Research Note: Review of the concept of using a lower door glass panel to improve blind spot vision for a Scania R420 Cat. N3 vehicle

Introduction

The aim of this research note is to examine the potential for a glass panel in the passenger door to remove the blind spot between the direct vision available through the passenger window and the indirect vision available through the Class V mirror that was identified in the Loughborough DfT project (Cook and Summerskill 2011).

Methodology

The existing SCANIA R420 CAD data was modified to include a window panel in the bottom half of the passenger door frame, see figure 1. The new window size was estimated based upon the current top window width.

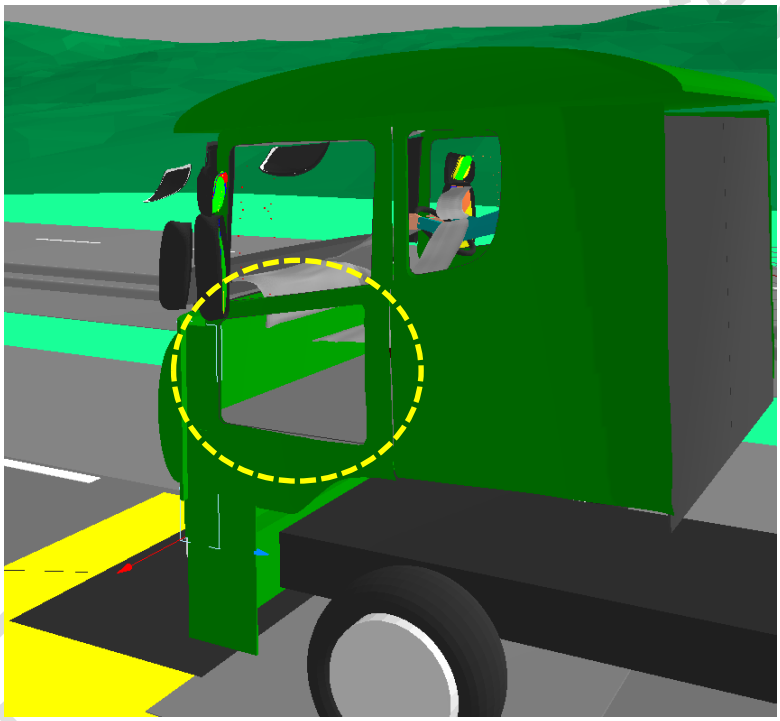

Figure 1. The additional window added to the lower half of the Scania R420 passenger door.

The new window was setup to allow the drivers vision volume to be projected. A cyclist model (UK male with 'average' height) was placed in the blind spot location identified in the Loughborough University DfT project. The position of the cyclist was varied fore aft to allow an understanding of the direct vision of a cyclist passing the Scania vehicle on the near side. The mirrors on the vehicle were setup to meet the required coverage defined in UNECE Regulation 46.

Results

The first stage of the analysis is shown in figure 2. The cyclist has been placed in a location where he cannot be seen by direct vision through the existing passenger door window, or the Class V, Class VI or Class II mirrors and is therefore in the blind spot identified in the Loughborough DfT Project. See Figure 2.

