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Single bicycle accident originating from unsuccessful interactions

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1 BACKGROUND

In Sweden, single accidents are the biggest traffic safety problem for cyclists contributing alone with 80% of their serious injuries [1]. In this respect, the issue of bicycle infrastructure maintenance received significant attention. Slippery, uneven or in other way problematic road surface is reported as a main contributing factor in about half of the single bicycle accidents [2]. This work explores other causal mechanisms for single accidents, primarily those originating from unsuccessful interactions between cyclists and infrastructure elements as well as other objects and road users on the bicycle path.

Interactions with the infrastructure take place at locations of rapid change (often reduction) of the effective space available for cyclists. Such examples could be the narrowing of the bicycle paths at the entrance into a tunnel, speed-reducing gates, parking areas for bicycles and e-scooters, poles, manholes, tree branches and other objects hanging over the bicycle paths and forcing cyclists to adjust their travel. In such situations, the cyclist can either collide with the objects directly or lose balance as a result of the rapid speed/direction changes necessary to avoid the collision. Another risk factor is the sharp (and unexpected) turns or lateral displacements of the bicycle path itself that can be observed at the entrances to tunnels (often combined with a steep road descent) or intersections.

Collisions between cyclists and pedestrians resulting in severe injuries are relatively few, about 10% of all severe injuries [2]. It is reasonable, however, to expect that many of such unsuccessful interactions result in single falls rather than direct collisions. It was shown that about 10% of single accidents had an interaction with other road users (incl. motor vehicles) as a contributing factor [2].

2 STUDY SETUP

This complete study plan contains analysis of the bicycle single accident records in Swedish database Strada [3], analysis of cyclist trajectories at relevant location extracted using video analysis technology [4] and experimental evaluation of some of the 'bicycle calming' measures with the goal to find an optimal geometrical dimensions providing sufficient speed reduction of the bicyclists without compromising their stability.

In this presentation, we will report the accident analysis results.

Strada (Swedish Traffic Accident Data Acquisition) is a national database containing information about traffic injury craches [3]. The unique feature of the database is that it combines both the police crash records and healthcare records about traffic-related injuries. The first database pilot was initiated in 1999 and covered only few geographical areas. However, starting from 2016, it has nationwide coverage with all emergency hospitals reporting the injury data [5]. The police and hospital records are merged using personal identifiers of the people

suffered in accidents. These identifiers are then removed and are not visible in the reports accessible to the researchers.

Bicycle single accidents are primarily known through the hospital records, having corresponding police reports available only in very few cases. It is important to note that not all patients get registered since they can choose to opt from the registration.

The emergency hospitals record the injury severity according to the Abbreviated Injury Scale[1] [6]. At the same time, the patients receive a questionnaire containing both closed-ended and open-ended questions designed to cover all types of traffic crashes. The closed-ended questions concern crash type, road state, location type and trip purpose, and the open-ended questions address the course of events before and during the accident. These accident descriptions were read and classified by the research team using a simple taxonomy developed for this study.

94,570 non-fatally injured cyclists were retrieved from the emergency hospitals' data, covering the period of 2010 to 2019. Both the open- and closed-ended questions are further analysed to select the cases relevant for the purpose of this study.

3 EXPECTED RESULTS

The expected results will present mapping of the single bicycle accidents originating from unsuccessful interactions by road state, location type, trip purpose, injury severity and injured body regions. It will also reflect which type of 'interaction' (another road user, infrastructure, obstacles, etc.) preceded the single accident.

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[1] MAIS = Maximum Abbreviated Injury, with MAIS capturing the highest (i.e. most severe) AIS code that patient sustains; AIS 1 = minor and AIS 6 = maximum.