

# The Bicycle Choreography of an Urban Intersection

- 1 Copenhagen Intersection
- 12 Hours
- 1 Wednesday in April
- 16,631 Citizen Cyclists
- 31 Desire Lines

|   |           |                         |
|---|-----------|-------------------------|
| The Bicycle Choreography of an Urban Intersection<br>Desire Lines & Behaviour of Copenhagen Bicycle Users   |           |                         |
| for<br><b>COPENHAGENIZE EU</b><br>Copenhagenize Design Co.<br>Godthåbsvej 73, 1., 2000 Frederiksberg, Denmark<br><a href="http://www.copenhagenize.eu">www.copenhagenize.eu</a> |           |                         |
| with  | scale     | date of observation     |
| Anthropologist: Agnete Suhr   | 1:250     | 18.04.12                |
| Mikael Colville-Andersen  | id        | weather                 |
| Pedro Madruga   | 000 377   | 15 C. Dry. Partly sunny |
| Risto Kujanpää  | size      | timeframe               |
| Kristen Maddox  | 60x105 cm | 07:00-19:00             |

An Anthropological Study - with some serious data crunching, too.  
by Agnete Suhr - Anthropologist (A.S.)  
Mikael Colville-Andersen, CEO of Copenhagenize Design Co. (M.C.A)  
Pedro Madruga - Environmental Engineer (P.M.)  
Kristen Maddox - Urban Planning Researcher

Design by:  
Risto Kujanpää  
Mikael Colville-Andersen

Photography & screen grabs  
Mikael Colville-Andersen, Copenhagenize Design Co.



Copenhagenize Design Co.  
Godthåbsvej 73, 1.  
2000 Frederiksberg  
Denmark

## The Bicycle Choreography of an Urban Intersection - an anthropological study

|  |    |
|--|----|
| Abstract                                 | 4  |
| Introduction                             | 5  |
| Objectives & Primary Findings            | 6  |
| The Intersection                         | 7  |
| Desire lines                             | 8  |
| <br>                                     |    |
| 1. Anthropology                          | 12 |
| Setting the scene                        | 13 |
| Tactical behaviour vs regulation         | 14 |
| Following flows & following each other   | 15 |
| General observations of the intersection | 18 |
| <br>                                     |    |
| 2. Data Crunching                        | 24 |
| Bicycle users                            | 25 |
| Rolling past stop lines                  | 26 |
| Cycling in pedestrian crossings          | 27 |
| Number of U-turns                        | 28 |
| Right turns on red                       | 29 |
| Numbers of rule bending                  | 30 |
| Time factors                             | 31 |
| <br>                                     |    |
| 3. Copenhagenize Fixes                   | 32 |
| The fixes in detail                      | 34 |
| <br>                                     |    |
| Literature                               | 36 |

# Abstract

Bicycles and pedestrians move along paths that form the urban streetscape, yet their movements hold much more than meets the eye. As they stick to or stray from these paths they fall into various behaviour categories. Based on a period of video-recorded observation we identify three: Conformists, Momentumists, and Recklists. The names describe how these groups move through city spaces and react to others. Copenhagen's city streets are known for embracing bicycle users, yet many stereotypes and myths about their movement patterns still remain. We separate myth from reality by relaying on the age-old practice of close observation. What we uncover is a world of minute changes in body language, interactions amongst various types of road users, and many different reactions to traffic signals and intersection markings.

# Introduction

## The Bicycle Choreography of an Urban Intersection

A city is movement. A city is people moving along individually-choreographed Desire Lines. In a city like Copenhagen, where 36% of the population ride bicycles to work or school, much of that choreography is performed on two or three wheels. In a rural setting, the quiet scenes offer the greatest appeal. A landscape stretching away with only a grazing cow or drifting clouds or crashing waves to suggest that things are alive. In a city, we are all part of a grand, organic choreography of motion.

As homo sapiens we search for recognisable signals from faces and body language. A long line of cars gives us little to identify with. Psychology has taught us that we humans despise creatures like spiders and insects because we cannot identify with them because they lack a human face, whereas we love dogs and monkeys and other creatures with faces resembling our own. Citizen Cyclists, however, are clearly visible to everyone - especially to each other. There is human energy on display. We regard visible faces and assorted postures. Urban cycling in itself is movement. Legs swirling around, heads turning, arms signalling, bodies hopping on and off while still rolling. All appealing and recognisable to the human eye. A flirtacious smile, a flash of leg, gesticulation during a conversation at a red light. We can associate with it.

Our curiosity is peaked at the thought of transforming cities into symphonic, melodic, urban landscapes filled with people in motion, in movement, in concerto. Your fellow citizens surrounding you, allowing you to observe their movements. Each of them an integral part of the city. Each of them a visible moving part in the organic spectacle of the metropolis, not covered by a hood or encased in steel, but brilliantly exposed. Like taking the back cover off an old, ticking pocket watch and seeing the finely crafted parts all contributing to keeping track of time.

"If one is bumped by a car, the whole school is bumped. It's a nerve one has in the elbow, a herd function, which Copenhageners have learned so well that it is second nature." Johannes V. Jensen on Copenhagen bicycle users in his 1936 novel 'Gudrun'.

Often when we're discussing things at the Copenhagenize Design Co. office, we'll wander over to the windows and look out at the ceaseless tide of bicycle users rolling past. For reference and, perhaps, for subliminal inspiration. The Bicycle Choreography of an Urban Intersection project was spawned for a variety of reasons. First and foremost, it was driven by our curiosity. We cycle around Copenhagen each and every day and we are constantly observing the finer anthropological details in our mainstream bicycle culture.

The other reasons for embarking on this project are as follows.

### Lack of Existing Material

Behavioural studies of bicycle users are rare. William H. Whyte's work with direct observation – including but certainly not limited to – The Social Life of Small Urban Spaces - influenced us greatly but all of the great works about urban life in the 1960s and 1970s were focused on pedestrian behaviour. Bicycles no longer featured greatly on the urban landscapes of America and other countries so it is not surprising that no one was thinking about bicycle user behaviour in the grand scheme of city life.

Not even in European cities with great numbers of bicycle users have there been studies about bicycle user choreography. The bicycle as transport exists in an odd vacuum between pedestrians and motorised traffic. Bicycle users are merely fast-moving pedestrians but in the engineers' desire for urban order they are often wrongly placed in the big, square, boring box that contains motorised traffic. The City of Copenhagen does extensive bicycle counts throughout the city, providing us with good, hard data about numbers of bicycle users. Though "how many" is not the same as "how".

It's time to start looking at this behaviour in order to plan cities for it. We wanted to look long and hard at the patterns, movements, behavioural traits and desire lines of bicycle users in an urban intersection.

### Myths & Misconceptions

The return of the bicycle to cities all over the world is accompanied by a great deal of myth and misconception. The bicycle is often viewed as an transportational intruder in the modern urban theatre.

The same repetitive comments are heard around the world. "Those damned cyclists... breaking the law... running red lights... riding on sidewalks..." The fact is that bicycle users – and pedestrians – have been at the mercy of car-centric planning for more than eight decades. They are forced into subservience in societies that plan for cars first. Expecting bicycle users to behave like motorists is wrong and counterproductive.

Nevertheless, this is the status quo. Expecting bicycle users to pretend they are cars and chastising them when they act like pedestrians instead – with unique variations, of course. We felt a need to study these bicycle users. Place them in a behavioural microscope and see if the myths and misconceptions were actually true or just products of a chorus of popular perception.

### New Solutions

The streets are designed for automobile traffic. The current planning mindset is not suitable for bicycles – or pedestrians. By studying bicycle users over a 12 hour period we hoped to find some innovative solutions to traffic planning that is more human, more beneficial to bicycle users and pedestrians and more modern.

So... off we went. Filming an urban intersection in Copenhagen for 12 hours on March 28, 2012 from our office window. The results are found in this document. They will surprise.

Mikael Colville-Andersen, May 2013

# Objectives & Primary Findings

## Objectives



Our point of departure was, quite simply, to map the Desire Line of every single bicycle user in an urban intersection in Copenhagen. 16,631 in all. By doing so, we hoped to achieve the following:

Explore the anthropological details of bicycle users and how they interact with other traffic users. Including body language,

Explore how bicycle users react with car-centric intersection design and if they choose their own Desire Line over the existing engineered structure and legal framework, how do they do so?

Document whether or not the persisting perception of bicycle users as “badly behaved” was legitimate.

Find new, modern solutions for intersection design that would benefit pedestrians and bicycle users.

When determining whether behaviour was “good” or “bad” we used the current Danish traffic laws as a rough guideline. However, as the traffic laws are frightfully car-centric in nature and not at all designed to prioritise pedestrians or bicycles, we had to divide the laws into two categories and create three categories for bicycle users. They are as follows:

### Conformists

- Bicycle users who ride by the book.

### Momentumists

- Bicycle users who interpreted the current rules creatively whilst following their Desire Lines.

Our rule of thumb was that if something is legal in The Netherlands or in another cycling nation or city, then we regarded it as Momentumism. Right turns on red for bicycle users, for example are now legal in Paris and Brussels. In addition, bicycles are not excluded from pedestrian crossings in many cities around the world like Japan, Spain, etc.

### Recklists

- Bicycle users who flouted what we think to be rather sensible traffic rules; running a red or yellow light, riding on a sidewalk or ignoring the bicycle infrastructure.



## Findings

We classify the bicycle users’ paths according to the Desire Lines they follow. The Lines range from basic movements that follow the planners’ intentions for movements through the intersection, to the more complex methods such as U-Turns and multiple turns. They use these lines to optimize their ride and make the best use of the bike’s efficiency as transport mode. Most traffic users orient themselves according to the choreography of other users, as opposed to the existing traffic rules.

According to the “types” of bicycle users that we identified, 93% were Conformists, 6% were Momentumists, and 1% were Recklists. The number of Momentumists increased in the afternoon. The 12 hours saw very little drama. Bicycle users, pedestrians, car drivers, and bus drivers continued with their normal lives and interacted smoothly with one another.