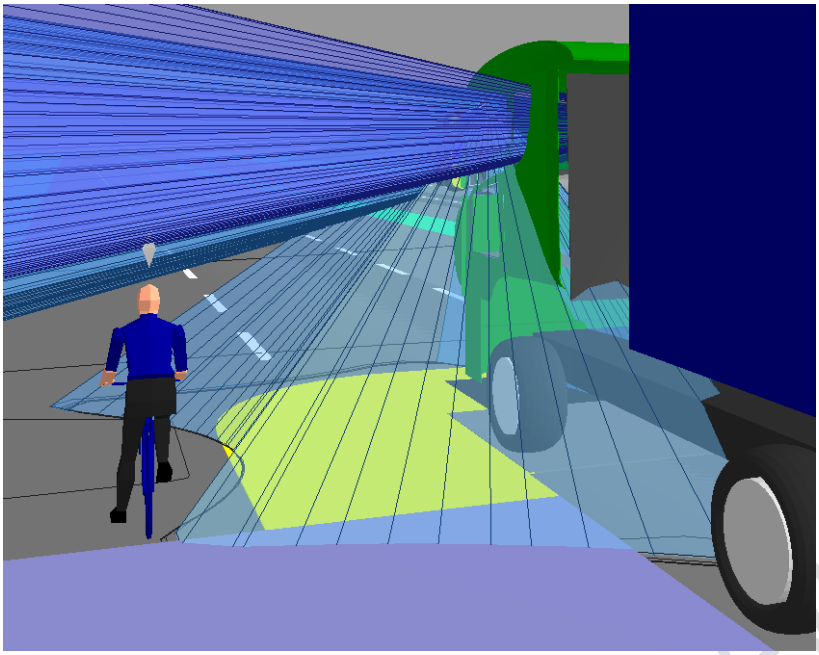

Figure 2. Exterior view showing that the cyclist is not visible to the driver of the Cat. N3 HGV though the traditional windows, or the Class II, IV and V mirrors

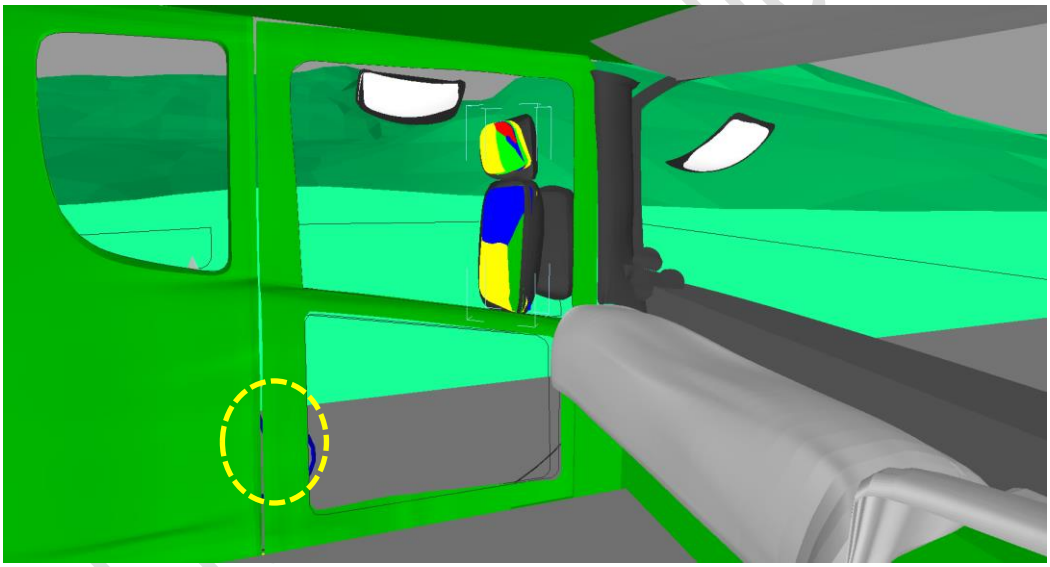

Figure 3. View through the driver's eyes. With the cyclist in the location shown in Figure 2, only a very small portion of the front wheel of the bicycle is visible to the driver (see area highlighted by the yellow circle)

The second stage involved moving the cyclist forward in 500mm increments allowing the vision through the new lower door window to be examined. See figure 4.

