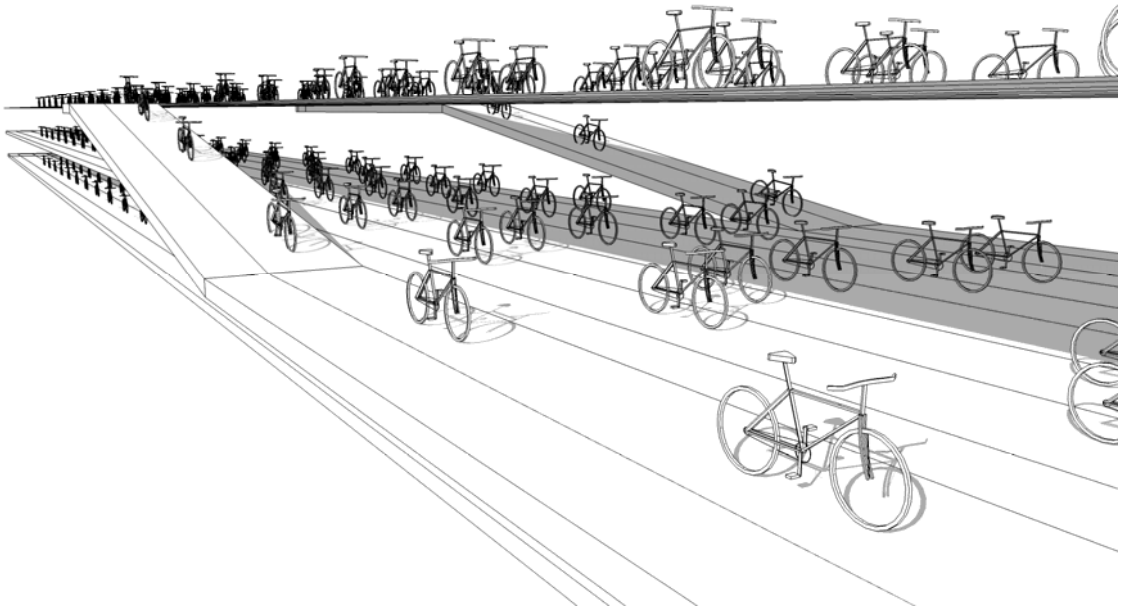
Bike City

2.1 Bike City - Introduction



1 000 000 people

↘ **1 000 000 bicycles**

traditional bikes

max speed: 48 km/h

no very steep going up ramps (2,5%)
the going down ones can be much more slanted (15%)

city friendly to the environment and users

5 min 37,5s connection between functions
9 min 7,5s connection between the furthest part of the city

2.1.1.1 Bike City – Advantages & Disadvantages

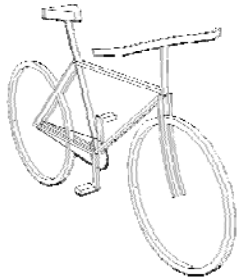
Advantages

−no pollution
−healthy
−cheap
−very flexible
−almost everybody can use it
− useable in almost every terrain
− small demands on urban space
− silet in operation

Disadvantages

−tiring
−low capacity
−no weather protection
−not very safe

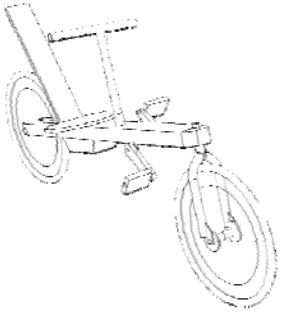
2.1.1.2 Bike City – Transport mode variations



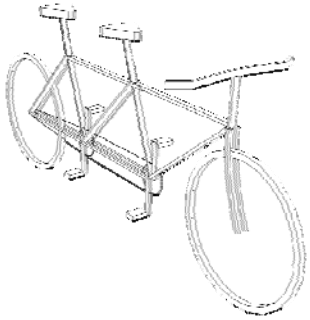
traditional bicycle
1 persom, single-track

sociable bicycle
2 people, single-track

conference bicycle
7 people, multi-track



recumbent bicycle
1 person, single-track

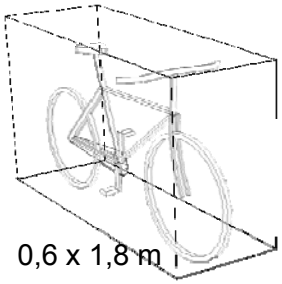


tandem bicycle
2 people, single-track

bicycle for disabled
1 people, multi-track

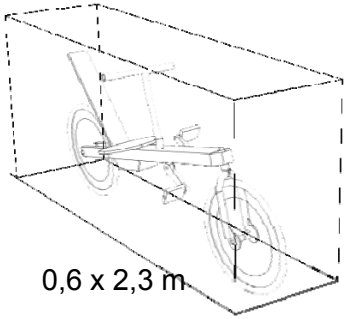
2.1.1.3 Bike City – Performance: storage

