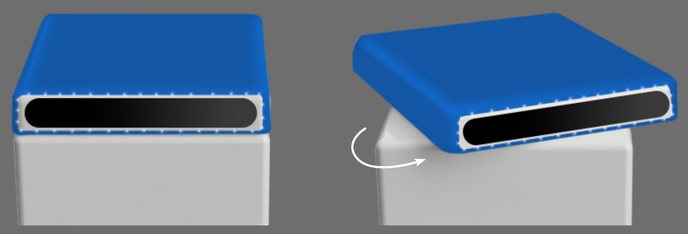
Designing predictable behaviour for autonomous delivery vehicles

By communicating their intended direction through body language

The online market of home delivered packages has been growing for years and it is estimated that this last mile delivery market accounts for more than 20% of pollution in cities. Therefore, it is important to look into alternative-, and less polluting ways of transporting these packages. An alternative way is to introduce Autonomous Delivery Vehicles (ADVs). ADVs are electric and self-driving ground vehicles, which drive with a limited speed of 5-10 km/h. They are equipped with various sensors, cameras and GPS tracking for safety and security reasons and ultimately they're able to manage all driving tasks without any human intervention in a mixed traffic environment.

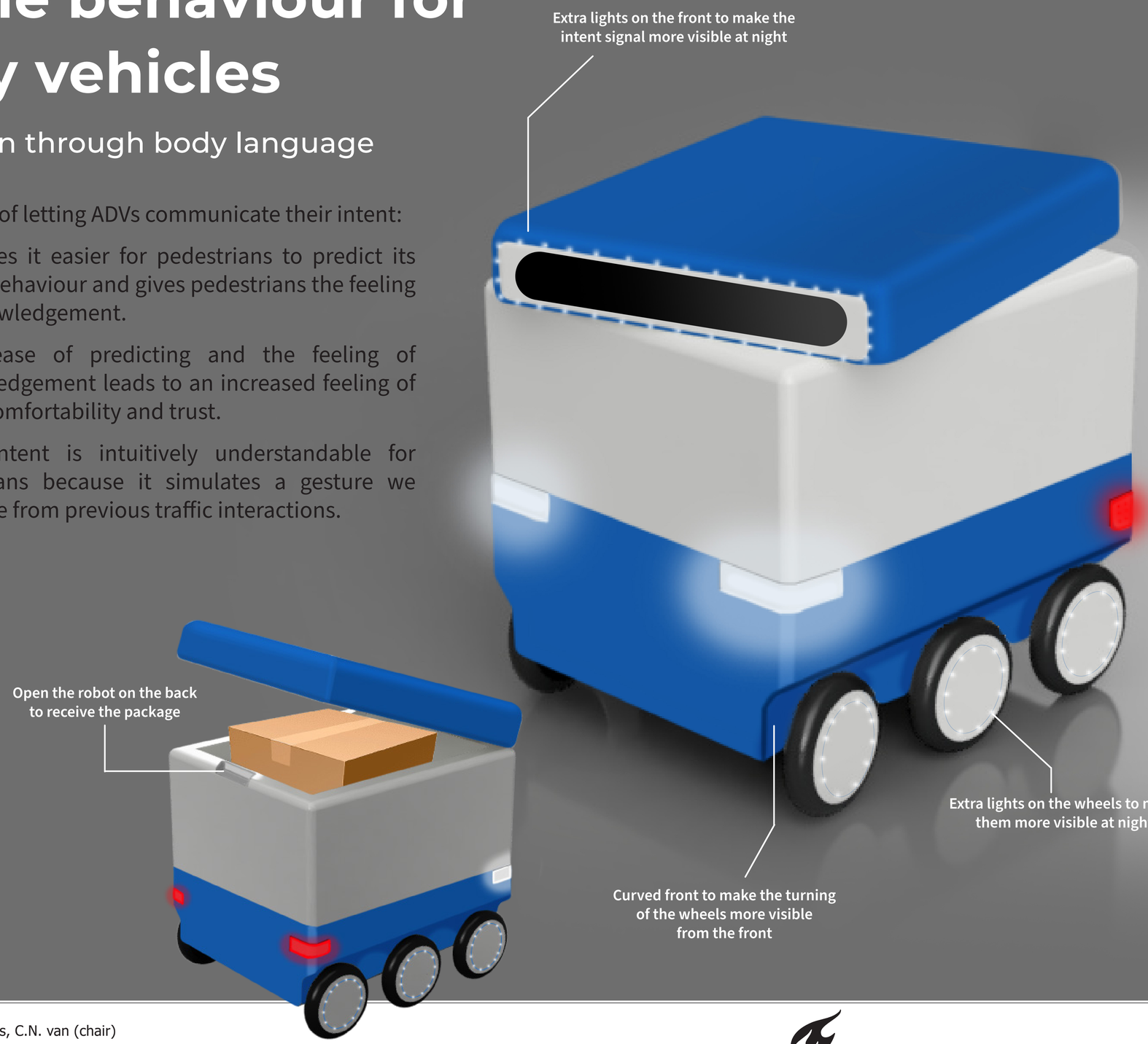
ADVs mainly drive on the pavement and will primarily interact with pedestrians. Currently, pedestrians don't have any experience with ADVs, which makes predicting the robots behaviour difficult. This unpredictability has its foundation in the way pedestrians communicate in traffic. This communication consists mostly of non-verbal communication like eye-gaze, pre-sorting, or changing posture, something the ADVs don't use (yet).

The ADV design is based on intent signals which pedestrians use in traffic to communicate their intended direction. The intent that the ADV is communicating is whether it is going to pass an opposing pedestrian on the left or right side. The integrated intent signal is inspired by how pedestrians look around and turn their heads into the intended direction.



Benefits of letting ADVs communicate their intent:

- It makes it easier for pedestrians to predict its driving behaviour and gives pedestrians the feeling of acknowledgement.
- The ease of predicting and the feeling of acknowledgement leads to an increased feeling of safety, comfortability and trust.
- The intent is intuitively understandable for pedestrians because it simulates a gesture we recognize from previous traffic interactions.



Noa Knorringa
Designing predictable behaviour for autonomous delivery vehicles
28-08-2023
Design for Interaction

Committee

Prof. dr. ir. Nes, C.N. van (chair)
Dr. Ir. Bourgeois, J. (mentor)
Dr. Vroon, J.H. (second mentor)

Faculty of Industrial Design Engineering

TU Delft

Delft University of Technology