalistic driving study and to establish a scientific and organizational basis for this new type of research.
The work in PROLOGUE comprises a number of small-scale pilot studies in different research areas, including novice drivers, in-vehicle information systems, and vulnerable road users, through site-based observations. The pilots are preceded by an inventory of the technical, methodological and organizational issues. The work has identified potential areas of application and research questions for which the naturalistic approach would have an added value. Ongoing naturalistic studies have been reviewed and summarized. A survey has been carried out to support the preparation of a catalogue of applications and research topics for future naturalistic driving studies.

1 Introduction

Research into the field of traffic safety mainly focuses on collisions. Most of the research work tries to analyze quantitative and qualitative data on collisions to learn about accident causation and to develop countermeasures. There are several different methods of collecting data about accidents, such as police records, reviews of court files or on-the-spot accident investigations.

30 years ago, the “Wiener Fahrprobe” (Viennese driving test) was developed as a means of driver observation for the purpose of driver assessment. The method was quite sophisticated, including a comprehensive observation program. However, the observation period was approximately one hour and there were two observers in the vehicle, which does not fully motivate a driver to behave in a normal manner.

Instrumented vehicles have been used in the past, mainly for field operational tests (FOTs) or similar experiments. In most of the cases, the vehicles are filled with cameras, computers, wires and plugs. In many cases, an observer is on board as well; at least one assistant is needed to start the observation device and to save the data after a test drive. Frequently, such observations have been carried out on standardized routes and the test subjects were driving just for the purpose of the test.

Simulator studies offer opportunities to simplify research work, but still the time spent in the simulator, i.e. the amount of information, is limited, and not all questions can be reliably answered in a simulator.

Nevertheless, using instrumented vehicles and simulators is a step towards observing “normal behavior” instead of analyzing accidents. There are weaknesses in all these methods, which are soon to be overcome with the use of a new method.

The PROLOGUE (PROmoting real Life Observations for Gaining Understanding of road user behavior in Europe) project aims to assess the feasibility and usefulness of a large-scale European naturalistic driving study. PROLOGUE is funded by the European Commission within the framework of FP7. It started in August 2009 and will finish in July 2011. There are nine partners from five EU-countries, Norway and Israel. PROLOGUE is coordinated by SWOV, the Road Safety Research Institute of the Netherlands. The project will deal with all aspects of ND studies, starting with a literature survey and defining potential research questions. PROLOGUE develops proposals on aspects of data collection, i.e. which parameters to measure and which technology (sensors, data storage) to use. There will be a focus on how to analyze the enormous amounts of data that will be