1,08 m³



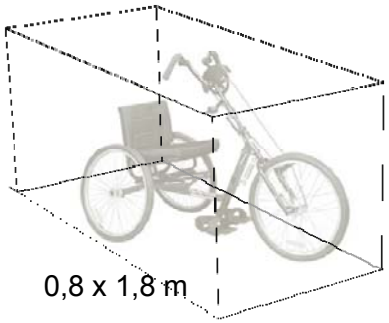
0,6 x 1,8 m

1,2 m³



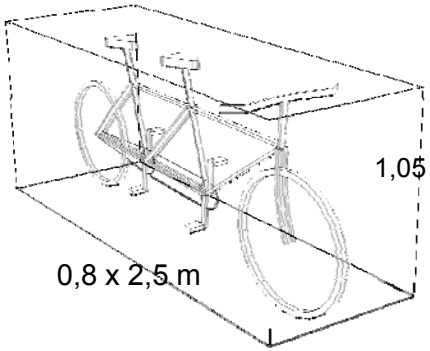
0,6 x 2,3 m

1,44 m³



0,8 x 1,8 m

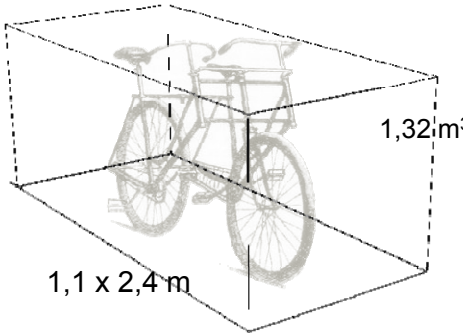
2,1 m³



1,05 m³ / person

0,8 x 2,5 m

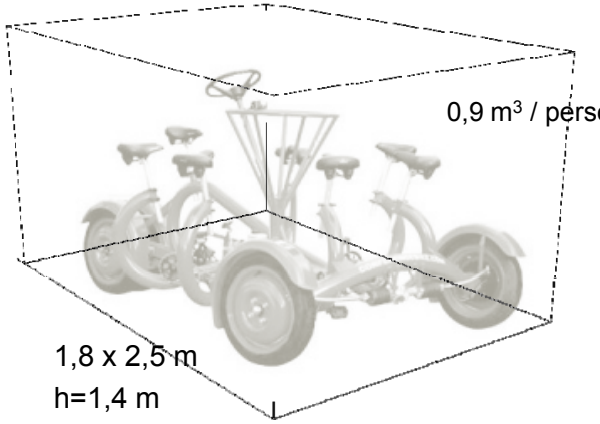
2,64 m³



1,32 m³ / person

1,1 x 2,4 m

6,3 m³

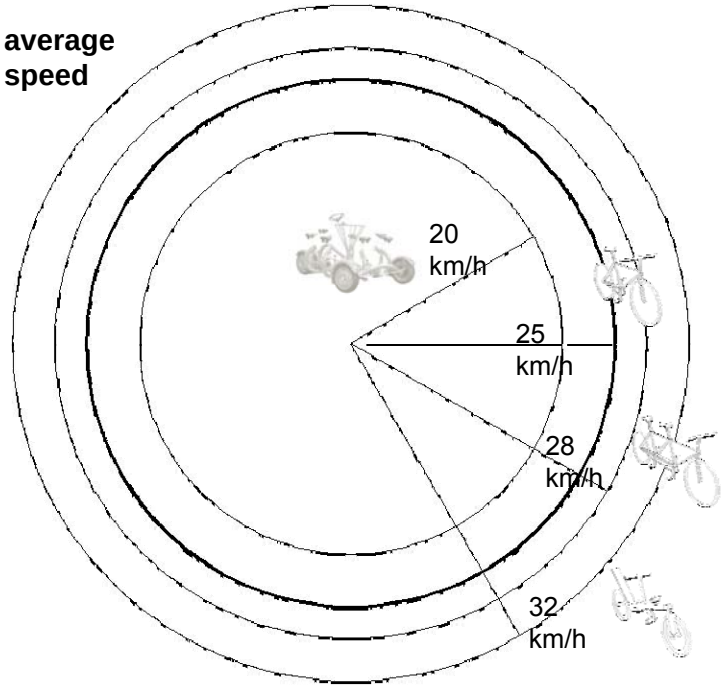


0,9 m³ / person

1,8 x 2,5 m

h=1,4 m

2.1.1.3 Bike City – Performance : speed

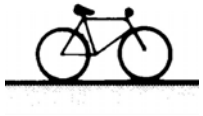


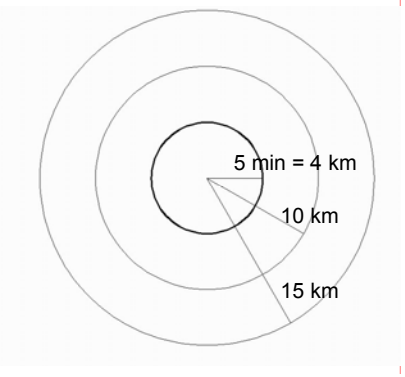
max speed

flat	48 km/h
going up	25 km/h
going down	70 km/h

max race speed

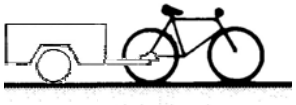
flat	70 km/h
going up	34 km/h
going down	110 km/h

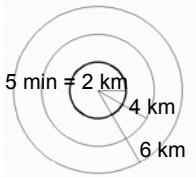




BICYCLE
passengers: 1
64 l
max speed: 48 km/h

5 min – 4 km
10 min – 8 km
15 min – 12 km

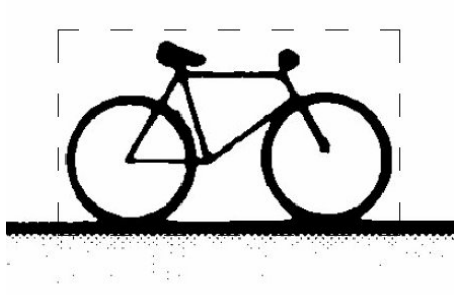


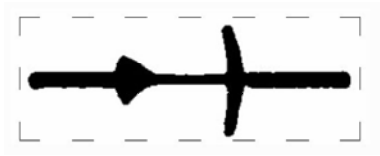


BICYCLE WITH A TRAILER
passengers: 1 + 2 children
105 l, 45 kg
max speed: 24 km/h

5 min – 2 km
10 min – 4 km
15 min – 6 km

2.1.1.3 Bike City – Performance : dimensions





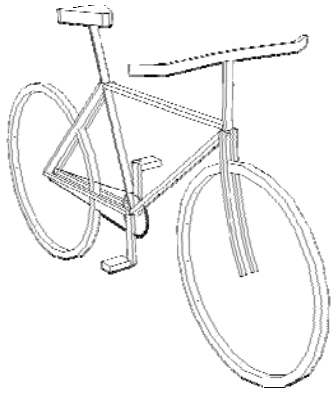
capacity : 1 person / vehicle
max speed : 48 km/h
average speed : 25 km/h
acceleration to max speed : 11 s
turning radius at max. speed : 34 m

5 min distance : 4 km

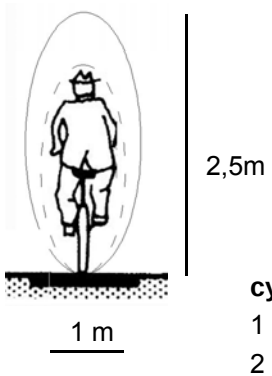
fuel type : human
fuel consumption : 500 kcal/h

vehicle:

