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Thema:
Motorcycle Motor Skill Level System – Definition von Fahrerfähigkeiten und Ausbildungsinhalten auf Basis von Realunfalldaten

Zusammenfassung

In mehreren Studien wurde gezeigt, dass ein Unfall in der Entstehung häufig auf das mangelnde Fahrkönnen des Einzelnen zurückzuführen ist (bspw. Bauer et al. 2014, Kuschefski et al., 2012). Basierend auf den Analysen von Realunfällen werden die Fähigkeiten verunfallter Motorradfahrer in Hinblick auf die Unfallursachen eingeschätzt. Auf Grundlage dieser Erkenntnisse wird ein Levelsystem zur Beurteilung motorischer und kognitiver Fähigkeiten von Motorradfahrern entwickelt. Weiter erfolgt eine Definition von Fahrerfähigkeits-Mindestlevels (motorisch und/ oder kognitiv) zur Vermeidung der als relevant ermittelten Unfallsituationen. Mit diesem Vorgehen soll auch eine Grundlage zur Bewertung bzw. Anpassung von Ausbildungsinhalten für Motorradfahrer geschaffen werden. Auch wenn der Fokus auf motorischen Fähigkeiten liegt, soll die kognitive Verankerung dieser Fähigkeiten durch die Unterstützung der korrekten Selbsteinschätzung erfolgen.

Die wesentlichen Kernbereiche dieses Levelsystems basieren auf der permanenten Anpassung folgender drei Säulen:

A) Aus Unfalldaten ermittelte, fehlende Fahrerfähigkeiten dienen im Levelsystem zur Festlegung notwendiger Mindestlevels.
B) Das Levelsystem soll die Motivation von Motorradfahrern zum Trainieren steigern. Es bietet einen Ausblick auf erreichbare Fähigkeitslevels sowie Unterstützung bei der Selbsteinschätzung der Hobbyfahrer.
C) Die Überprüfung und Festlegung von Mindeststandards bei der Aus- und Weiterbildung.

Motorcycle Motor Skill Level System – Definition of rider skills and training content based on accident data

Abstract

Different studies showed that a lack of skills of the individual motorcyclist is regularly recognized as main contributing factor to accidents (e.g., Bauer et al. 2014, Kuschefski et al., 2012). Rider skills that contributed to the accidents are defined founded on real accident data. Based on these findings, a level system for the assessment of rider motor and cognitive skills is developed. Further, a set of minimal rider skill requirements is defined, which would be necessary to avoid the analyzed types of accidents. This approach shall provide a basis for the evaluation respectively optimization of motorcycle training content. Even if focusing on motor skills a cognitive anchoring of different skills, levels and training content is necessary. Riders shall receive support for improving their self-assessment capabilities.

The motor skill level system is based on three main pillars that undergo regular adaptation:
A) Necessary rider skills that are defined based on accident data serve as input for the definition of minimally required skills.
B) The level system shall motivate riders to train their skills. It provides an outlook on what is achievable and supports a correct self-assessment of the riders.
C) The review and definition of standards for initial and post-license rider training.

Position Paper

One may assume that human beings aim at mastering situations that relate directly to their physical wellbeing as well as their experienced pleasure the best they can. Motorcycling as means of transport or as leisure activity can be regarded as one activity that is related to physical wellbeing due to the costs of an accident and pleasure due to the fact that at least in mid-European countries, motorcycling is mainly a leisure activity (Broughton & Stradling, 2005; Chesham, Rutter, & Quine, 1993; Will et al., in press).

Comparable leisure activities such as climbing or windsurfing have grades that define either skills of a person or challenges posted by a certain activity (e.g., climbing route). These grades and levels provide an orientation on achievable skills and allow every person to assess their own skill level. Typically, these scales refer to motor skills involved in the activity.

As there are similarities between the mentioned activities and motorcycling, this paper proposes a motorcycle motor skill level system to allow motorcyclists to classify their skills (guideline for self-assessment) and provide a collection of skills one may aim to accomplish (motivation to train).

It is important to see that cognitive skills provide the necessary framework on how to deal with motor skills. Every riders should benefit from a wide range of - ideally automated - motor skills that he or she is aware of, while at the same time only situations are pursued that leave a safety margin to master possible critical scenarios.