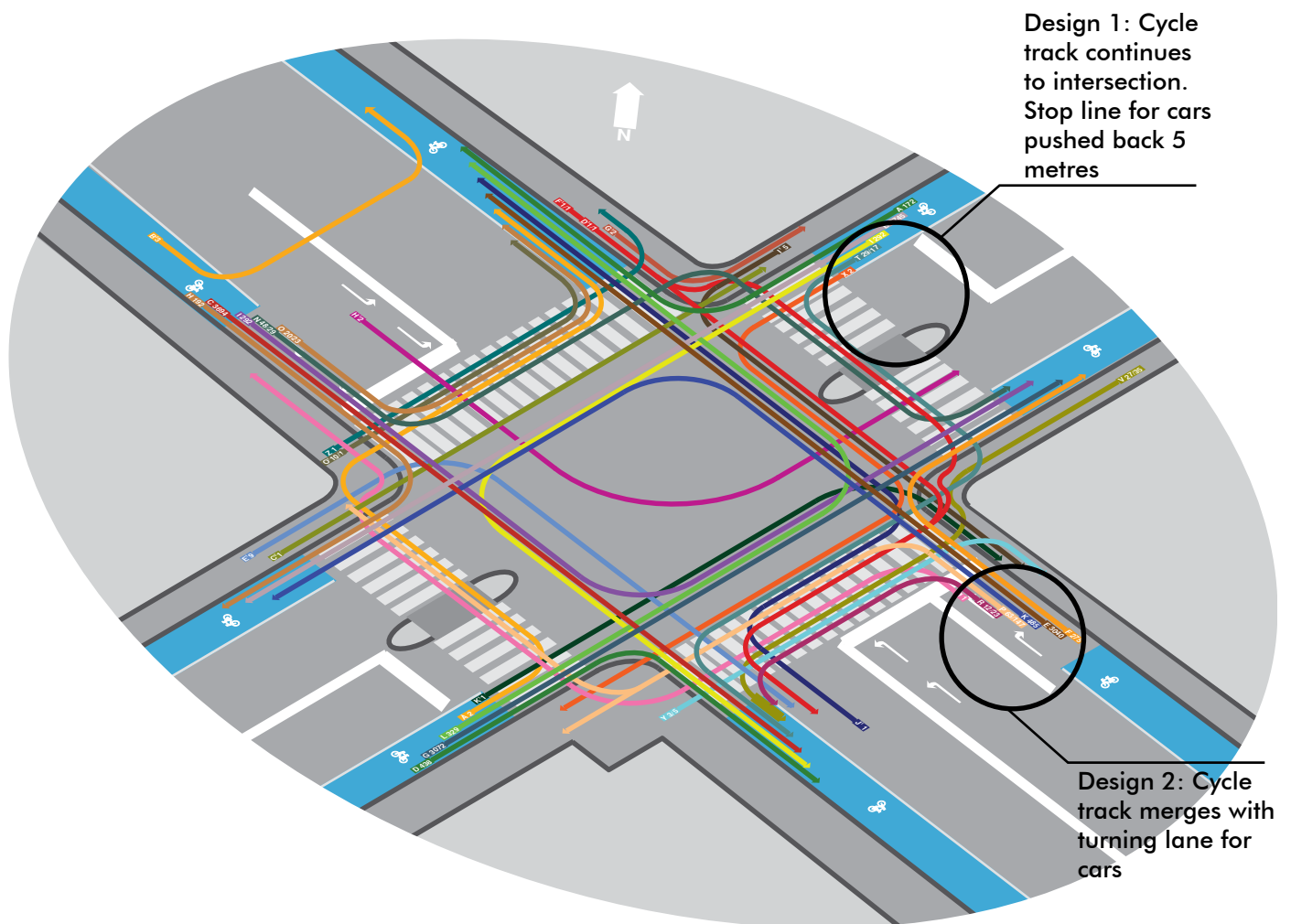
For a detailed description of the statistics obtained from our observations, please turn to the document’s “Data Crunching” section.

After processing the data and reviewing the film footage, we felt confident to make recommendations (see “Copenhagenize Fixes”) for urban design that complement users’ actual travel behaviors.

# The Intersection

## Basics

The intersection we analysed is outside our office window - Godthåbsvej and Nordre Fasanvej - in Frederiksberg in the heart of Copenhagen. It wasn't just a matter of convenience. This intersection is unique in that it is primarily a transport intersection and a meeting of a (roughly) north-south and a east-west artery. There are few shops of interest here and the vast majority of traffic users are heading somewhere else.



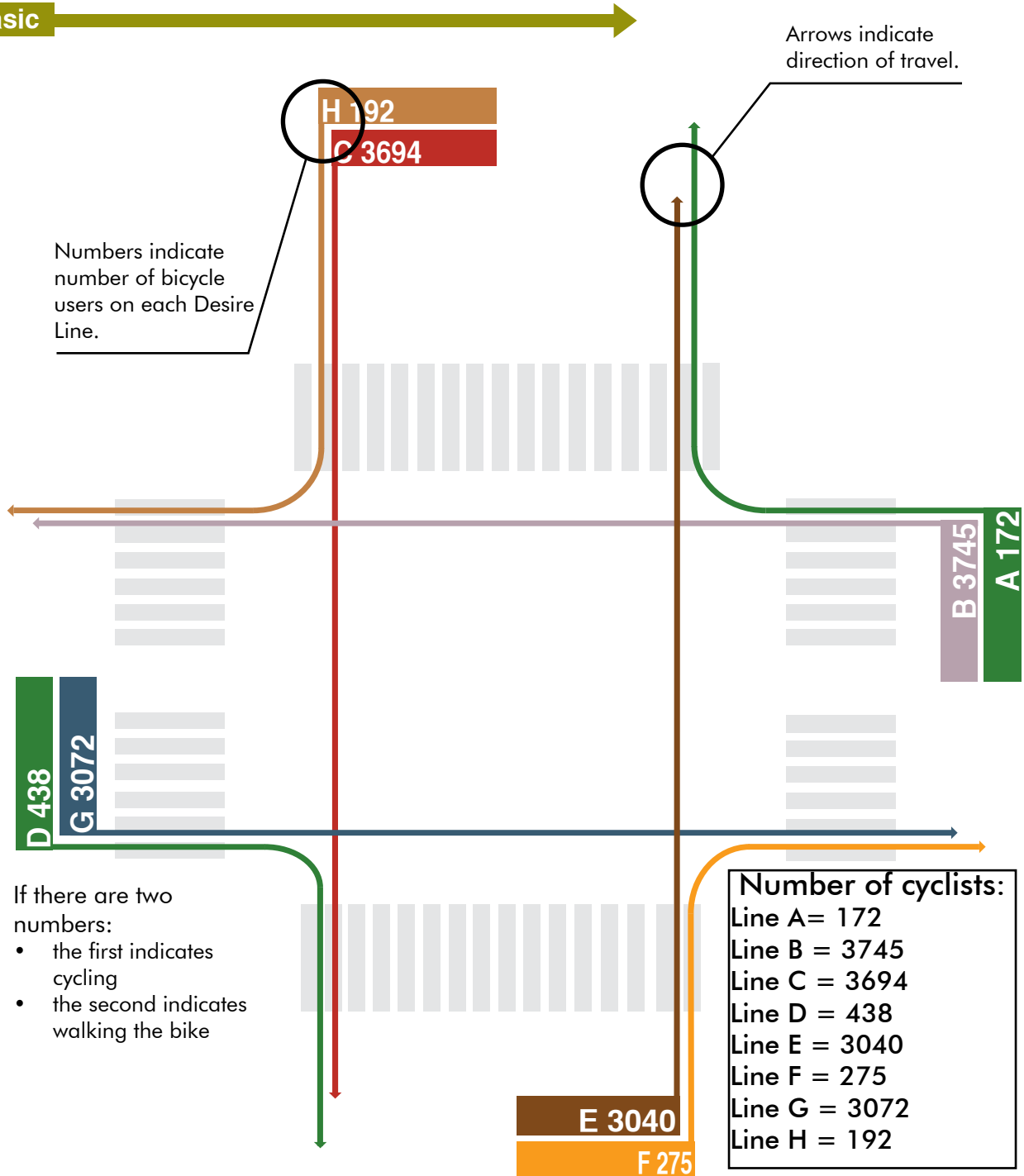
## Basics

In addition, the intersection features two kinds of infrastructure for bicycle users. One, which is becoming standard in Copenhagen, where the cycle track continues to the pedestrian crossing and the stop line for cars is five metres farther back. The other, the kind where the cycle track ends and bicycle users must mix with cars in a turn lane.

Are there behavioural differences between the two types of infrastructure?

# Desire lines

## 1. Basic



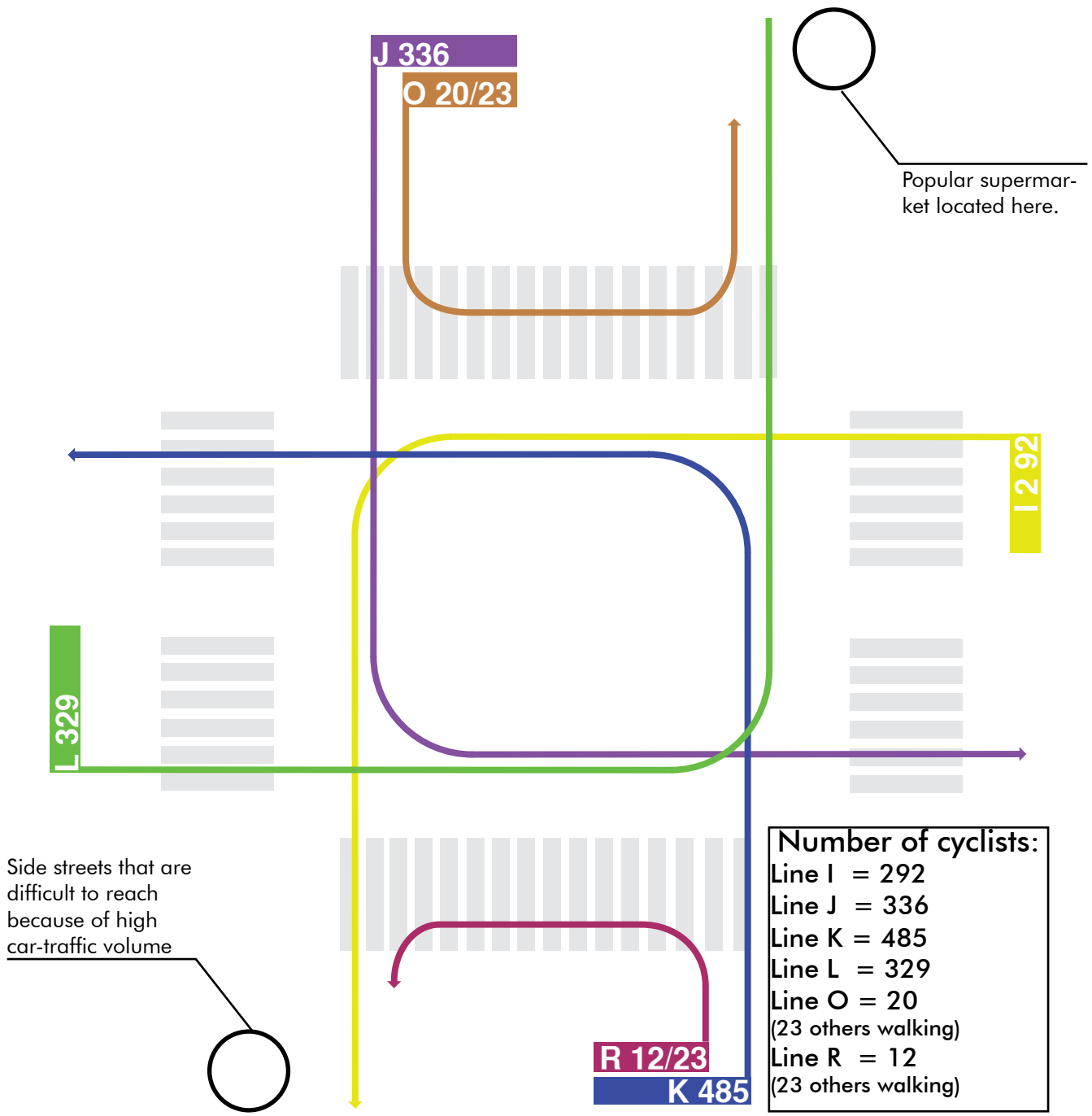
The primary travel directions for the bicycle users in this intersection followed all the other traffic users. North-south or east-west. The numbers of bicycle users heading in these primary directions were largely equal, suggesting that most bicycle users in the course of the day are commuters going to and from work.