length 1,8 m
width 0,6 m
height 1 m
volume 1,08 m^3



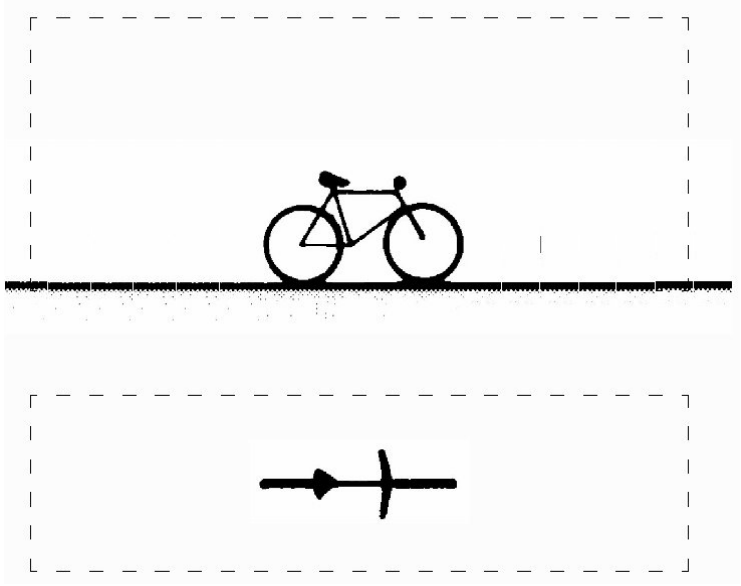
2.1.1.4 Bike City – Buffer zone

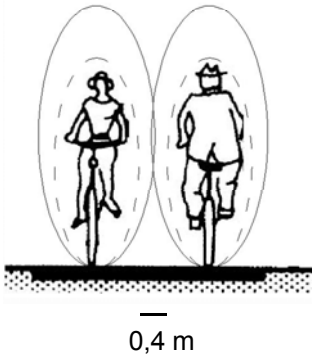


cycle path

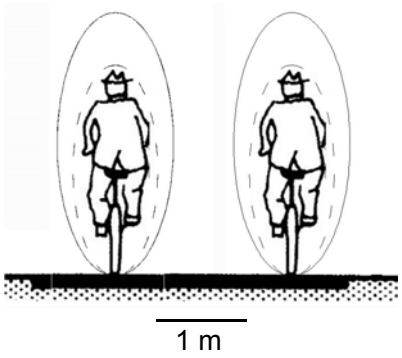
1 rider: 0,6 – 1 m

2 riders: 1,6 – 2 m





average speed

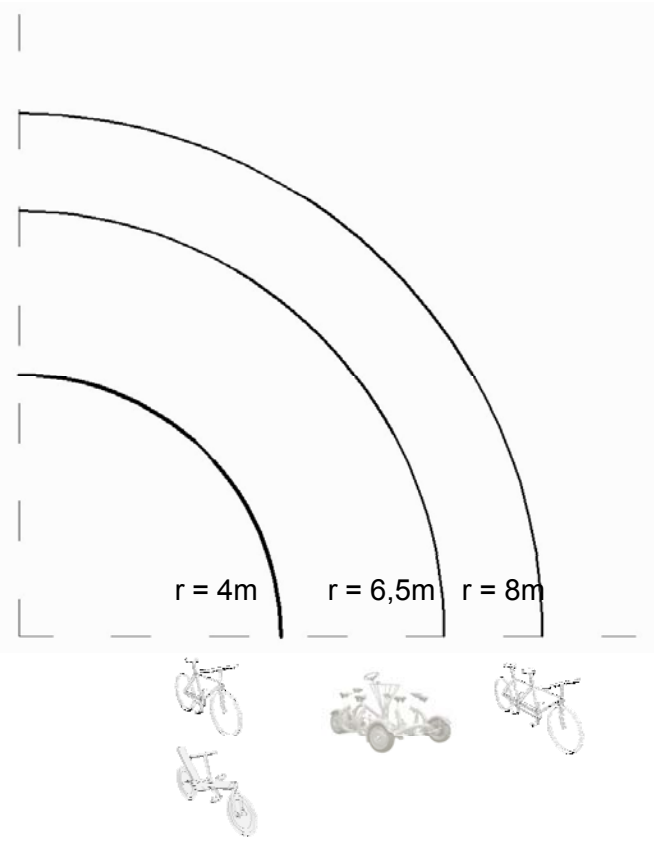


max speed

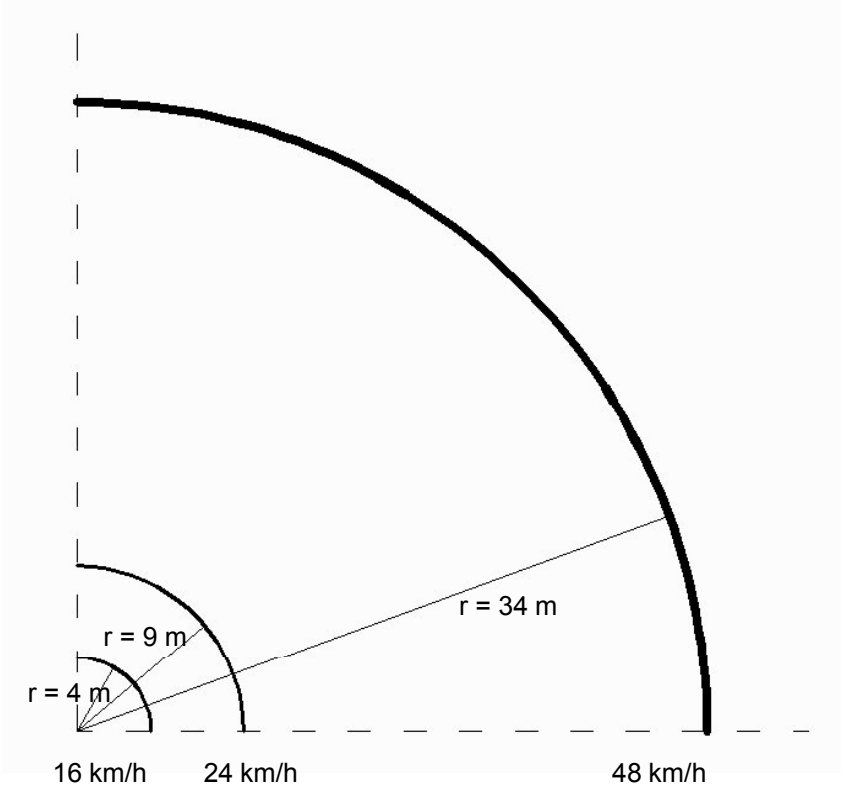
with a rider in move:

length	6 m	(assumption)
width	1,6 m	(assumption)
height	2,5 m	
volume	8 m^3	

2.1.1.5 Bike City – Pathway limitations: turning radius



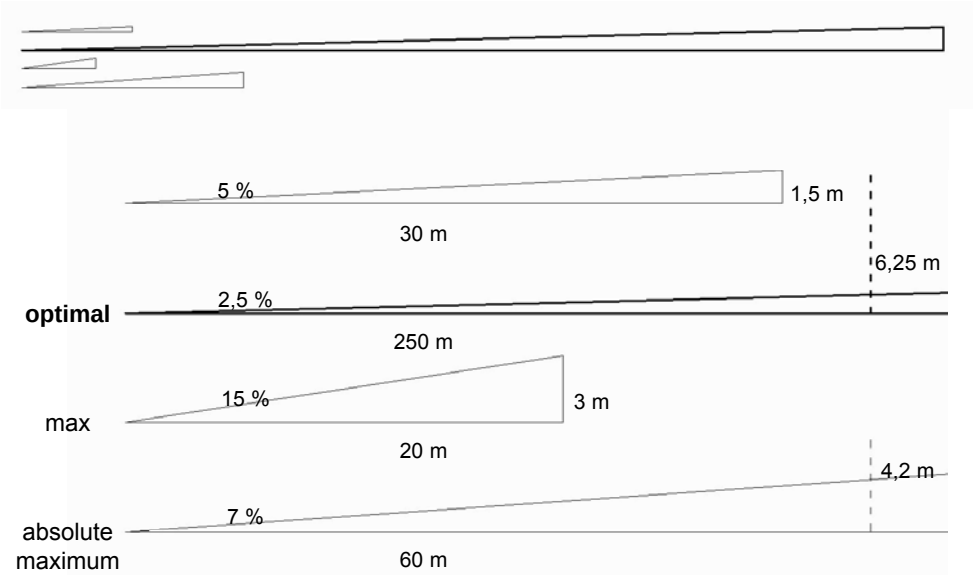
turning radius for different types of bikes