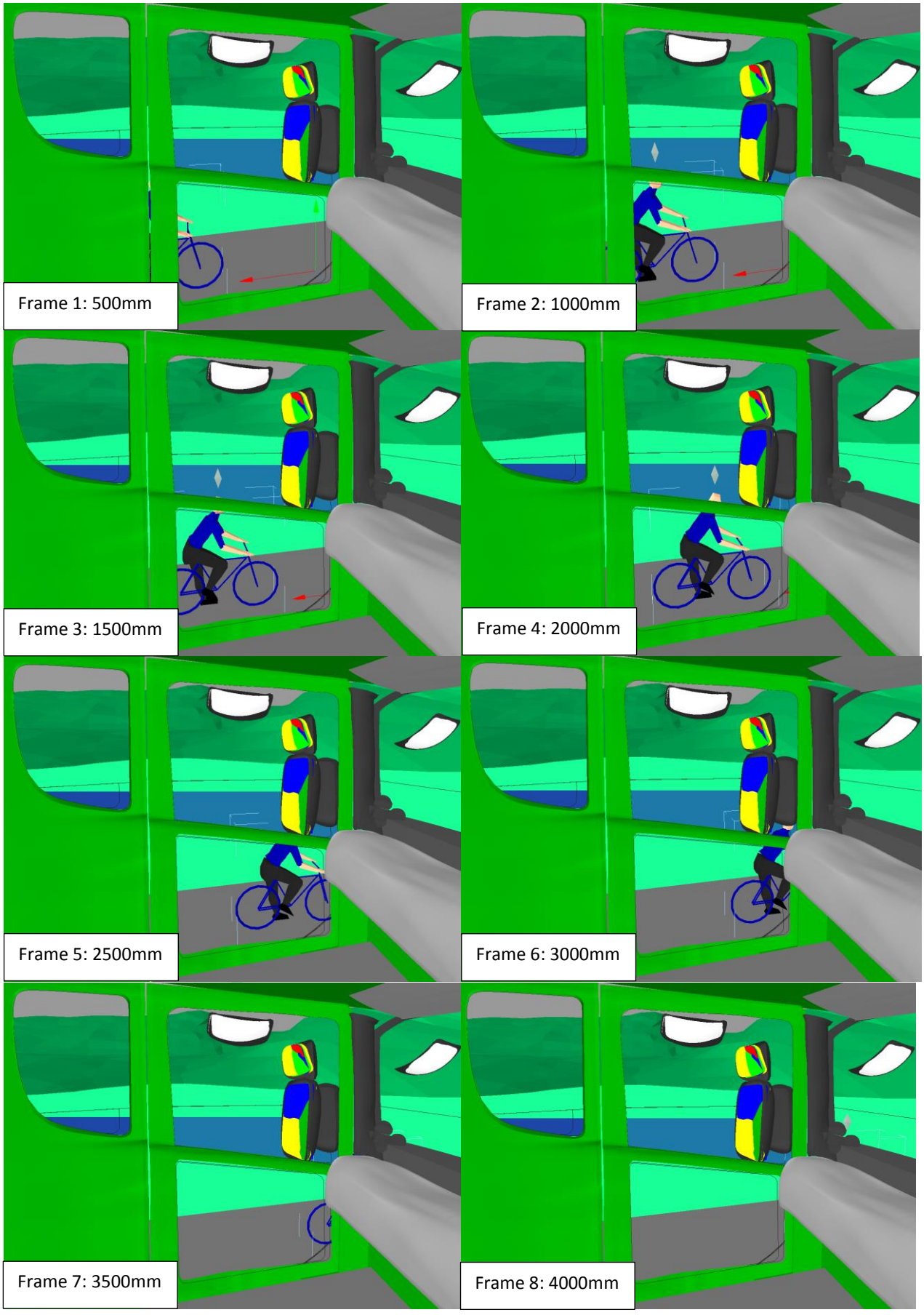

Figure 4. View through the driver's eyes. From frame 1 to frame 8 the cyclist is moved forward from the position shown in figure 2 in 500mm increments

Figure 4 shows that the new lower door frame window allows direct vision of the cyclist for 7 of the 8 frames. The new lower door frame window would therefore allow greatly improved direct vision of the cyclist. There are however still locations the cyclist would not be visible to the driver by any means (i.e. the position shown in Figure 2), and locations where the cyclist would only be visible in the Class VI mirror, see Figure 5.

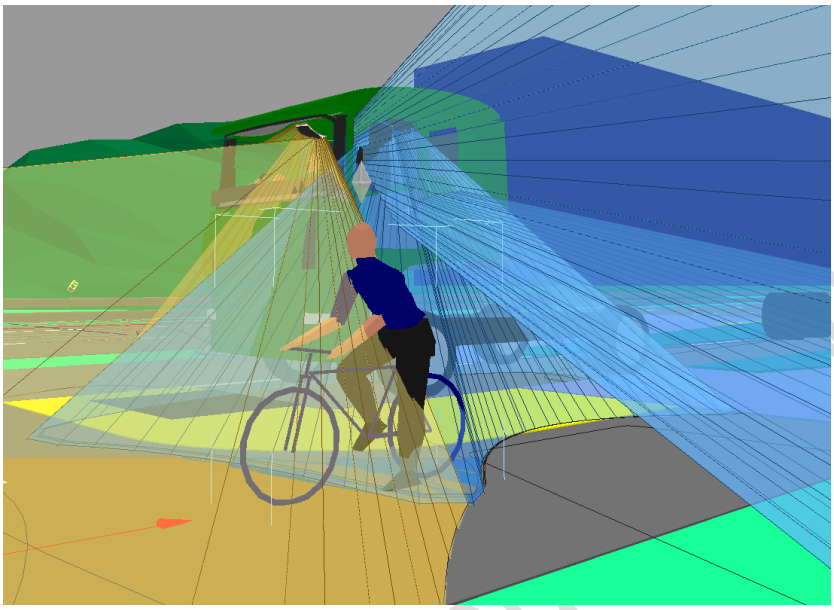

Figure 5. The cyclist is not visible through direct vision (see frame 8 in figure 4) but is partially visible in the Class VI mirror

As is shown in Figure 6, much of the benefit of the new lower door window is lost when there is passenger in the vehicle.