These Desire Lines feature the most common lines. Straight on through the intersection or a right turn.



# Desire lines

## 2. Left turns & U-turns

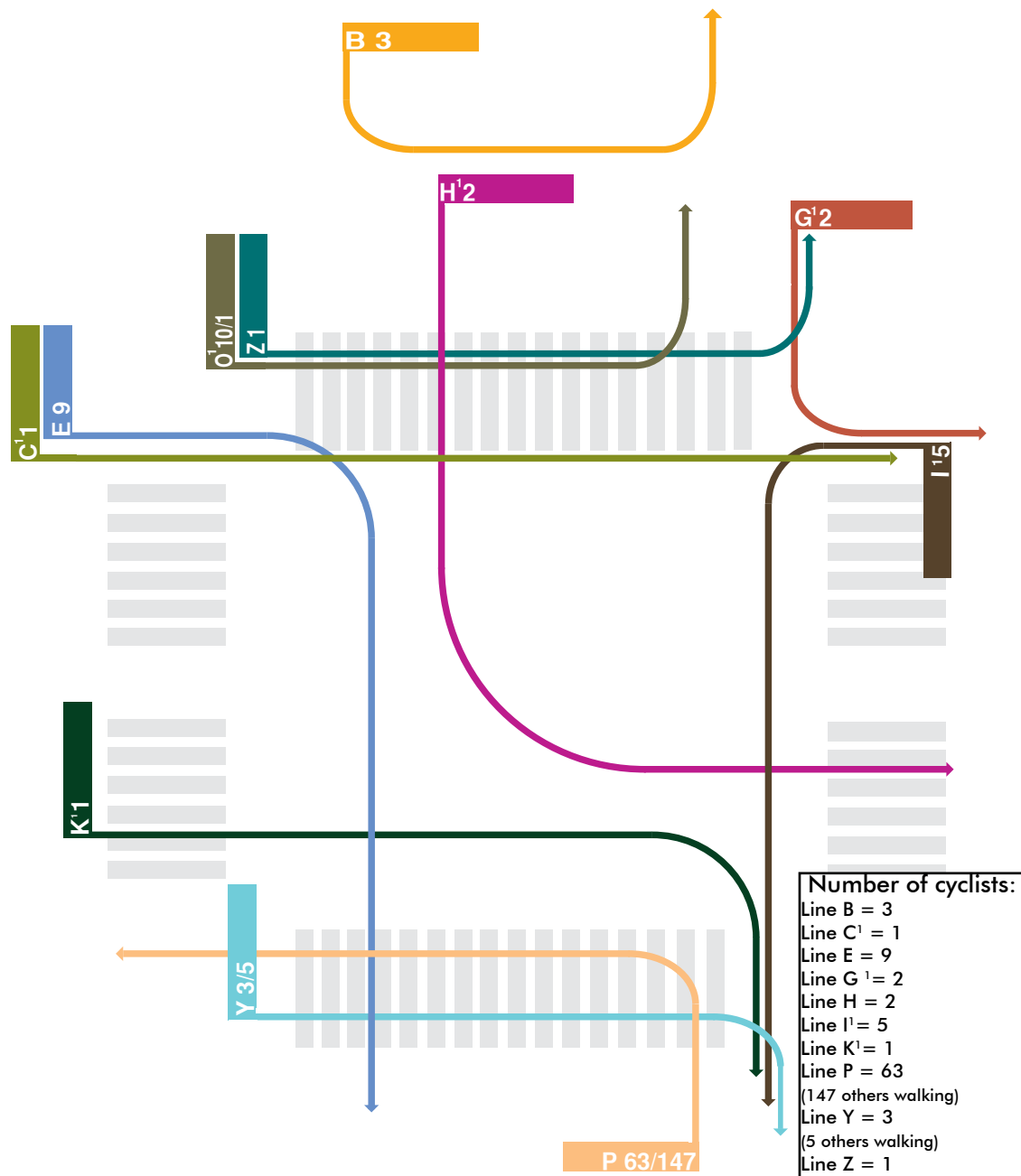


Where you sometimes turn right, you sometimes have to turn left. These Desire Lines involve a left turn, using the Copenhagen Left - or Box Turn - which is the legal requirement for turning left in Denmark. Bicycles continue across the intersection to the far curb and prepare for a left turn - either when the light turns green or when the traffic permits a safe crossing.

It was interesting to observe U-turns in the Choreography. A much neglected angle in mobility. All the U-turns occurred on Godthåbsvej, due largely to the high level of car traffic that reduces mobility and accessibility dramatically on this street. Unable to cross the street to the left, bicycle users are forced to continue to the intersection and turn back in order to get back to their destination. At the top right of the graphic is a supermarket in this densely-populated neighbourhood - a frequently visited destination throughout its opening hours.

# Desire lines

## 3. Mobility Flexibility

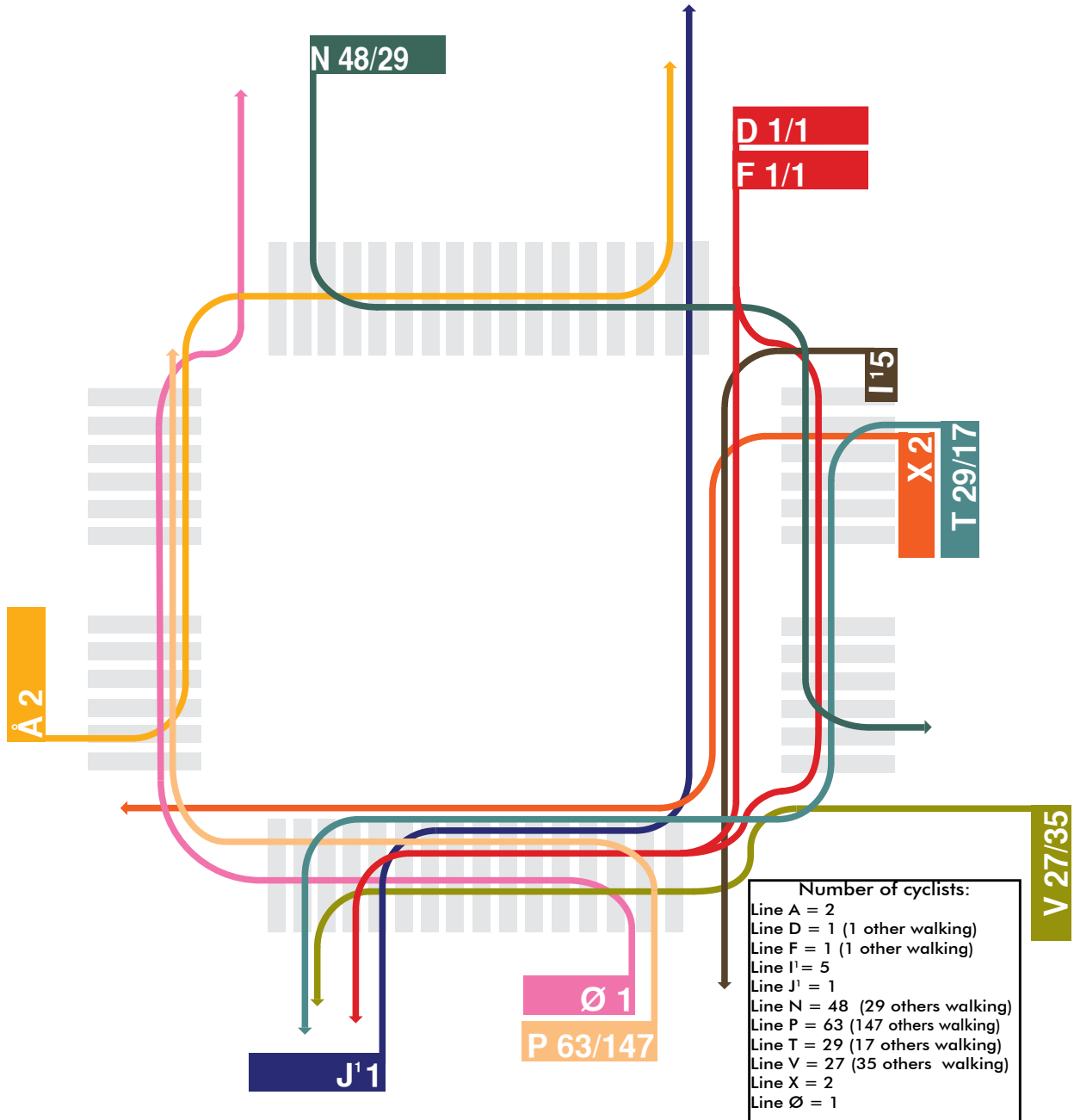


Homo sapiens in the urban theatre show an impressive level of creativity. Bicycle users, like pedestrians, carve out the Desire Lines that suit their journey and often reject the rigid, car-centric traffic culture in order to expedite their journey. It is clear, however, that safe infrastructure like cycle tracks and pedestrian crossings are preferred for the vast majority.

In the course of the day only a tiny handful of bicycle users, out of the total of 16,631, rejected the existing infrastructure in the intersection and rode in the car lanes through the intersection. They were all bicycle messengers. Once the turn was completed, they invariably reconnected with the cycle tracks.

# Desire lines

## 4. Flowing Rivers



It is no secret that car traffic dictates the flow of intersections, at the expense of the mobility of bicycle users and pedestrians alike. Many bicycle users made it clear with their behaviour that this last century, car-centric planning is not suitable for their journeys. We call these bicycle users Momentumists. The nature of the bicycle of transport is that bicycle users are loathe to stop their momentum and will adapt their Desire Lines in various ways, in order to suit this momentum. Homo sapiens are rivers, always seeking the easiest route.

Various projects in Copenhagen address this anthropological need, including The Green Wave stretches, where bicycle users can ride 20 km/h and never put a foot down, as well as the bike-oriented railings and footrests at various intersections. There is much more, however, to consider.

# Anthropology

The Nature of Bicycle User Mobility



# 1

# 1. Anthropology

## 1.1 Setting the Scene

White and yellow paint on dark-grey asphalt. Traffic lights shifting from green to yellow to red. Blue signs with white arrows. This sets the overall stage for the Choreography of an Urban Intersection. The specific place described is the intersection connecting Godthåbsvej and Nordre Fasanvej at Frederiksberg, a municipality in the Copenhagen area in Denmark.

(A.S.)