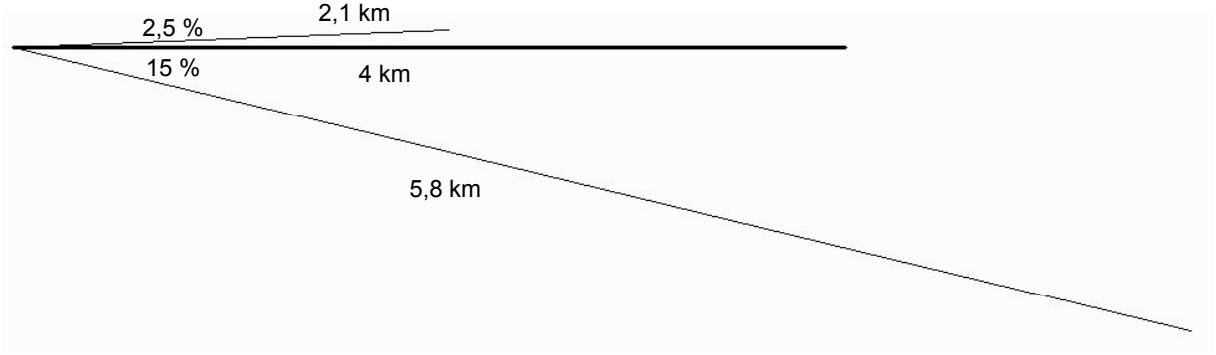


with max superelevation: 12%

turning radius for traditional bike

2.1.1.5 Bike City – Pathway limitations: inclination





2.1.1.6 Bike City – Pathway surface studies

Sand, gravel

+ cheap
+ eco-friendly
- easy loss of control
- lots of energy needed

Soil

+cheap
+ eco-friendly
- can become uneven
- slippery when wet

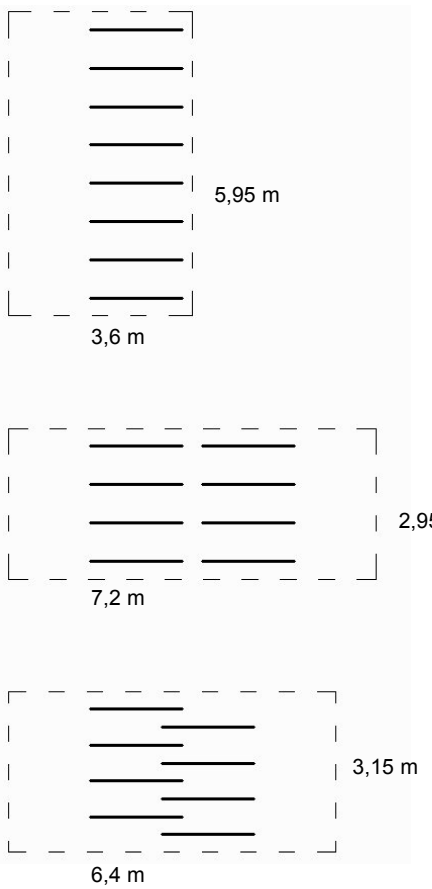
Asphalt

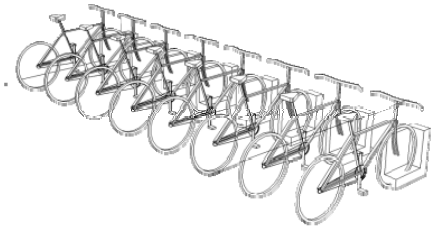
+ rough one is the best for wet surface
+ even surface
+ easier pedalling
- hot weather: surface can become hot enough to allow tires to sink into the surface
- production: environment pollution

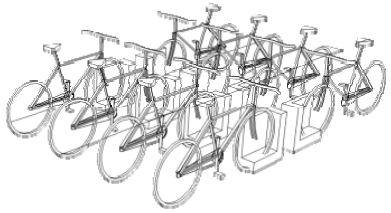
Bad things on surface for biking:

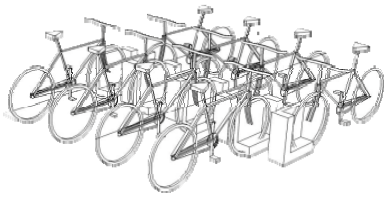
–potholes: (damage to bicycle wheels and rider)
–small objects (tire destruction, loss of control)
– ripples or wavings (difficult control, speed decrease)
– surface made of slabs (tend to shift during riding on them)
– no big changing the level of riding eg. curbs

2.1.1.7 Bike City – Additional program typologies: parking









STORAGE AREA

- bike parking lot
  - big multileveled parking lot
  - bicycle stand
- canopied or not
- closed (even guarded) or not
- outside, inside

	6 BIKES			50 BIKES		
	parking	access	total	parking	access	total
typical	10,4 m^2	8,32 m^2	18, 72 m^2	76,4 m^2	61,12 m^2	137,52 m^2
typical	11,8 m^2	9,44 m^2	21,24 m^2	77,8 m^2	62,24 m^2	140,04 m^2
folded	10,08 m^2	10,08 m^2	20,16 m^2	59,36 m^2	59,36 m^2	118,72 m^2

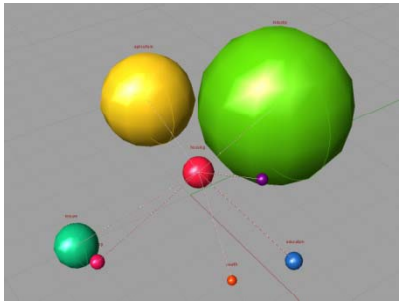
up to 9

10 and more

2.1.2.1 Bike City – Proximity and fragmentation studies

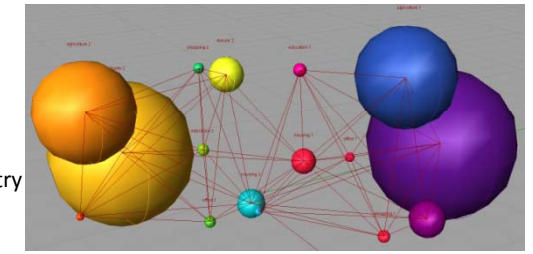
1 function, connected with housing

works!



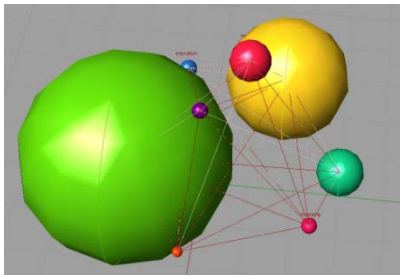
2x function, connected most usable

each duplicated is connected
big problem: housing - industry & agriculture



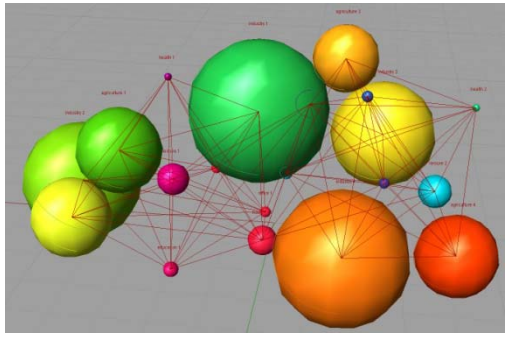
1 function, all connected

19: ok
4: 0,2-0,4 km more
5: 0,7-1 km more



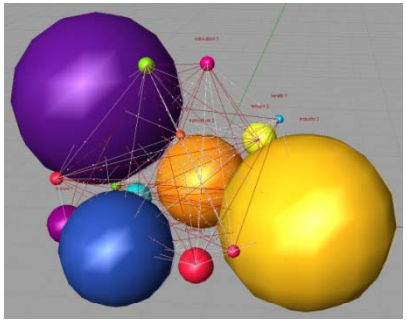
as the previous one + industry & agriculture divided

each industry is close to each agriculture



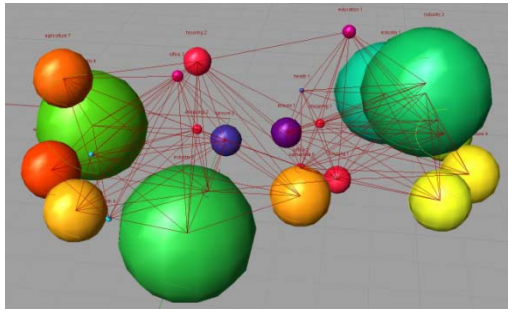
2x function, all connected

1 of each same 2 is reachable
not everything, especially the same function



as the previous one + health & agriculture divided

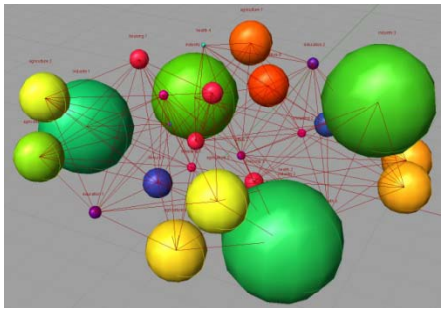
8 - agriculture
4 - health, industry
2 - housing, shopping, office, education, leisure



2.1.2.1 Bike City – Proximity and fragmentation studies

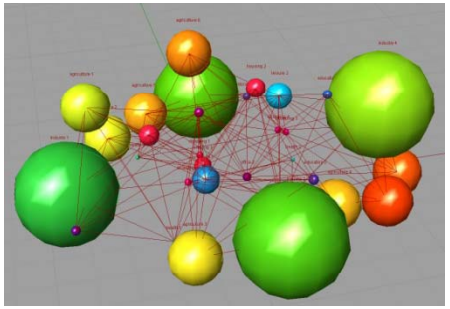
as the previous one + housing divided

8 - agriculture
4 - housing, health, industry
2 - shopping, office, education, leisure