Further, it is obvious that it is not necessary for every rider to aim at the highest level. Same as for climbing, some riders may settle on a motor skill level that is sufficient to cover situations they seek. Hence, for any unexpected critical situation riders may benefit from automated action patterns gained in higher motor skill levels.

Different studies showed that a lack of skills of the individual motorcyclist is regularly recognized as main contributing factor to accidents (e.g., Bauer et al. 2014, Kuschefski et al., 2012). Rider skills that contributed to the accidents should ideally be defined founded on real accident data. Based on these findings a set of minimal rider skill requirements is defined, which would be necessary to avoid the analyzed types of accidents. This approach shall provide an empirically funded basis for the creation of different skills and consequently for the evaluation respectively optimization of motorcycle training content (e.g., define a start velocity for emergency brake maneuvers). Where appropriate, the motor skills coming from accident data are augmented with maneuvers that increase the riders' anticipation of motorcycle behavior given a certain input (optimized rider-motorcycle interaction).

As the motorcycle motor skill level system shall be used by every rider, the motor skills are typically defined as maneuvers, which are rather easy to understand for motorcyclists (e.g., emergency braking on a straight road from 100 km/h to standstill). The different skills should furthermore be clustered in actions that are easy to understand and that contain comparable maneuvers (e.g., braking, steering).

The proposed motorcycle motor skill level system may potentially be one classification among others that follow the same aim. For instance, depending on typical regional or national characteristics, the development of different motorcycle motor skill level systems might be useful (e.g., USA might have different accident types and consequently necessary skills than India). Also, the definition of five levels seems to be useful, but there is no strict reason for other classifications to create five levels themselves.

Table 1 provides an example about what the motorcycle motor skill level system could look like. It focuses on braking with a motorcycle equipped with ABS while going straight (no significant lean angle).

Table 1: Motorcycle motor skill level system for the domain "braking with ABS without lean angle (straight)".

Level	Skills
Level 1	Braking with the highest possible deceleration from 50 km/h
Level 2	Braking with the highest possible deceleration from 70 km/h
	Braking over a patch with reduced friction (e.g., dirt, gravel) from 50 km/h
Level 3	Braking with the highest possible deceleration from 100 km/h
	Braking over a patch with reduced friction (e.g., dirt, gravel) from 70 km/h
	Braking with a locked front-wheel for 0.3 m from 50 km/h (vehicle control in case of ABS malfunction)
Level 4	Braking over a patch with reduced friction (e.g., dirt, gravel) from 100 km/h
	Braking with a locked front-wheel for 0.5 m from 70 km/h (vehicle control in case of ABS malfunction)
	Trial stop (braking and stopping - without taking feet from footrests - and accelerating again)
	Stoppie from 50 km/h (controlled elevation of rear wheel)
Level 5	Braking with a locked front-wheel for 1.0 m from 100 km/h (vehicle control in case of ABS malfunction)
	Stoppie from 100 km/h (controlled elevation of rear wheel)
	Testing tire grip while riding
	Braking with the rear wheel in hair pin curves (no relevant lean angle) to stabilize the motorcycle (to standstill and accelerate again)

As noted before, the given threshold values do ideally come from accident data where available. It is not the aim to check whether a rider can handle a locked front wheel for 0.48 m or 0.50 m in order to "achieve" level 4. It is more about the general training of motor skills that allow to control the situation instead of showing a startle response that limits actions in hazardous situations. Same hoods true for maneuvers such as a controlled Stoppie. This motor skill is nothing to be used in public traffic for fun. It is about the general capability to handle a elevated rear wheel for instance in emergency situations instead of releasing the brakes due to shock.

It is clear that the self-assessment might differ from any external assessment of rider skills. Furthermore, some criteria such as highest possible deceleration can not simply be assessed or measured by every rider. This demonstrates the importance of professional rider trainings. These trainings can provide substantiated feedback for the riders due to their experience respectively the availability of measurement technique.

Currently, a motorcycle skill level system gets developed and will be shaped throughout the time with fruitful discussions among riders and experts as well as experiences with its applicability.

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