The intersection seen from the main observation point



Map of the intersection



This intersection will be the focal point of the anthropological aspect of this article studying the behavior of bicycle users and motorists in all shapes and sizes performing the choreography of an urban intersection. This study follows the contemporary focus on mobility studies in social science (Grieco & Urry 2011)

Inspired by the French social scholar, Michel de Certeau, this article will investigate the 'practice of everyday life' in this intersection in relation to the regulated asphalt stage on which the practice is performed (de Certeau 1984). Thus, this article contributes to an understanding of the actual mobility behavior in an urban intersection. In addition, inspiration came from William H. Whyte's studies of city dwellers. Gaston Bachelard, French philosopher (1884-1962) coined the term 'desire paths' in *The Poetics of Space* (1958), to describe the paths worn by feet repeatedly stepping through the same unpaved areas. These are the logical paths carved to save time or experience more pleasant scenery. 'Desire Lines' cannot lie. They are straight-forward accounts of users' patterns and the stunningly detailed ways in which they experience the world around them.

An "intersection" implies that different actors have to interact or cooperate in order to perform the choreography as smoothly as possible. The intersection in question can be characterized as cooperative and efficient. There seems to be a common agreement among users to keep the traffic flowing while everyone passes through the intersection. Not many people stop to do much else then wait for a free passing. Even though there are many potential conflicts, none of them interfere with the flow. People seem sincere in their desire to make it all work and they make it work.

The empirical data is collected from 7 am to 7 pm on 11 April 2012. It consists of bicycle user and motorist counts, recording the 'Desire Lines' of the bicycles and the number of legal and illegal acts - according to the Danish traffic laws - as well as general behavioural observations.

(A.S.)

FOOTNOTE

<http://map.krak.dk> 09.09.12

## The Tactics

On this particular day in April, we recorded 16,631 bicycle users and 27,644 motorists passing through the intersection from 07:00 to 19:00. They all played a part in the overall choreography. By studying in detail the actual movement of each bicycle user - and a general observation of motorist behaviour, it is obvious that their mobility choices are not entirely dictated by Danish traffic regulations.

So what determines the choreography? To answer this, we will use Michel de Certeau's understanding of the concept of strategy and tactic navigating in different situations in everyday life. According to de Certeau, the concept of strategy is linked with production on a structural level.

This is also in opposition to the concept of tactic, which is linked with consumers' reactions and their everyday practice (de Certeau 1984:xix). Inspired by de Certeau's urban investigations (ibid.: 91-110) we will use these terms in our urban investigation. Strategy means the planned and regulated ideas of behavior – on a structural mapping level, where the tactics mean the everyday practiced behaviour – on street level. What this article will study is the street level navigating tactics of a specific urban intersection, outlining the actual navigating behaviour of bicycle users and motorists. (A.S.)

This is the Age of Overcomplication. Many technical solutions are invented not because they are needed, but because it's possible to invent them. While technical solutions can certainly be helpful in determining various factors in traffic user statistics, there are no computer models that can replace intense and direct human observation. Technical solutions can't tell us anything about body language or interaction with fellow traffic users. A chip or GPS cannot document the finer points of human behaviour.

We felt it necessary to merely watch the human beings in this intersection. For hours and hours and hours. To study them in detail and to mine valuable information from their behaviour, patterns and mobility desires. We did so out of human curiosity, professional curiosity and out of a desire to find modern solutions to replace the out-dated, car-centric planning in our cities. (M.C.A.)

## 1.2 The Tactical Behaviour vs Regulation

As an introduction to see how the relation between behavior and regulation is performed in the investigated choreography of an urban intersection, we will study the role of the traffic signals. Our observations show that bicycle users and motorists, depending on where they were going, interpreted the colours of the traffic signals differently. In these observations, the division between structural strategy and tactical everyday practice becomes clear. The flow of the choreography seemed very important.

(A.S.)

### Bicycle User

#### Green Light

Our observations showed that the green light meant: Go! This does not differ from the actual structural intention. What does differ is that some bicycle users interpreted the green signal for pedestrians as: Go! The screengrab below shows a bicycle user trying to move as a pedestrian on his bike through the pedestrian crossing - legal in many jurisdictions where bicycle users are rightly categorised as fast-moving pedestrians but illegal in Denmark. On green, the bicycle users generally orientated themselves towards the other people in the traffic and not towards regulations. The bicycle users paid extra attention to their surroundings while acting as rolling pedestrians. Their focus was on the oncoming pedestrians and turning bicycle users and, as a rule, they adjusted their body posture to make themselves more visible. Often straightened their backs or rising out of the saddle, making an extra effort to see and be seen. It was all very human.

(A.S.)



Bicycle user rolling slowly through the crosswalk

#### Red Light

By and large, bicycle users interpreted the red light as: Stop! Although, when turning right, many bicycle users stopped navigating by the traffic signals and started to navigate by the 'flow of the choreography', again paying extra attention to other bicycle users and pedestrians. Right turns on red for bicycle users are legal in Paris and Bruxelles, with many other cities considering them, but they are still currently illegal in Denmark.

Indeed, it was clear from our observations that extra care was paid whenever the flow of the choreography trumped the traffic regulations.

(M.C.A.)

## Yellow Light

Copenhageners use yellow lights differently than users in some other cities. The light pattern switches from red to yellow to green in addition to the green-yellow-red pattern. Originally planned as a prompt for car drivers who switch off their motors at red lights, the lights also give an extra boost to bicycle users. Bikes can begin moving in the yellow light, so they enter the intersection earlier than cars. Citizens atop bicycles quickly learn how to travel through lights without stopping, saving precious time and energy during morning commutes, grocery shopping, and any other bike trip.

Watch the cargo bike rider in the photo series below. He adjusts his speed so he can continue through the intersection as the light changes, without stopping.



Bicycle user measuring speed to continue through intersection without stopping



# Motorist

## On traffic rules and speed

Most data from this study relates to bicycle users' patterns. Just like bicycle users, however, motorists bend traffic rules. Unfortunately, bicycle users are frequently used as scapegoats when describing traffic misbehaviour. When they go against the grain, people are quick to use them as stand-ins for all bicycle users. Our data section illustrates that this is simply not true. According to traffic counting data from Frederiksberg Kommune, more than 20% of cars driving on the roads where the study collected data traveled faster than the legal speed limit. On some roads, the percentage was 40% (Frederiksberg Kommune, 2009; 25). That means that almost **half** of all motorist users were speeding. Similar studies from the United States are not more promising. In a study from a small town called White Fish Bay in Wisconsin, 61% of motorists broke the law by failing to yield to pedestrians in a sidewalk (Schlabowske, 2013, no page). With this in mind, we turn our attention to the motorists' behaviour we observed throughout the observation period.

## Yellow Light/Red Light

Due to the size and bulk of their vehicles, motorists have difficulties acting like any other mode of transport. During the observations it was, however, clear that the yellow light was the motorists' wiggle room. When turning left in the intersection, the motorists tailgated one another in order to attempt to change their appearance from an individual vehicle to that of a 'car train'. In this way, even though the light turned red, the 'car train' appeared like one vehicle and moved as such. They 'overlooked' the traffic lights and went with the 'flow of the choreography'.



Motorists forming a "car train" to squeeze through the intersection on the green light.

The examples of the traffic light represent the flexible relationship between the strategy and the tactics in this intersection. In the following I will investigate more the tactical behavior of the bicycle users and underpin the flexibility of the choreography of an urban intersection.

[A.S.]

It is worth noting that in the course of the 12 hours of observation, there was little drama. There were many cases of bicycle users turning right - on green or red - who had to negotiate pedestrians in the crosswalk. Not once in the course of the day was there a bicycle user speeding past a pedestrian, causing alarm. There were no pedestrians reacting surprised or irritated. The choreography was smooth and elegant and well-timed by all users. The traffic users knew each others' moves by heart.

### 1.3 Following flows & following each other

The everyday practice of bicycle users - like that of pedestrians - is not strictly based on structural regulation. On street level, one can say that bicycle users navigate based on their Desire Lines, but it is important to note that they do so with great consideration of their surroundings. Their tactics are chameleon-like because they are able to change their appearance based on their Desire Line. The nature of the bicycle allows users to freely float between the behaviour of pedestrians and motorists. In describing the tactics of bicycle user behaviour, we differentiate between two categories of chameleon-like behaviour, which are described in the following.

#### “I’m a car”

Two types of behaviour that we documented are where the bicycle user fully copies the acts of motorists and pedestrians. Either using the intersection in the car lanes or using the pedestrian crossing.

The handful of bicycle users who left the bicycle infrastructure and demonstratively acted like a car were all bicycle messengers. And when we say “handful” we mean three. Three out of 16,631.

While they reconnected with the cycle tracks after the turn, they followed the flow of the choreography, timing their turn based on the traffic lights for cars. Their body language transformed as well, and they adopted a more aggressive posture. In contrast to the bicycle users who used the pedestrian crossing, who instead attempted to resemble pedestrians.



Bicycle user pretending he is a car on a left turn.

The fact that only three bicycle users made a left turn like a car is yet another indication that Citizen Cyclists prefer bicycle infrastructure over the primitive alternative of mixing with motorized traffic.



Group of bicycles waiting behind the line.  
The two joiners wait behind the "first mover" who in this case follows the conventional stop line.

### **"I'm following the leader" -- Waiting behind the line**

Thousands of everyday scenarios point to humans' tendencies to "follow the leader". Traffic, as it turns out, is no exception. Despite the bicycle users' deliberate, individual choices regarding route and whether to speed up or slow down at an amber light, other users had a large impact on behavior when coming to a stop at a light. Although the law says bicycles must wait before the solid white line, the behaviour of other bicycle users was a large factor in deciding where they placed themselves.

If one rode past the line to wait closer to the intersection, several others often followed suit. They slowed to a halt, saw the "first mover" in front of them and crawled over the line to join him or her. This also happened after others turned left and stationed themselves before the line. When this occurred, others just arriving down the cycle path frequently rode past the line to join them. They followed the leader and formed bike packs as they waited in a group.

What was most refreshing about these newly minted "packs" was the camaraderie that one could observe as they formed. Ranging from a simple sideways glance to a smile, it was obvious that bicycle users acknowledged each other and interacted in these tiny ways. When something was really amiss, there were a couple instances of one bicycle user alerting another to a fault with their bike. This is not to say that Copenhageners are overly giddy about slapping one another on the back, loudly shouting "hej!", or striking up a conversation. Rather, their interactions were small, focused, and calmly self-aware of their placement within larger traffic flows.



The citizen cyclist with the red Dutch bike and pink basket is the “first mover”—or the first to position herself after the “official” cycle stop line.



The motorbike joins her after a left turn.

### “I’m following the leader” -- Moving past the line

If one bicycle user passes the solid white line, it is much more likely that others will follow suit with the “first mover”. The actual behaviour depends largely on the type of intersection. Sometimes bicycle users place themselves here to gain an advantage over cars. If they have a bit of a boost, they will be safer and their journey smoother—the same principles as the yellow light, but initiated on an individual level, not via the established infrastructure.

Time after time, we observed the little cycle “packs” developing on the street below. One leads, another “crawls” over the line and join them, then another or even more. It’s a small motion--a move of perhaps a couple meters--but it occurred time and time again. The bicycle riders were still a safe distance from traffic. Again, no drama.