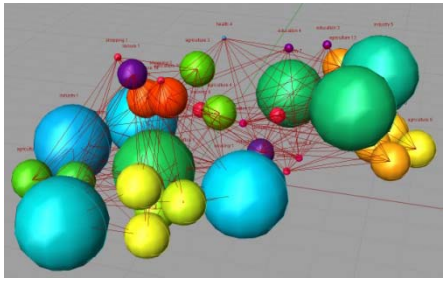
as the previous one + housing & shopping divided

8 - agriculture
4 - housing, shopping, health, education, industry
2 - office, leisure



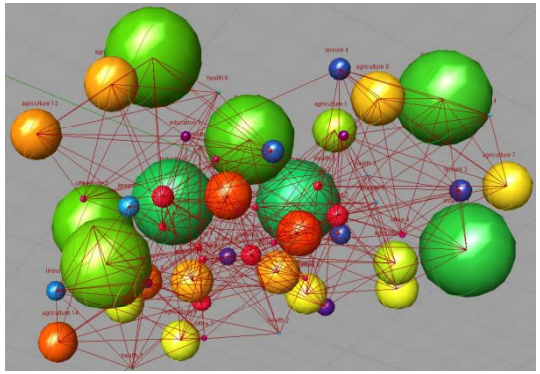
as the previous one + housing & shopping divided

16 - agriculture
8 - industry
4 - housing, shopping, health, education
2 - office, leisure



most useable functions close to each other

16 - agriculture
8 – industry, office, leisure, health
4 - housing, shopping, education

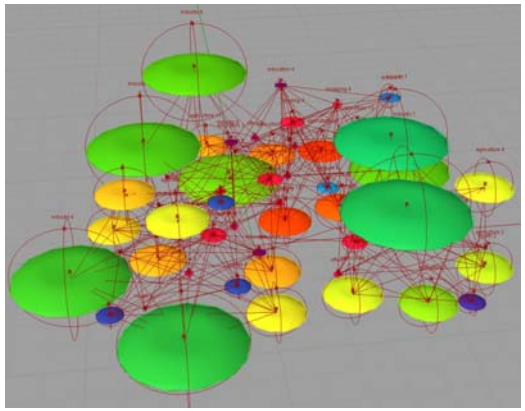


as discs

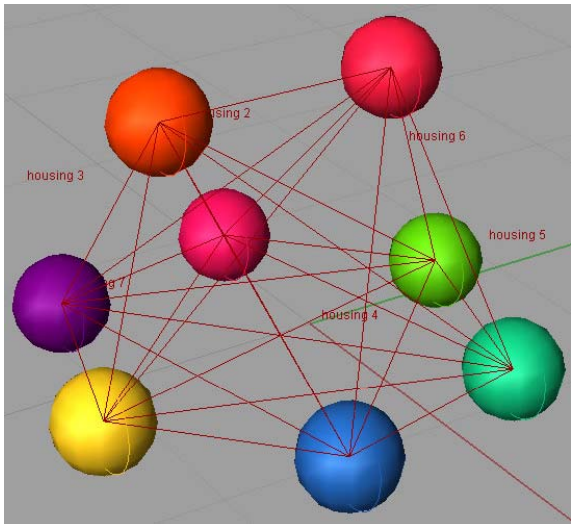
reachable in about 5 min 37,5 s + traveling within a function

the biggest in industry – 2 min 15 s x2 = 4 min 30 s

10 min 7,5 s



2.1.2.2 Bike City – Connection Hierarchy



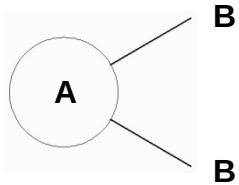
Priority connections:
most used ones

↓

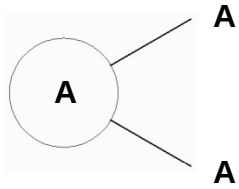
housing - office
housing - education
housing - shopping

all the housings (8) are connected

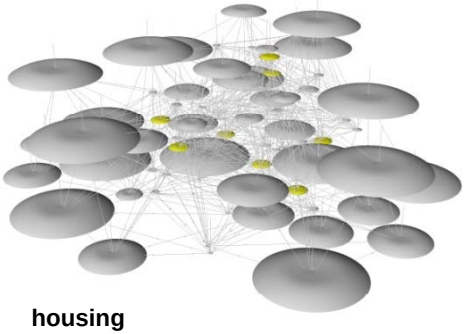
every part of function is connected with 2 parts of other functions
exception: agriculture, industry – connected with 1 part of other functions
(to make them more flexible in location)



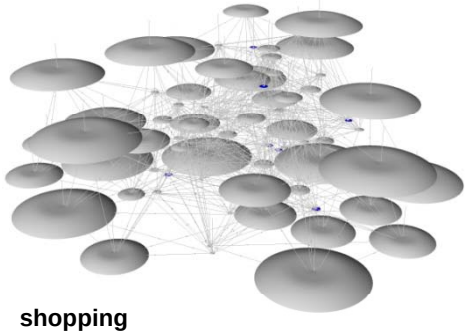
each part of a specific function is connected with 2 other from the same function
exception: agriculture, industry – connected with 1 part of the same function