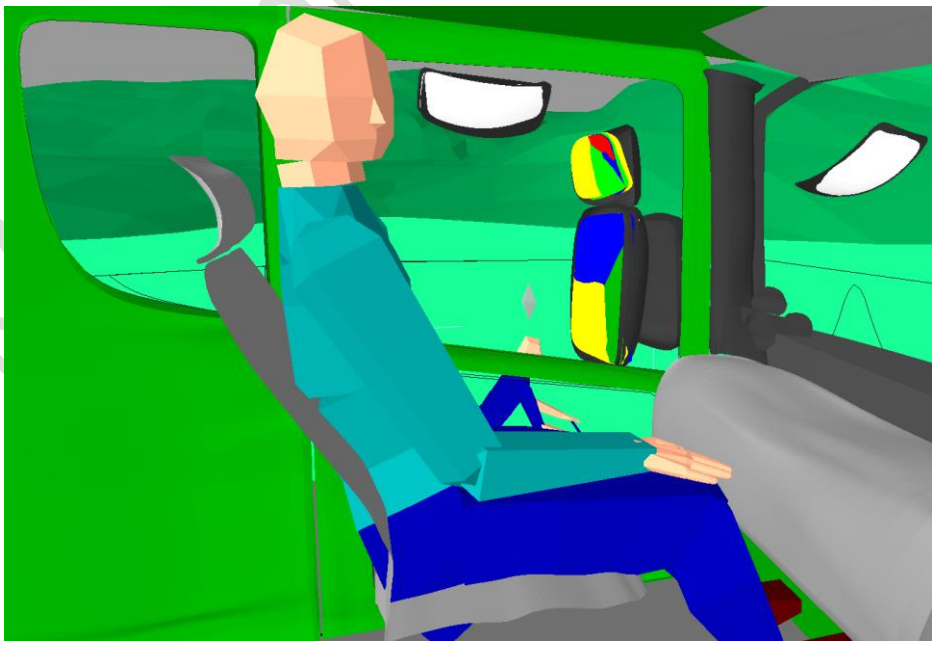

Figure 6. The view through the eyes of the driver. The benefit of the new lower door window is reduced when there is a passenger in the Cat. N3 vehicle.

Conclusions

The addition of a new lower passenger door window has potential to improve the direct vision of vehicles cyclists and other vulnerable road users. The new window as defined in this analysis, with the constraints of the Scania R420, does not completely remove the blind spot identified in the Loughborough DfT (Cook and Summerskill, 2011) project, and it is still possible for a cyclist to be completely obscured from driver vision. In addition, the benefits of the new lower passenger door window are reduced by allowing a passenger to sit in the cab of the Cat. N3 vehicle. The cyclist would be visible in all locations using the new Class V mirror coverage defined in the revision to UNECE Regulation 46 defined by the Loughborough DfT project, but it is acknowledged that direct vision is superior to the distorted image found in the use of mirrors such as the Class IV, V and VI with Radii of curvature between 200 and 300mm.

The new lower door frame window is a potentially valuable addition to the Category N3 driver's ability to be aware of vulnerable road users.

One of the aims of the research note is to highlight the benefits of using the Loughborough Digital Human Modelling system to quickly review the potential of suggested design solutions.

Caveats

- The size of the new lower door window has been estimated based upon the width of the existing door window, and the height of the floor in the Scania R420 vehicle. The window size may not be possible due to manufacturing constraints.
- There are a number of alternate cyclist positions that should also be explored using the techniques shown above that are closer to the side of the vehicle.
- The duration of the analysis that found these results was 2.5 hours, made possible by the availability of the Scania R420 DHM model produced in the Loughborough/DfT project.

References

Cook, S. E. & Summerskill 2011. The development of improvements to drivers' direct and indirect vision from vehicles. Phase 2. Loughborough University. Report for Department for Transport.

See PHASE 2 Report: http://hdl.handle.net/2134/8873