Another citizen cyclist follows suit after a left turn as does one more who intends to continue straight through the intersection. The last is the only to stop before the line. The light will soon change and staying here gives room for pedestrians.



Finally, the light changes and the pack rides off together.



“Scooting Momentum”

### “I’m just ‘walking’ fast, don’t mind me”

Another type of behaviour is where the bicycle user becomes a kind of centaur, staying on one pedal, but using the bicycle as a scooter. It allows the bicycle user to continue their momentum but also to hop quickly off the bicycle if obstacles appear. It’s a chameleon tactic. Morphing into the figure of a pedestrian, but still rolling at a slightly faster pace.

The bicycle users sometimes operate in a space between ordinary transport characters, and in a way that contradicts the way the structural producers attempted to construct a car-centric asphalt stage. The flexibility and morphological skills of the bicycle users add an extra, flexible dimension to the choreography of the urban intersection and creates a dynamic flow.

The bicycle in urban spaces has long been categorised as a “vehicle” in the traffic regulations. It is clear to see from the anthropological usage of the bicycle that it is more closely related to pedestrians than automotive traffic in the way citizens use it. We know the bicycle is a near-perfect transport form in cities but car-centric planning restricts its potential.

One of the important observations is how bicycle users riding through a pedestrian crossing change their physical appearance. They tend to sit up straight or stand up on the pedals as they roll calmly across the stripes, making themselves look larger and more noticeable. Almost demonstratively so. As though apologetically saying, "I am aware I am bending the rules, won't take long, please bear with me..." As soon as they reach the cycle track they revert to their typical cycling posture.



Compare the bicycle user circled in blue with the bicycles circled in green. The woman in blue has a much more upright posture than the others. Similar to how the "scooting" bicycle user carefully shifts position, those who ride through pedestrian crossings (or who are about to, in this case) sit straighter instead of forward on the handlebars. They alert pedestrians that they are approaching and are momentarily bending official rules. Few scuffles occur between bicycles and pedestrians. We seem to intuitively know the unofficial—and in some cases more important—rules of the road.

The pedestrian crossing is a safe passage in a car-centric planned intersection. For pedestrians and bicycle users alike. The two user groups coexist peacefully and have an intimate knowledge of each others' choreography. [Mikael Colville-Andersen]



A pedestrian at ease with sharing crosswalk space with a bike.



Potential conflict 2

In investigating the behavior in the intersection it became clear how flexible the inherent choreography is. The structural signals and markings built in the place become mere guidelines for the choreography - the choreography is determined by the flow of mobility. Different paths, desires and aims are represented in the intersection and these determine the choreography. The flexibility of the bicycle determines the behaviour of bicycle users. The single acts of pedestrians, motorists and bicycle users are the choreography.

Even though the people sometime navigate purely based on desire, it seems that the structural regulations are incorporated in their bodies. Looking at their body language one could see that they knew they were acting in opposition to the structural regulation. This is either in the form of 'duck the head' or keeping a steady pace while turning the corner maybe hoping that no one sees you.

So this study contributes to the studies of mobility in social science by focusing on the human actions behind the bicycle users and motorists counts. It shows the flexibility of the choreography of an urban intersection and how it is shaped by different aspects of human actions - at any past and morphological shape.



# Data Crunching

# 2

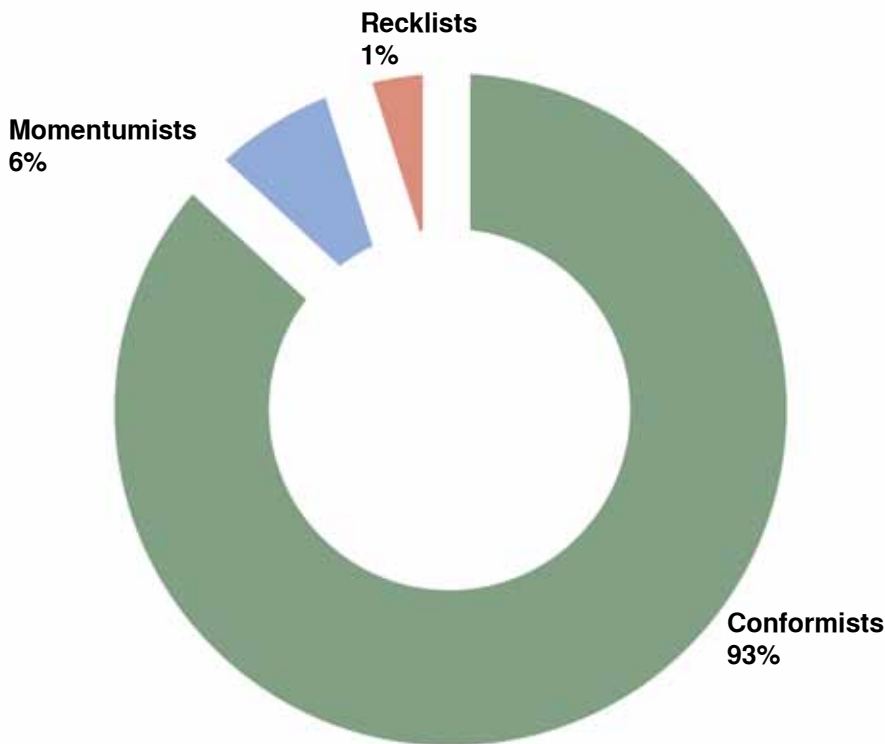
Behaviour by Numbers





# 2. Data crunching

## Bicycle Users



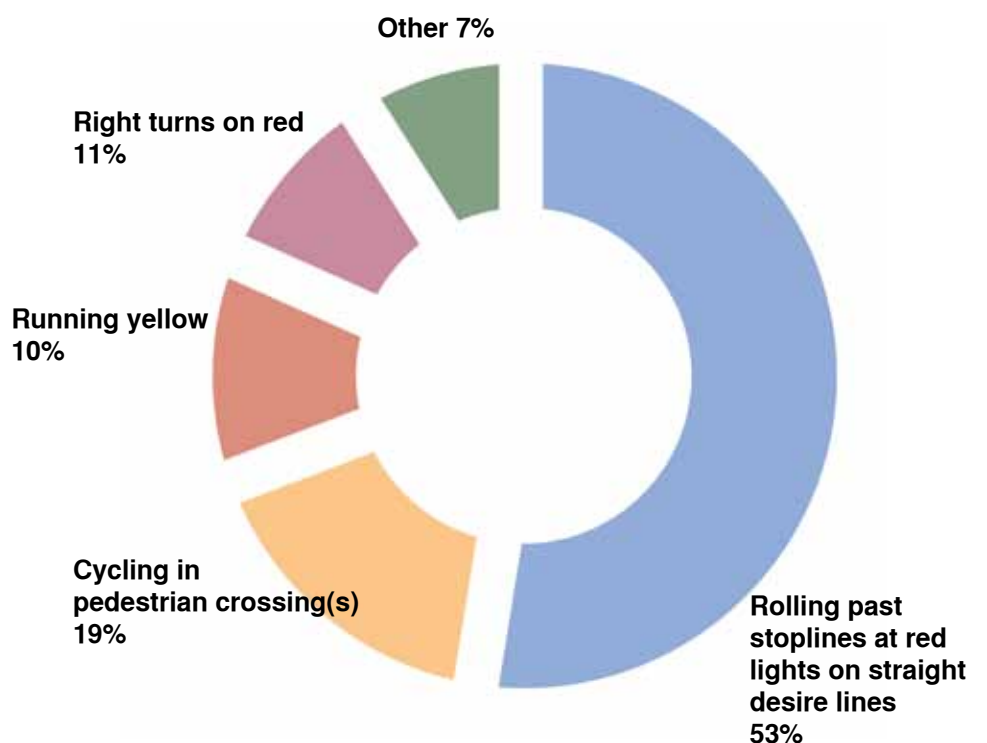
We divided the bicycle users into three groups. The Conformists did everything by the (car-centric) book. The Momentumists continued their flow and overstepped what we regard to be minor traffic regulations, such as turning right on red and rolling calmly across a pedestrian crossing. The Recklists broke more serious traffic laws like running red or riding on sidewalks. It is clear that most bicycle users are Conformists. They comprised 93% of the observed bicycle users. 6% of the total are regarded as Momentumists. Only 1% of the total bicycle users were Recklists. This clearly debunks the persisting myths about bicycle user behaviour. Copenhagen's bicycle users are the best on the planet.

## Rule Bending

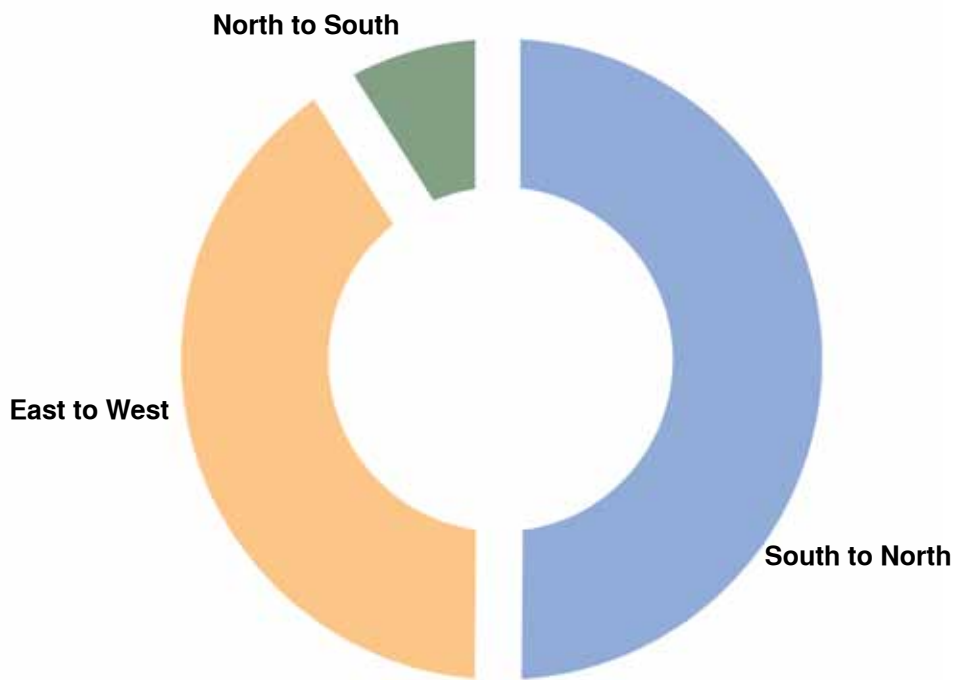
Of the 16,631 bicycle users observed in this 12 hour period, only 1,159 bent the rules. The most common infractions were Momentumist-related: rolling past stop lines at red lights whilst travelling on straight desire lines (53%), rolling across pedestrian crossings (20%) and turning right on reds (11%).

The desire to maintain a flow is inherent in the design of the bicycle. Minor traffic laws are interpreted freely in order to keep the flow. Our observations show that bicycle users bending the rules do so with care, with a change in their body language to make themselves more visible and at low, respectful speeds. Pure safety symbiosis.