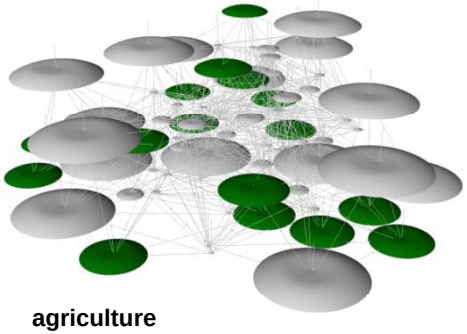
2.1.2.3 Bike City – Density disc



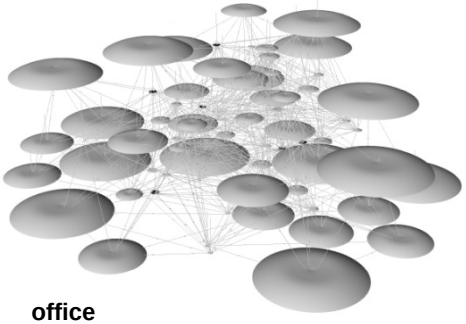
housing



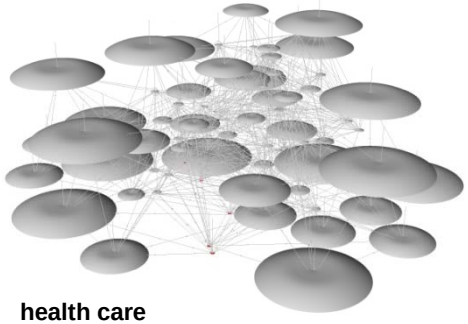
shopping



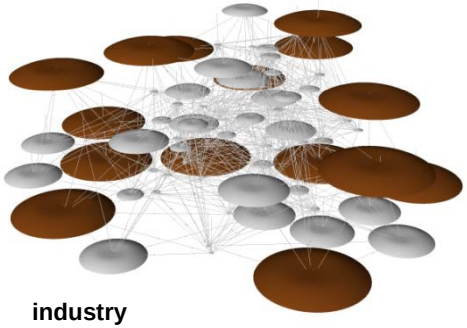
agriculture



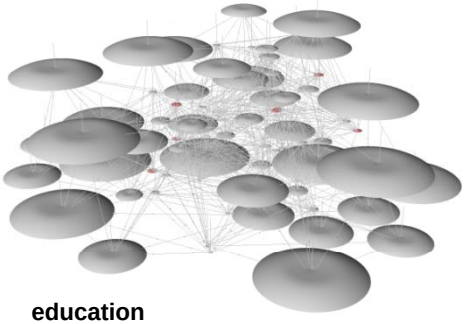
office



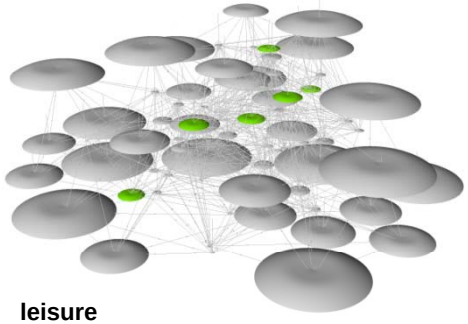
health care



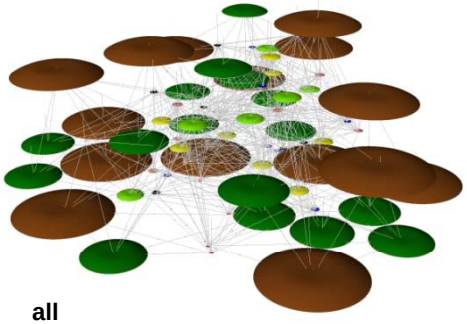
industry



education



leisure



all

2.1.2.4 Bike City – Additional programme

resting points

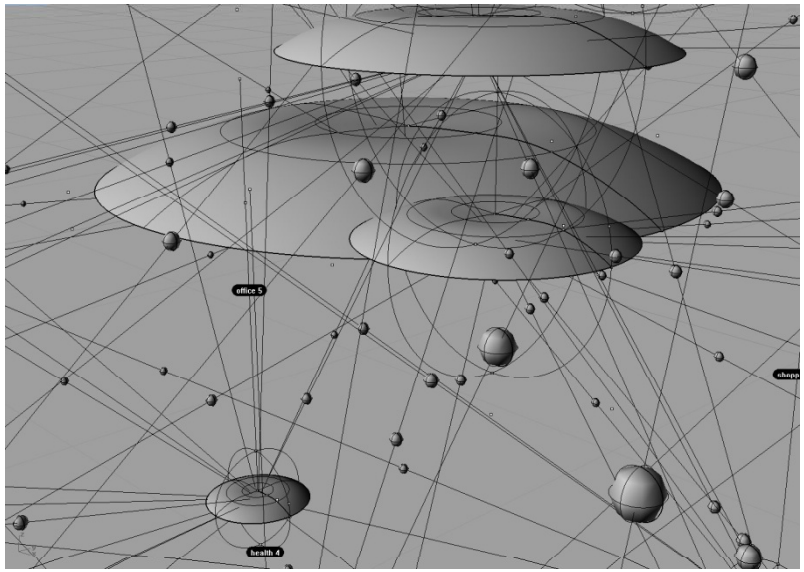
resting poing every 1km –
every 1 min 15s

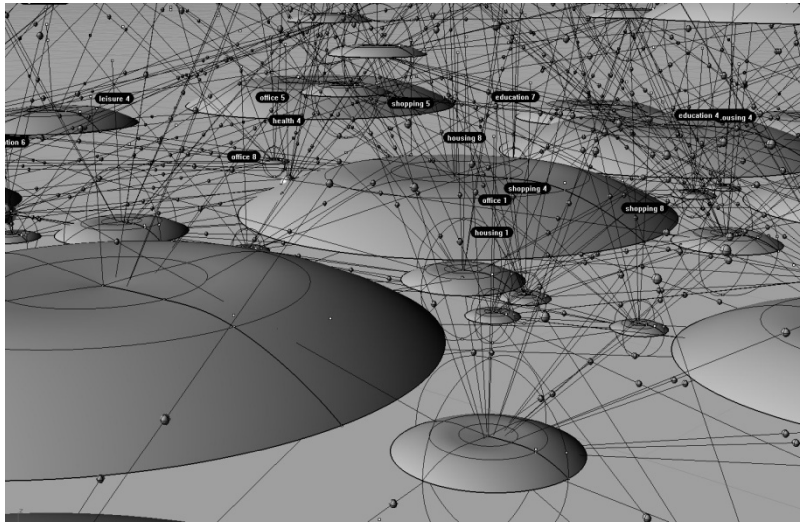
parking

space needed for parking out of all space in function:

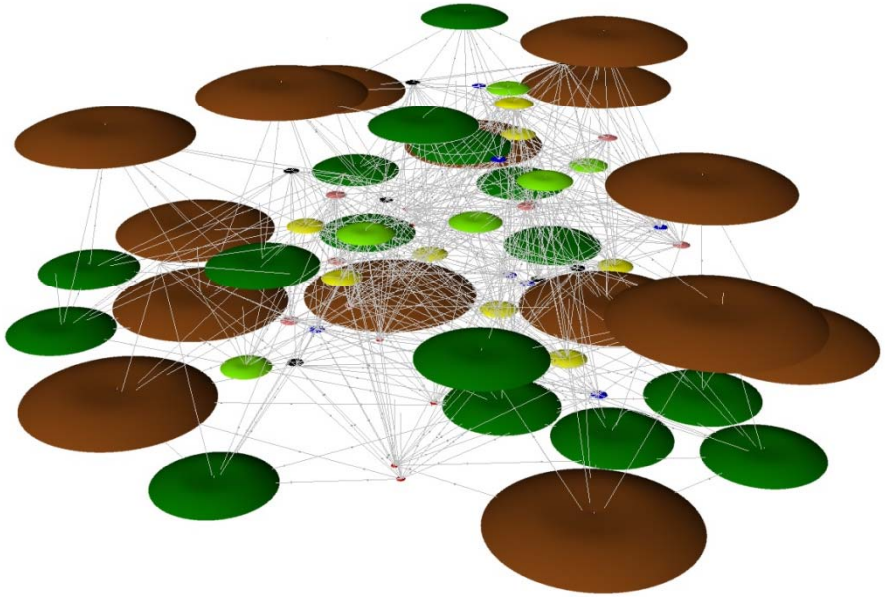
- housing 1,88%
- **office 13,36%**
- education 4,25%
- **shopping 6,8 %**
- leisure 0,16%
- industry 0,002%
- **health care 6,74%**
- agriculture 0,005%

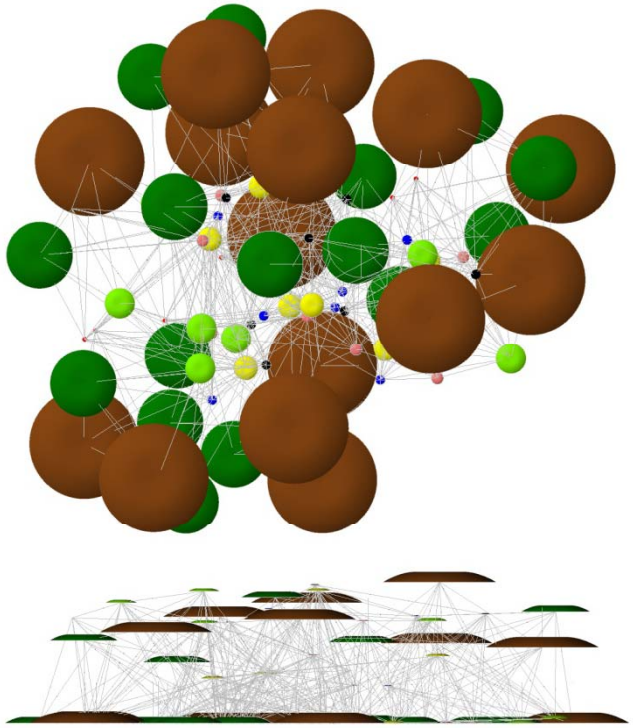
average: 4,15%





2.1.2.5 Bike City – Conclusion





based on:

most useable – the closest (housing & office / education / shopping)

division

8 – housing, office, education, shopping, leisure, health care

16 – agriculture, industry

536 different types of connections

centres of functoins are reachable
in about **5 min 37,5 s** + traveling within a function

the longest – between industry: 1 min 45 s x 2 = 3 min 30 s
9 min 7,5 s

housing – office: 6 min 10s
housing – education : 6 min 12s
housing – shopping : 6 min 10s

