Motorcycling Human Factors

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Motorcycling is a risky activity

- Motorcyclists represent 4% of licensed vehicles on UK roads
  - but they account for 21% of all UK road fatalities
  - In the order of 51 times more likely to be killed or seriously injured than car drivers

  (Dept of Transport, 2009)

- Most common motorcycle accidents
  - right of way violations or ‘SMIDSYs’
  - loss of control on bends (usually only the motorcyclist involved)
  - overtaking and filtering

  (Brown, 2002; Clarke et al 2004)

- How can Human Factors support Europe’s riders?
  - but … what is human factors?
Motorcycling Human Factors

- Human Factors
  - the science of human work
  - rider behaviour, motorcycle design and human-machine interaction

- Rider cognition
  - processes become more automatic with experience = more spare capacity

- Attention
  - split between task and environment (hazards, navigation, etc)
  - potential causing us to miss vital information

- Decision-making
  - distraction effects, confirmation bias
  - focusing on the wrong primary issues?
Motorcycling as an interactive system

- adapted from McInally (2003)
Motorcycling as an interactive system
The performance of one agent in the system can affect others in the same system.

Training, expertise and confidence
- differences between novice, experienced and advanced trained riders

Rider fatigue and alertness
- traffic conditions, filtering, junctions, traffic lights, bends
- risk taking behaviour (thrills vs danger)

Situational factors
- road surface – we’re always looking at it
- we don’t have sun visors or windscreen wipers!
- weather – tyre warm-up, tyre contact
- thermal comfort – physical and cognitive issues
Keeping it real or faking it?

- Keeping it real …
  - human-motorcycle interaction in real context of context
  - BUT not always ethical or practical

- … Faking it
  - simulation allows for complex experimental designs
  - employ a wide range of metrics
  - software captures wealth of data
  - controlled conditions
  - consistent repeatability
  - safety of the laboratory
  - mistakes allowed
  - distraction tasks are possible
  - potentially fewer resources
MotorcycleSim

- Coventry and Southampton working together
  - developed from STISIM-Drive driving simulation software
  - full size interactive motorcycle
  - rider interaction using real controls
  - reconfigurable riding scenarios

- Physical & functional fidelity
  - looks like the real system
  - behaves like the real system

- Principles associated with accidents
  - braking on bends!
  - swerving on straight roads!
Left hand bend hazard
Left hand bend hazard

Advanced riders

Safer profile – notice the hazard earlier, less correction and compensate before the hazard
Left hand bend hazard

Novice and Experienced riders

Dangerous profile – notice the hazard later and over-compensate past the hazard
Advanced systems and ITS

- **Advanced systems**
  - 3D audio
  - speech input

- **Integrated rider aids**
  - rider information/communication systems
  - entertainment systems

- **Geo-spatial information for riders**
  - couriers, paramedics, police
  - accident detection (e.g. SafeRider)
Advanced systems and ITS

- Transfer of technologies from aviation/military systems
- Technologies filtering from automotive applications
- Innovative designs based on user requirements?
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Advanced systems and ITS

- ITS
  - rider warnings and information
  - maintenance and diagnostic
  - lightning and visibility
  - braking
  - stability and balance
  - rider fitness
  - passive systems
  - communication
  - vehicle to vehicle communication
  - vehicle to infrastructure
ITS development needs

• Designing solutions that motorcyclists need and want!
  – understanding different motorcycling cultures
  – understanding issues of automation

• Formal user-requirements elicitation
  – iterative and participatory processes
  – diverse methodologies and diverse populations
  – expert and end user interviews and focus groups
  – define current practices, capabilities and issues
  – define future requirements
  – manage expectations