In the course of the 12 hours there were no dramatic situations or close-calls.



## Rolling past stop lines

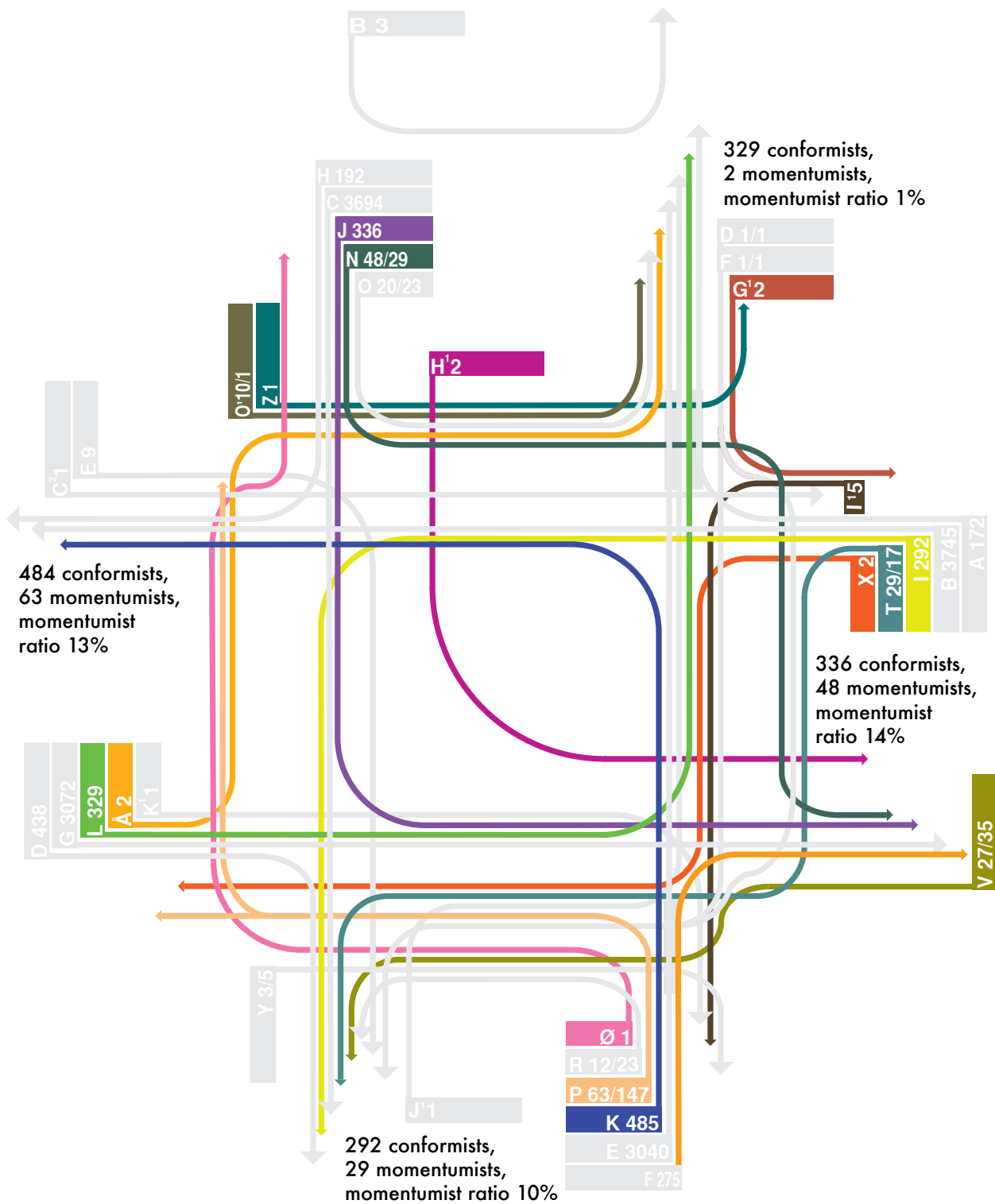


Stopping before the stop line is the most frequently bent rule (53% of the 1,159).

Whilst current traffic laws determine that bicycle users should stop before the stop line – and not after –, it's possible to observe that the number of Momentumists in the East to West direction (where there is a space after the stop line and before the car lines) is almost the same as the South to North one (where that space is non-existent).

Thus, data seems to show that road design has no influence in rule bending: Momentumists do it regardless.

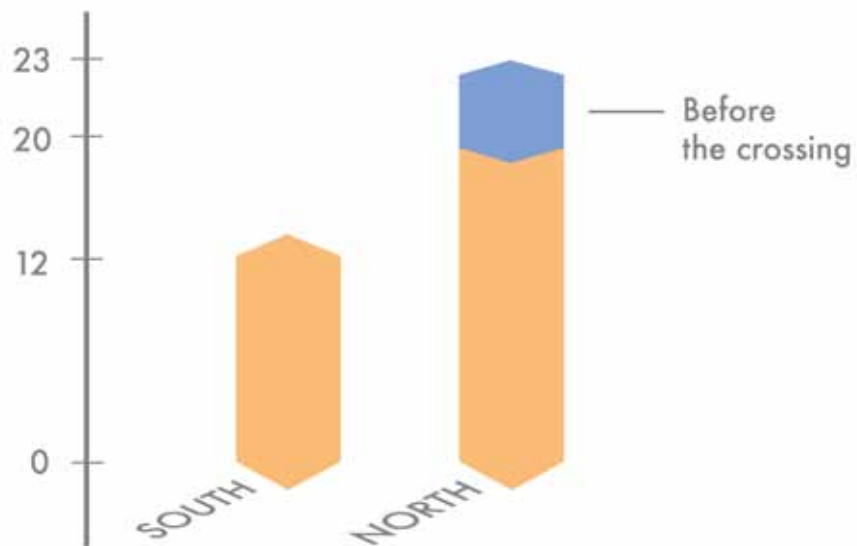
# Cycling in pedestrian crossings



When Momentumists desired to turn left, turn back or just cross the road without breaking their flow, they often used pedestrian crossings to do. As stated before, using pedestrian crossings is the second most frequent type of rule bending (20%). In the following graph, it's possible to analyse left turns by direction. The left turns from North to East are the ones with the lowest rule bending ratio whereas from West to South is the highest. Nevertheless, the similar values of Momentumist ratios on different street designs may suggest that it doesn't influence bicycle users' choices. There's also a clear evidence of a bicycle user off of the cycle track doing a left turn from North to West.

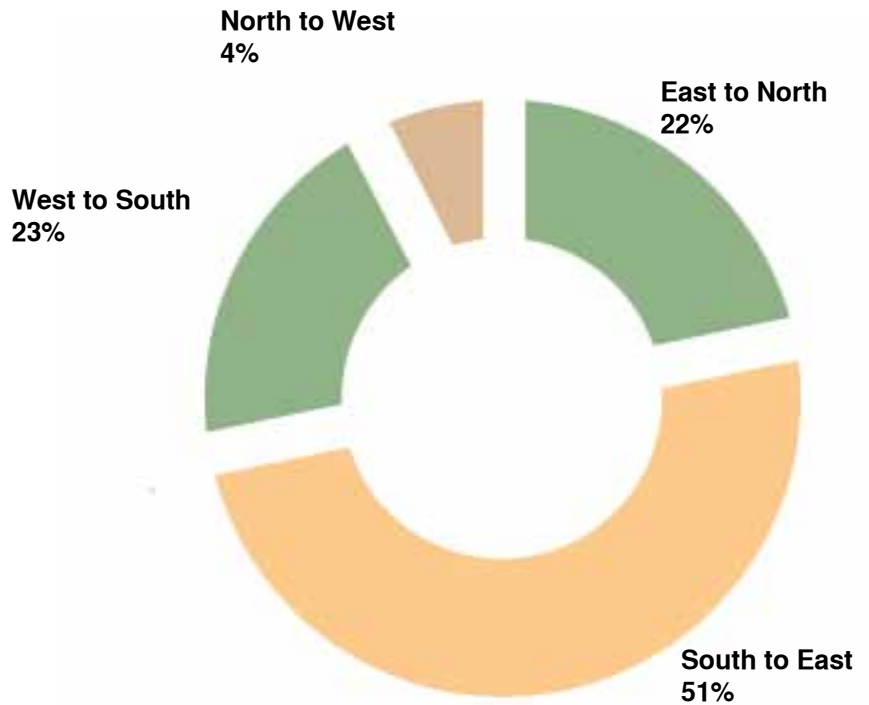
## Number of U-Turns

Regarding U-Turns, data suggests that in the North part of the intersection there are more reasons to change paths. Most of these U-Turns (32 of the 35 observed) are done in a pedestrian crossing whereas only three happen before the bicycle user arrives in that area.

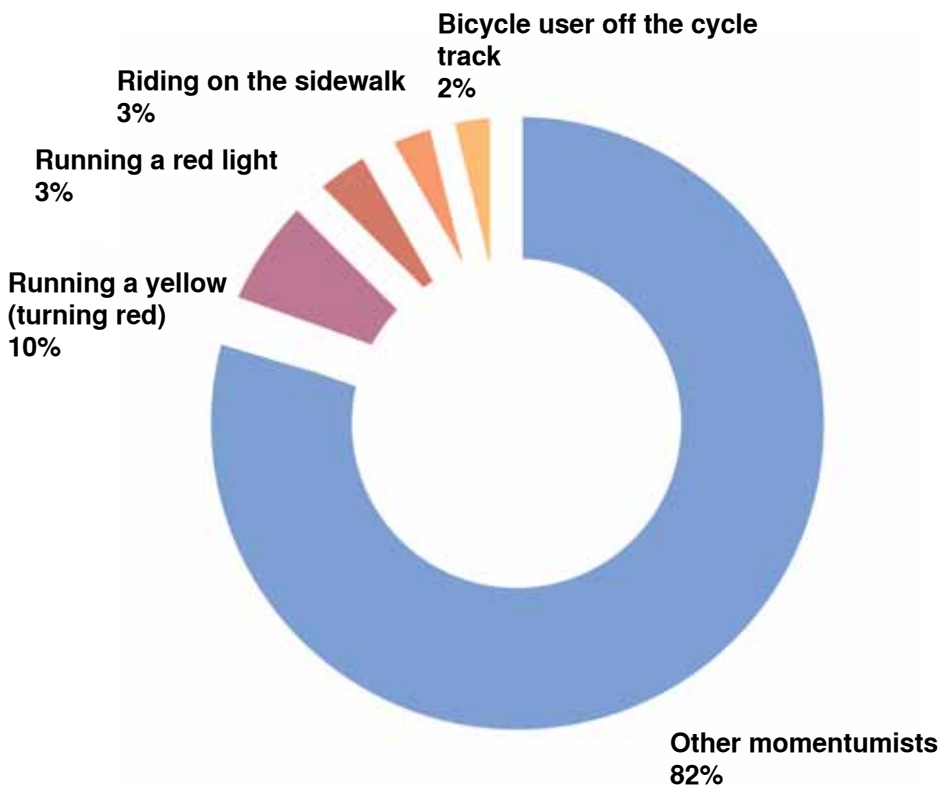


## Right turns on red

Momentumists frequently turn right on red. Moreover, the data doesn't show a correlation between the street design and the number of right turns on red signals, as shown by this chart.