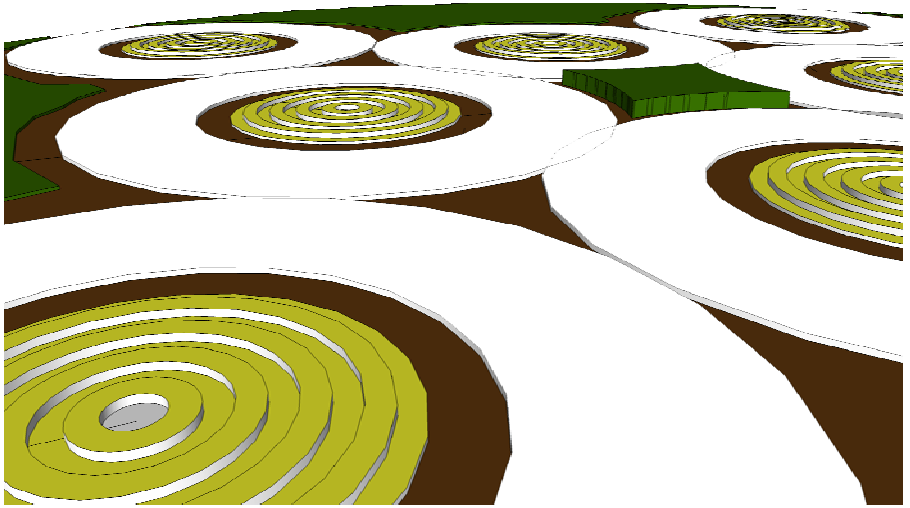
2.1.3 Bike City – Transport city model

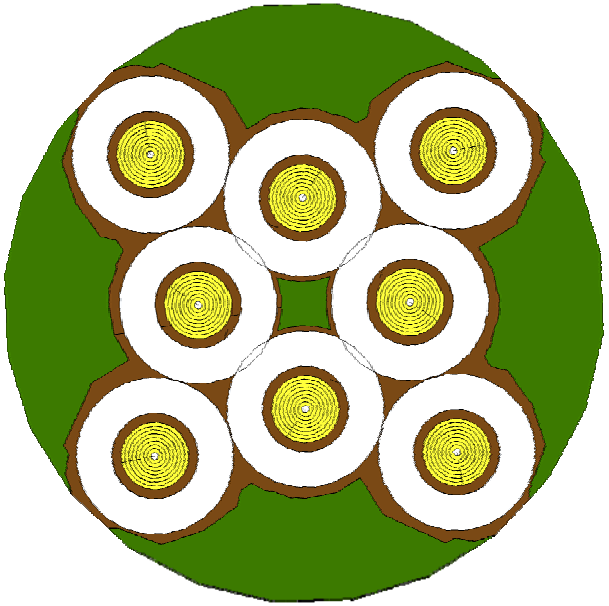
agriculture
housing
industry
other

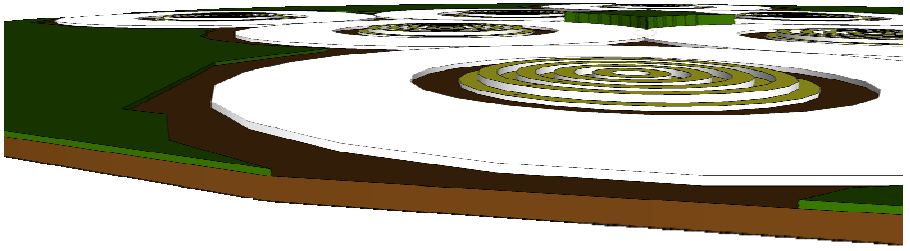
city
r = 4km

5,5 km (6 min 52,5 s) between the centres of the furthest housings

housing:	3 and 8 floors
industry:	10 floors
agriculture:	3 floors
central:	20 floors
other functions:	7 floors







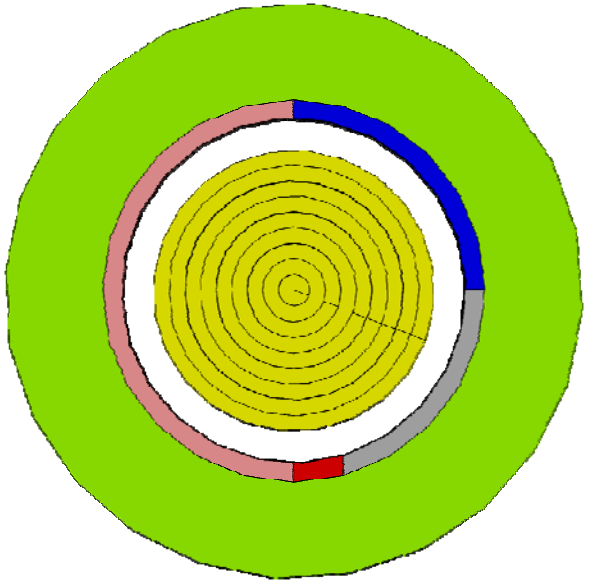
2.1.3 Bike City – Transport city model

package

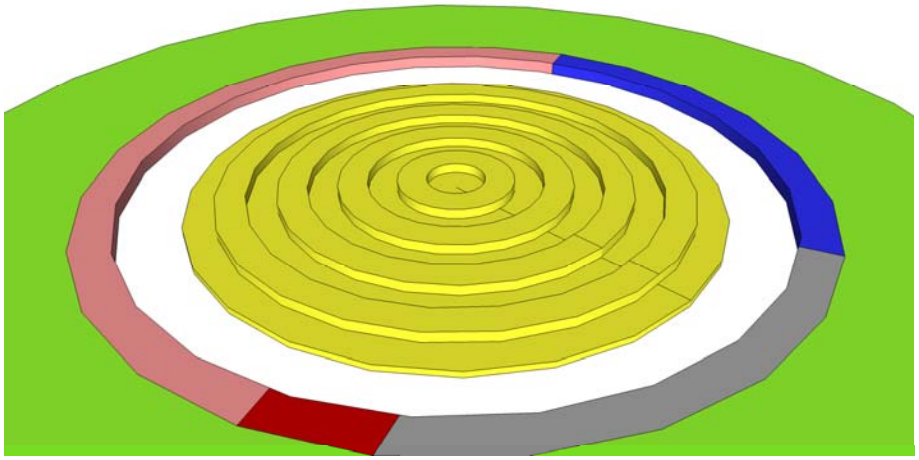
housing – 3 and 8 floors
r = 450m

office, education, shopping, health care – 7 floors
r = 550-610m (width 60m)

leisure – 7 floors
r = 610-920m (width 310m)



between the furthest part:
1,8 km – 3 min 37s
up (1 km) – 2min 37s
flat (0,8 km) – 1 min



