Modelling Bicycle Interactions

Chris Osowski

Ben Waterson, Jason Noble

UNIVERSITY OF Southampton

Transportation Research Group

Background

Current design standards and guidelines for bicycle infrastructure:

- Are generally qualitative;
- Feature numerical values that (broadly) haven't changed since their incorporation into standards some ~60 years ago;
- Do not robustly consider the interaction of bicycles with one another (e.g. Figure 1);
- Do not address the capacity of the resulting infrastructure;
- Do not address the interaction of bicycles with other road users and/or pedestrians.

How can we expect to **design infrastructure** fit for the 21st Century, and that **encourages cycling**, when we lack an understanding of the fundamental behaviour of cyclists?

Figure 1: How can we design for this:

Rather than this:

Research

The initial stage of this research included building a model that replicated the circumstances of the design standards such that they can then be validated against reality. This would be standard procedure for most vehicle and/or pedestrian schemes but is rarely (if ever) done for cycle schemes. Such a model (and its calibration) will enable the refinement of existing standards, such that they can be scaled to the volume of bicycle traffic they are intended to serve.

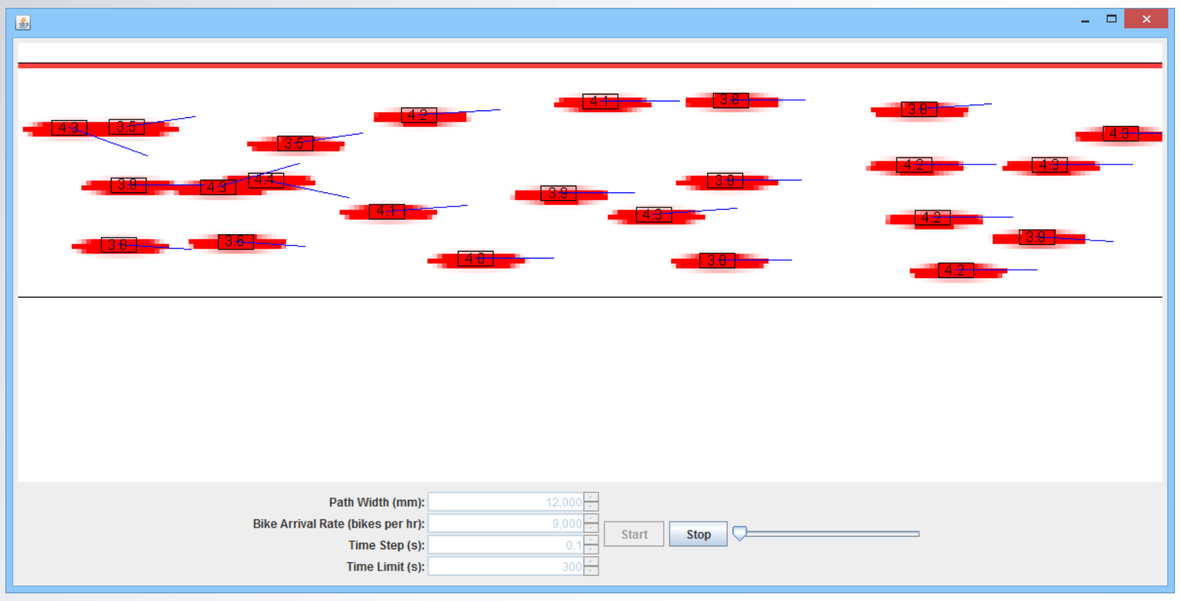
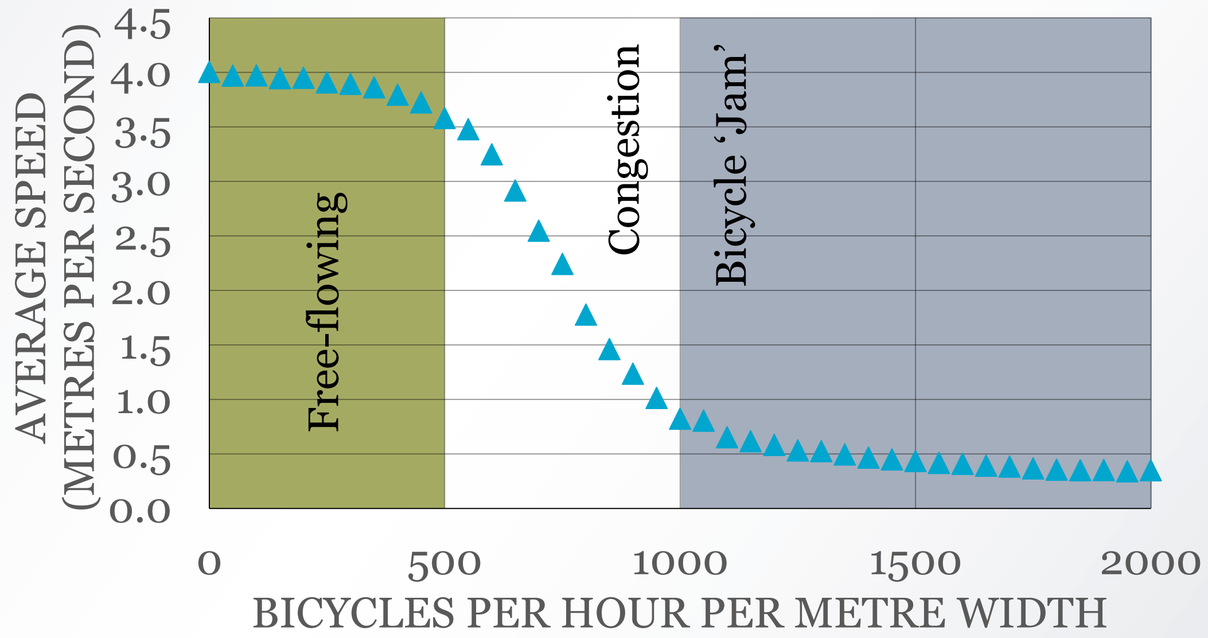


Figure 2: 2D representation of the pilot model. Bicycles travel left to right on a fixed width bicycle-only path avoiding the red 'repulsive force' areas generated by each bicycle.

Figure 3: 3D representation of the model.

Figure 4: Output plot from the model



Outputs

Figure 4 shows the output of the pilot model. Similar to vehicles and pedestrians, increases in cycle flow eventually lead to the onset of congested conditions. This shows the link between infrastructure width and capacity and demonstrates the validity of the core model.

Future Work

With the basic principles replicated successfully, the next step is to move onto a general case model and calibrate such a model against real-life cyclists.

The model will ultimately be of value in enumerating the value of schemes and allowing their economic evaluation.

This work was supported by an EPSRC Doctoral Training Centre grant (EP/G03690X/1).

EPSRC Engineering and Physical Sciences Research Council

ICSS

Chris Osowski
Institute for Complex Systems Simulation
Electronics and Computer Science
University of Southampton, SO17 1BJ
Web: www.osowski.co.uk
Email: chris.osowski@soton.ac.uk