## Recklists

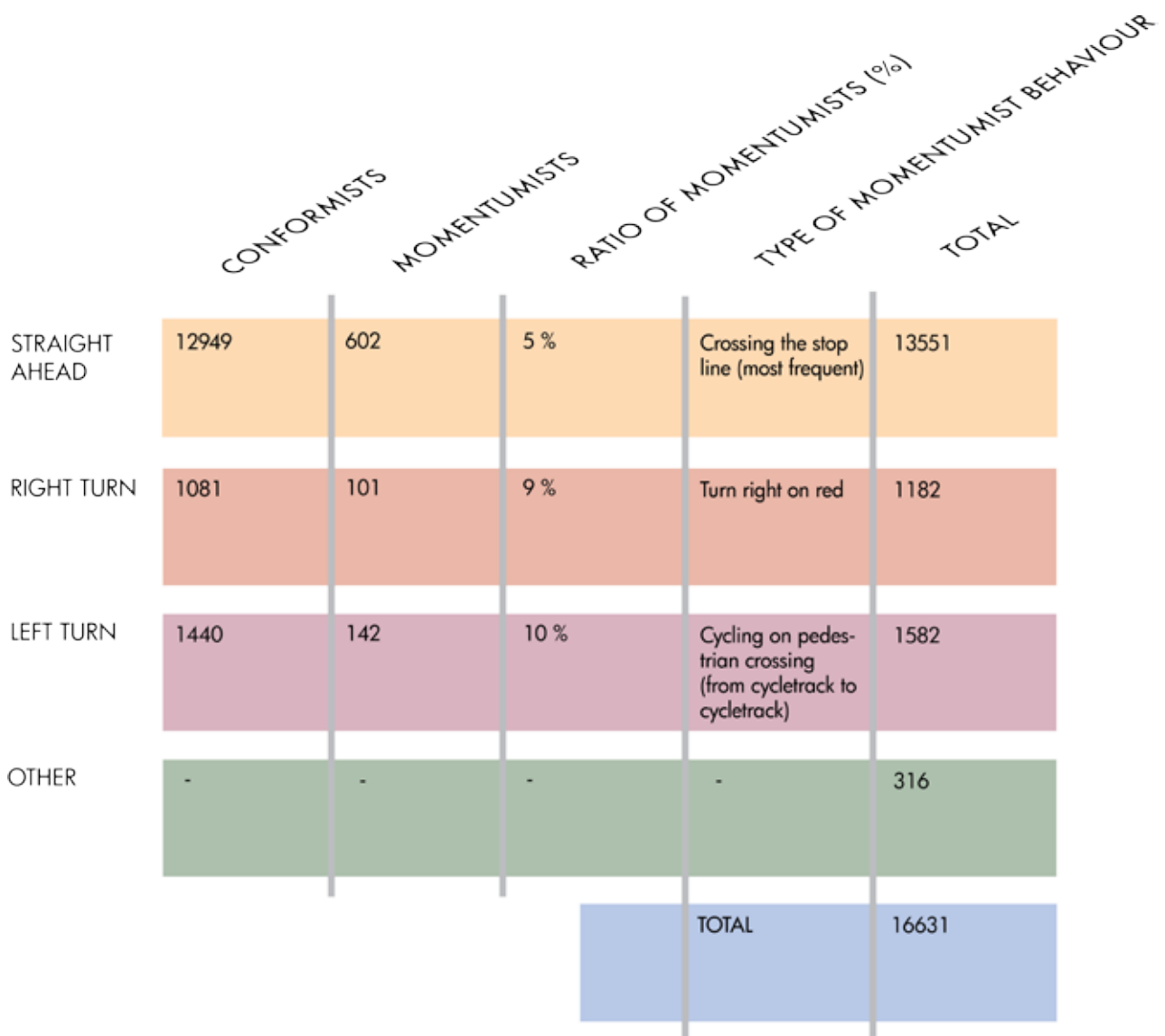


Despite the fact that the Recklists bent traffic laws, they did not injure themselves or other people.

In the Recklists case, the "running a red light" group excludes the right turns on red (which is included in the Momentumists' analysis).

Moreover, the number of Recklists also varies throughout the day, which we will analyse further on in this document.

## Numbers of rule bending

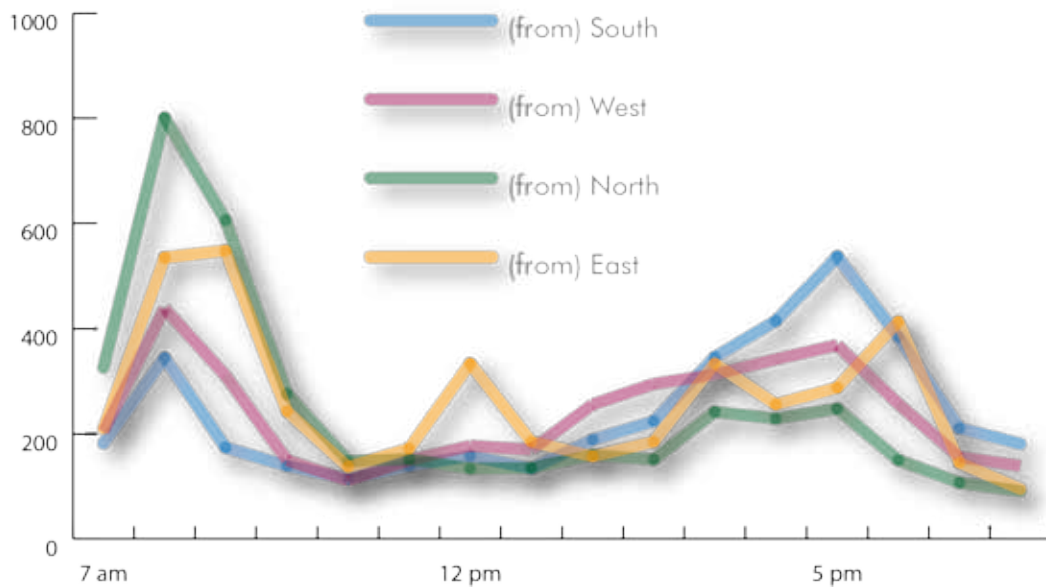


While crossing this intersection, bicycle users have two main options: go straight ahead or turn. That being the case, data shows that the bicycle users' desire keeping their flow, especially when they are turning. When it comes to left-turns, 10% were Momentumists. The ratio for right turns is almost the same: 11%. The number is relatively lower (5%) for crossing over stop lines on straight lines. Thus, special attention should first be paid to bicycle users turning left and/or right.

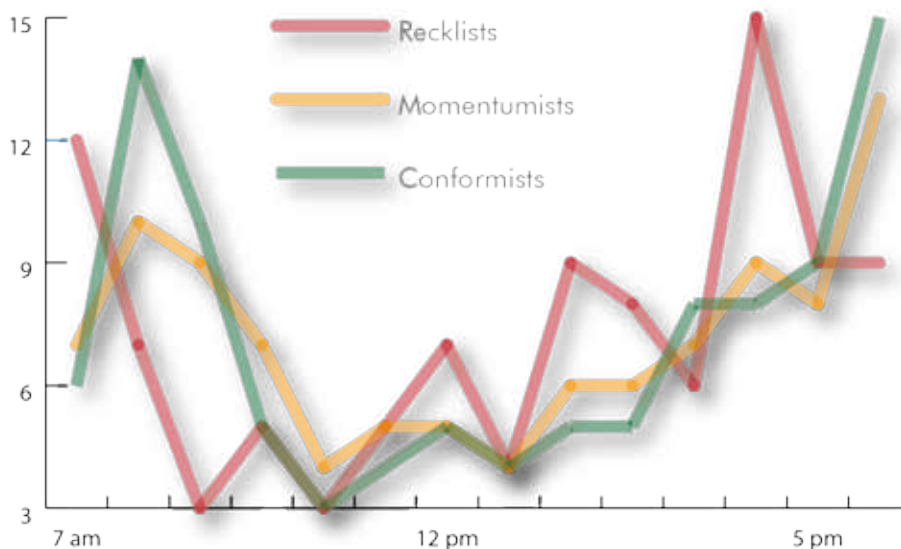
In conclusion, bicycle users bend the rules to keep their flow, their Momentum. Whatever the traffic rules, bicycle users will search for the fastest line possible, and they will do it without endangering anyone. Car-oriented traffic rules are not sufficient to influence the bicycle users' momentum. We have yet to discover something more powerful than bicycle users' momentum.

## Time factors

Analysing behaviour based on time of day



General traffic flow: In the morning rush hour, most of the bicycle users come from the North and head towards the city centre. As expected, that flow reverses in the afternoon when people head home. Out of the four directions, only the South direction has an increase of traffic throughout the day. The other directions have either a small decrease or remain virtually the same during the 12 hour period.



Data demonstrates that, despite the graphical variation, the overall trending number of Recklists increased throughout the day, whereas the Momentumists and Conformists' trends for the same number.

# Copenhagenize Fixes

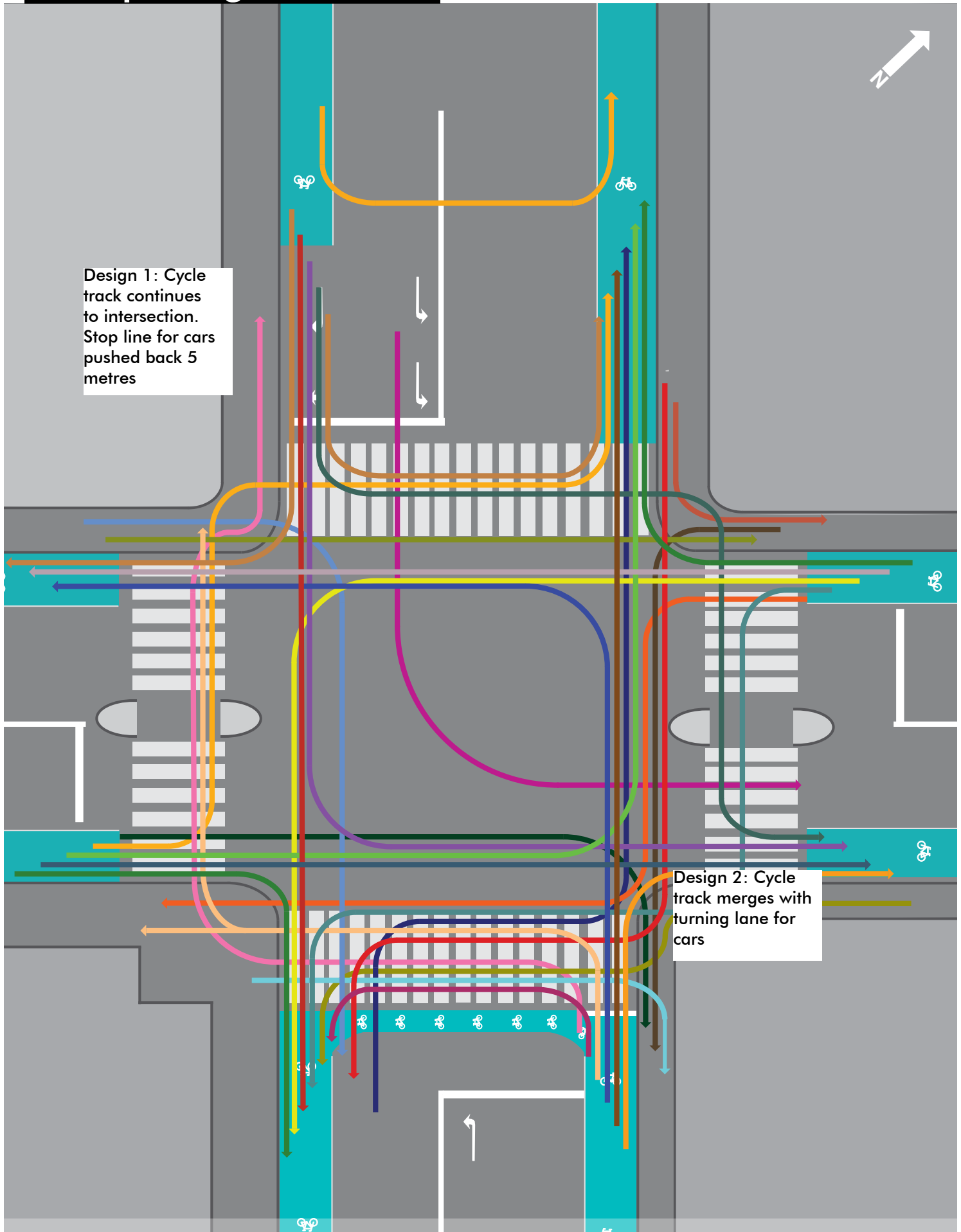
Where to go from here?



