1. Introduction

During the last five years video-techniques for the unobtrusive observation and analysis of roaduser behaviour have been widely used. Especially for the evaluation of counter-measures or new road design elements the analysis of roaduser behaviour may be very helpful in understanding the functioning of the traffic process in relation with local characteristics. In this context our research is not restricted to the rare events like accidents and serious conflicts; also other behavioural aspects like speed, speed changes, path chosen, place of stopping, etc. are taken into consideration. After a short description of the method some applications with respect to interactions between roadusers will be discussed.

2. Definition and types of conflicts

To describe the danger involved in a traffic situation, Hayward (1972) defined the time-to-collision (TTC). This measure is the time for two vehicles to collide if they continue at their momentaneous speeds and on the same path. If the vehicles are not on a collision course the value of TTC is infinite. If they are on a collision course the TTC is finite and will decrease with time. An evasive action like decelerating and/or swerving may lead to a minimum value for TTC, which then increases to infinity again. The minimum TTC value now can be taken as a critical measure for the risk involved in an interaction between roadusers. Hayward suggests to use a minimum TTC value of 1.0 s as a good threshold. The definition of a conflict then is:

"A conflict is a traffic situation with a minimum TTC less than 1.0 s".

The threshold value of 1.0 s seems to be a rather arbitrary choice and could depend on the type of interaction (car-car or car-cyclist) or on different speedclasses. From the studies conducted so far, it appears that interactions with a minimum TTC-value greater than 1.5 s, in general do not substantially contribute to figures based on min TTC < 1.5 s. So 1.5 s is used as an upper limit in our studies, until now restricted to urban areas. In most of the manoeuvre-combinations the interaction between motorvehicle and cyclist or moped-rider is of main interest in our conflict studies. Three types can be distinguished:
a) car from/to minor road -- cyclist on priority street (mostly on a separate cycle-track),
b) cyclist from/to minor road -- car on main road and
c) right-turning car -- cyclist on main road.

3. Observation method

As mentioned in paragraph 2, the TTC measure is used for describing the interaction between road users. For the computation of TTC curves the measurement of motion and position parameters is necessary. For the objective quantification of several aspects of road user behaviour registration by means of film or video in most cases is still the only way. In a preliminary study both techniques were compared (Horst and Symonsma, 1979). With respect to costs and practical aspects the use of video is preferred.

For the recordings a suitable position for mounting the camera(s) has to be found in the neighbourhood of the location, preferably at a height of at least 4 m above the road surfaces, and as unobtrusively as possible. For all locations under investigation (until now about 40), a good camera position could be found rather easily in adjacent buildings or lampposts. Two types of video-recordings are made: one continuously on a timelapse videorecorder (VHS-system), mostly with a reduction factor of four (12.5 fields/s) or eight (6.25 fields/s), and the other on a normal speed video-recorder (U-matic system), 50 fields/s. The U-matic recorder is started by hand when a road user from a relevant direction arrives and stopped when the manoeuvre has taken place. At each location video recordings mostly are made during one day for six hours, 8-10 h, 12-14 h and 15:30-17:30 h. During these periods traffic counts are made for periods of five minutes, normally on the spot, sometimes afterwards from the timelapse recordings. For further details about the recording equipment see Horst (1982).

4. Data analysis

Those aspects, for which clear behavioural alternatives can be distinguished, are scored by individual observers directly from the video-recordings. Compared with a direct scoring by observers in the field, the possibility of repeating the scene, is seen as an advantage with regard to the reliability. A programmable electronic grid can be mixed into the video picture which, for example, enables a simple measurement of speed, path chosen, place of stopping, waiting time, passing time, etc. To describe the interaction between road users a complete quantitative analysis is done by