# 3

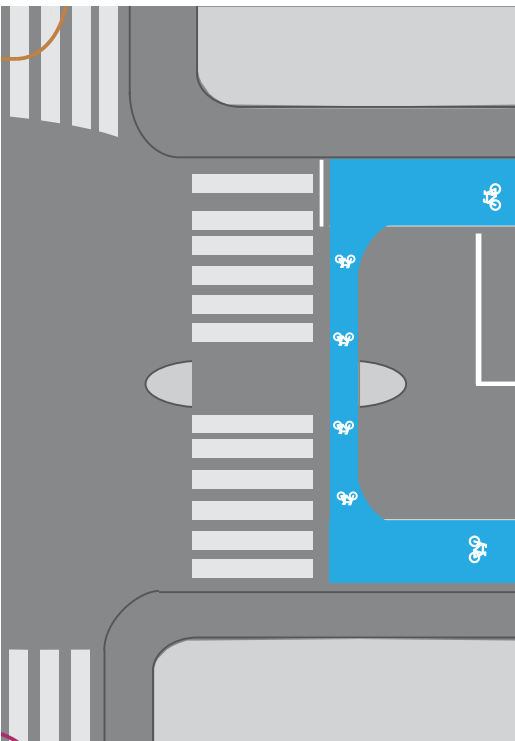
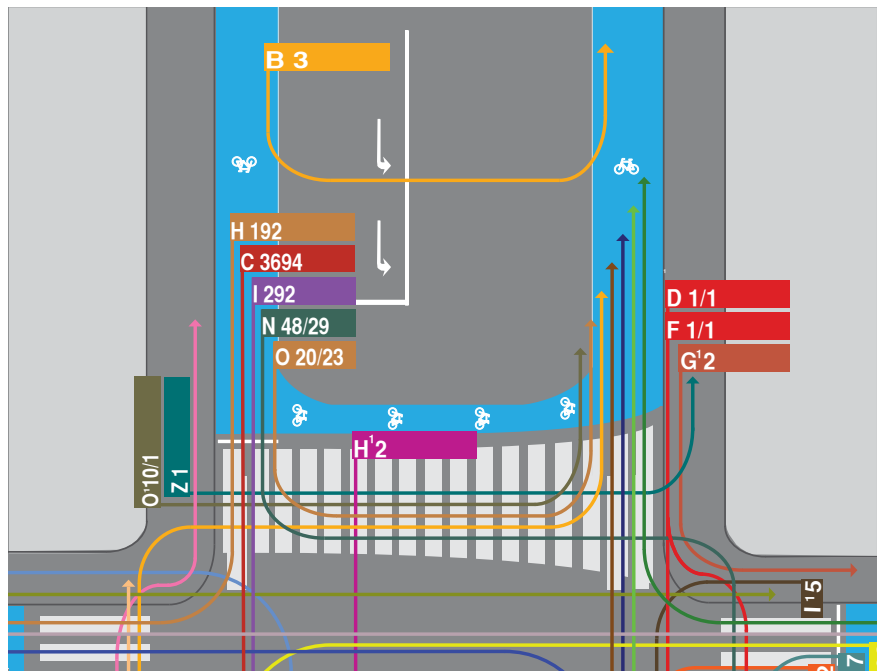


### 3. Copenhagenize Fixes



## The fixes in detail

As previously mentioned, the U-turn is an often-unnoticed movement used by bicycle users. The bike's flexibility assists in this maneuver; turning your bicycle around 180 degrees isn't a problem. Bikes tend to mimic pedestrian behavior. So why not add a cycle path parallel to the pedestrian crosswalk to assist with U-turns? The addition would work in tandem with desire lines—not against it. The slight curve on one end of the new path follows the bicycle users' curve as they turn.

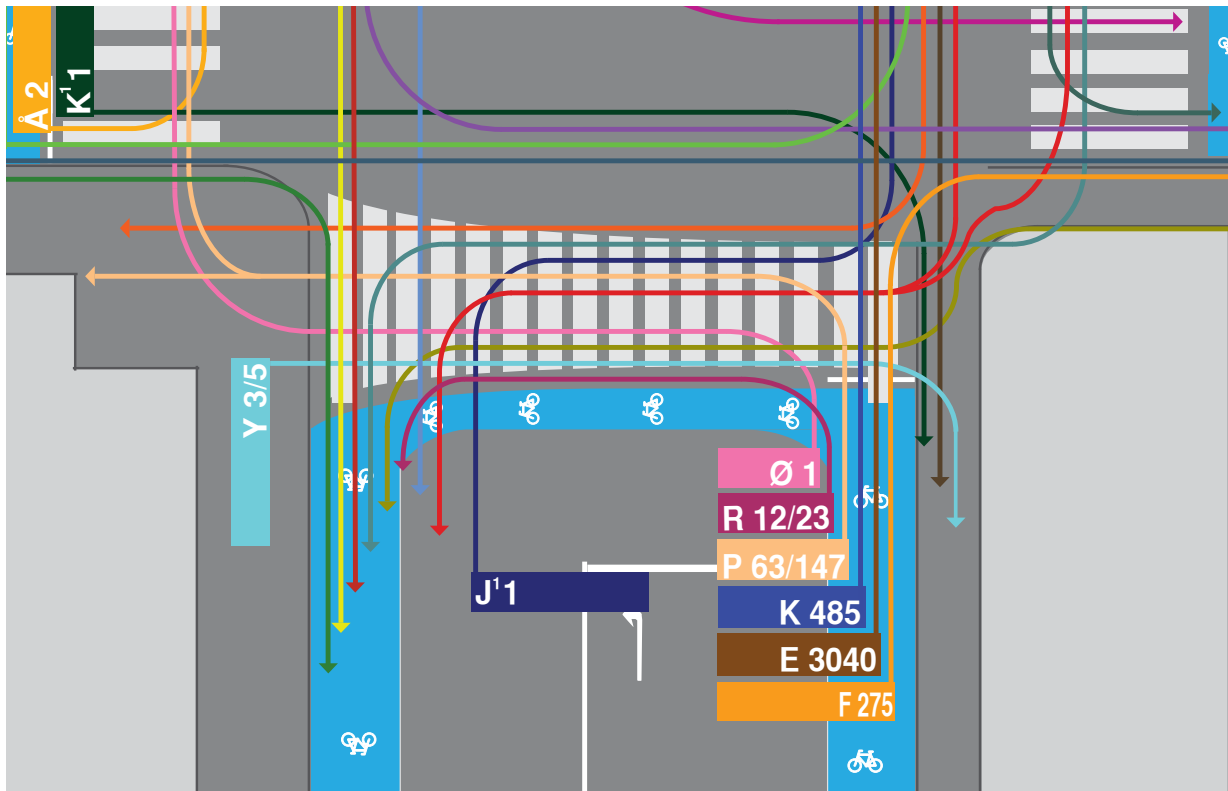


Such an addition would settle qualms about potential bicycle/pedestrian interaction, since each user would have their own space. The observation data disprove the myth of tensions between pedestrians and bicycle users. Nonetheless, these myths will keep operating in society and paint negative portraits of bicycle users.

One of the reasons bicycle users roll past the legal stop line is to distance themselves from cars. Pulling back car stop lines by five meters would allay these fears and create a more comfortable environment for bicycle users

Legalizing bicycle users' right turns on red would greatly increase their fluidity of movement. The change would not endanger these road users, since at this intersection and most others throughout the city, the journey continues on segregated cycle track.

Adding a traffic light for bicycles would cater to their every movement: from the basic turns to the flowing rivers. Bicycle traffic lights are far from uncommon in Copenhagen, so this simple addition would not require much effort.



Our most dramatic-looking recommendation sheds light on something far from revolutionary, the simple act of crossing the street. Time after time, we witnessed pedestrians choosing to stand at the edges of pedestrian crosswalks. They frequently stepped off of these edges and skirted the path altogether. Simply extending the sides of the dedicated pedestrian area would draw attention to pedestrians, ensuring safer transit.

Korean designer, Jae Min Lim proposed a similar recommendation for the 2010 Seoul Design Competition. His design is called the 'ergo crosswalk' and was designed to match pedestrians shortcuts across intersections. Although the recommendation has attracted attention throughout the design community, Copenhagen could be the first to actually implement crossings more attuned to pedestrians' travel patterns

# Literature

Bachelard, Gaston

1958 *The Poetics of Space*. Gaston Bachelard. Boston: Beacon Press

De Certeau, Michel

1984 "General Introduction" & "Walking in the City" in *The Practice of Everyday Life*. Translated by Steven Rendall. Berkley, L.A. & London: University of California Press

Grieco, Margaret & John Urry

2011 "Introduction: Introducing the Mobilities Turn" in *Mobilities: new perspectives on transport and society*. Margaret Grieco & John Urry (ed.) Burlington & Farnham: Ashgate

Schlabowske, Dave

2013 "Our PR problem: self-righteous Spandex-wearing scofflaws". Bicycle Blog of Wisconsin. posted 15/4/2013. <http://wisconsinbikefed.org/2013/04/15/our-pr-problem-self-righteous-spandex-wearing-scofflaws/>

Vejdirektoratet for Frederiksberg Kommune

2009 "Trafikudvikling of -tællinger 2004-2009" Frederiksberg Kommune