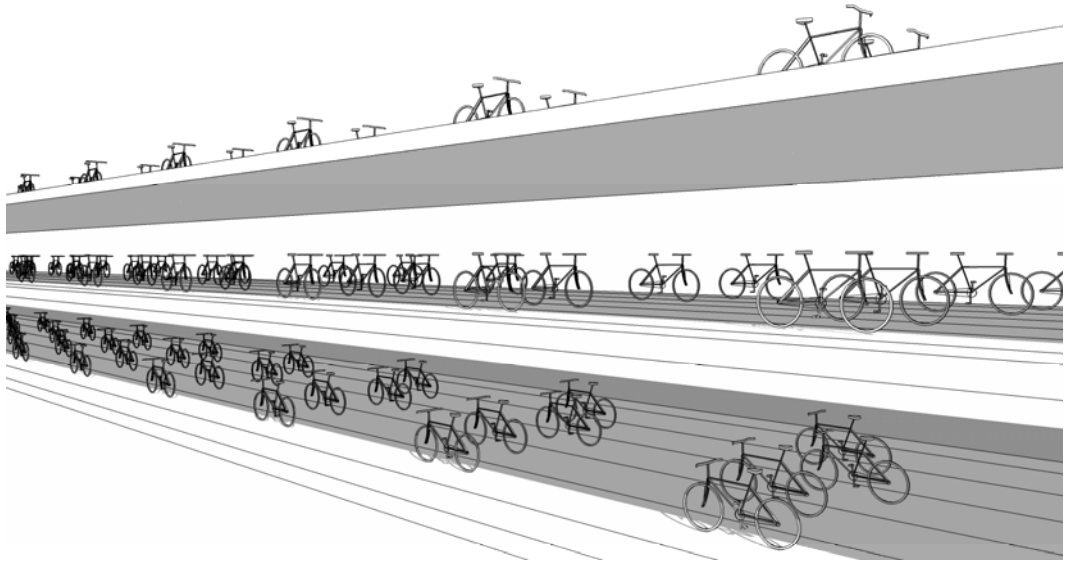
housing
education
office
health care
shopping
leisure

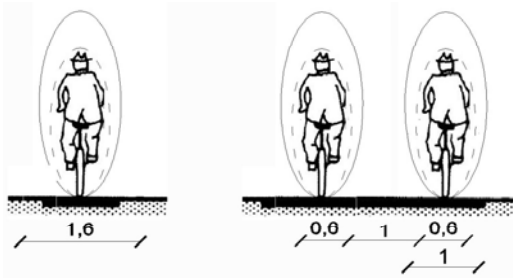
2.1.3.1.3 Bike City – Pathways capacities and dimensions

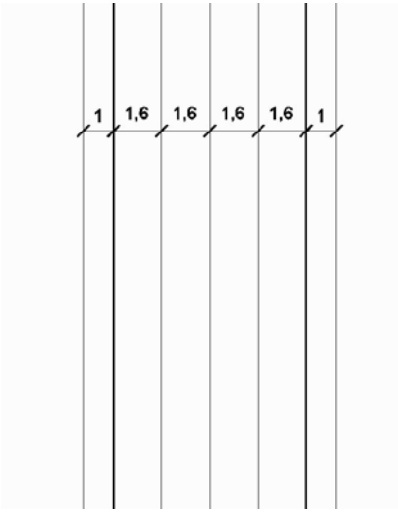
1 person / vehicle
max speed buffer zone: 1 x 6 m (assumption)

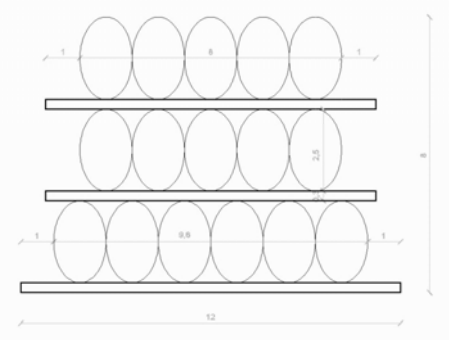
1 LANE
max speed => 133 bikes / 1 min

max speed => 665 bikes / 5 min

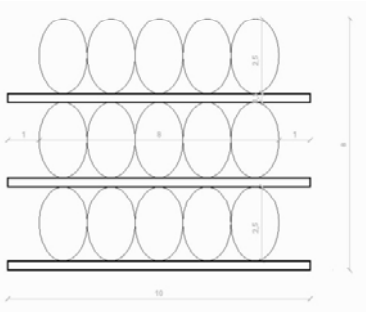




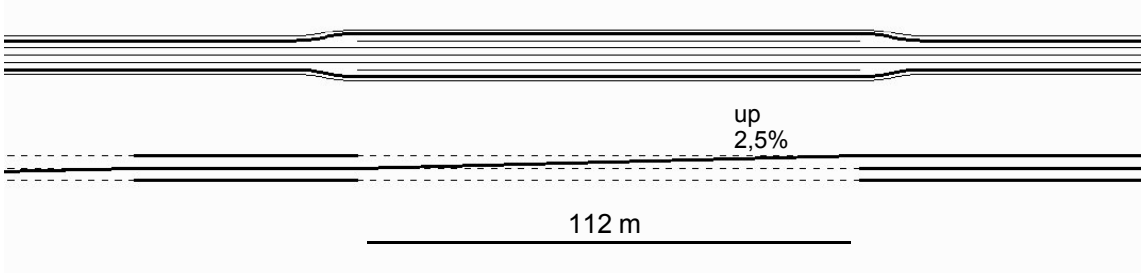




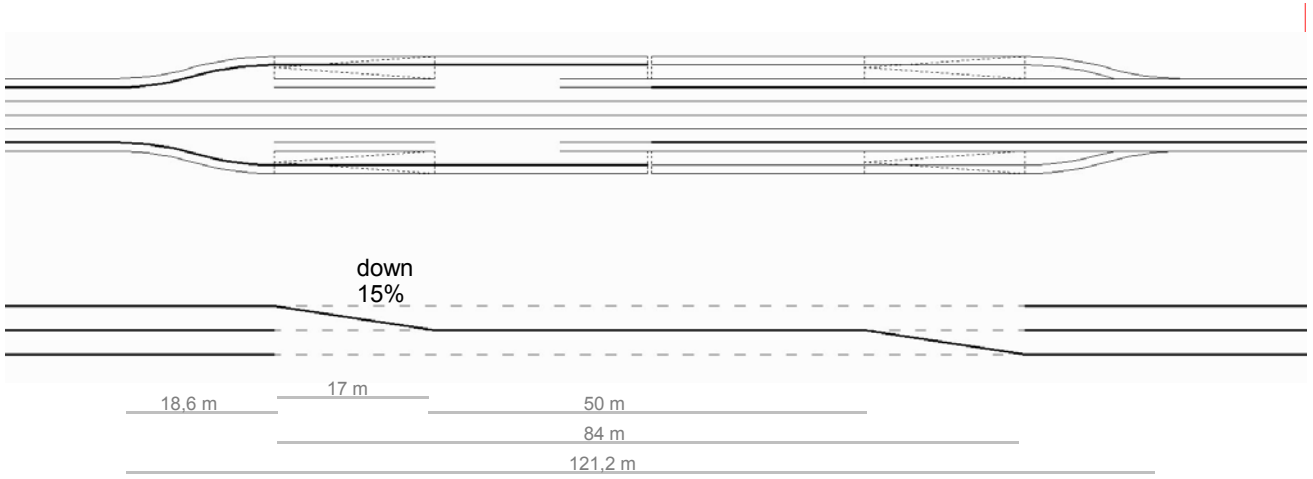
2.1.3.1.1 Bike City – Merging and weaving zones: changing layers



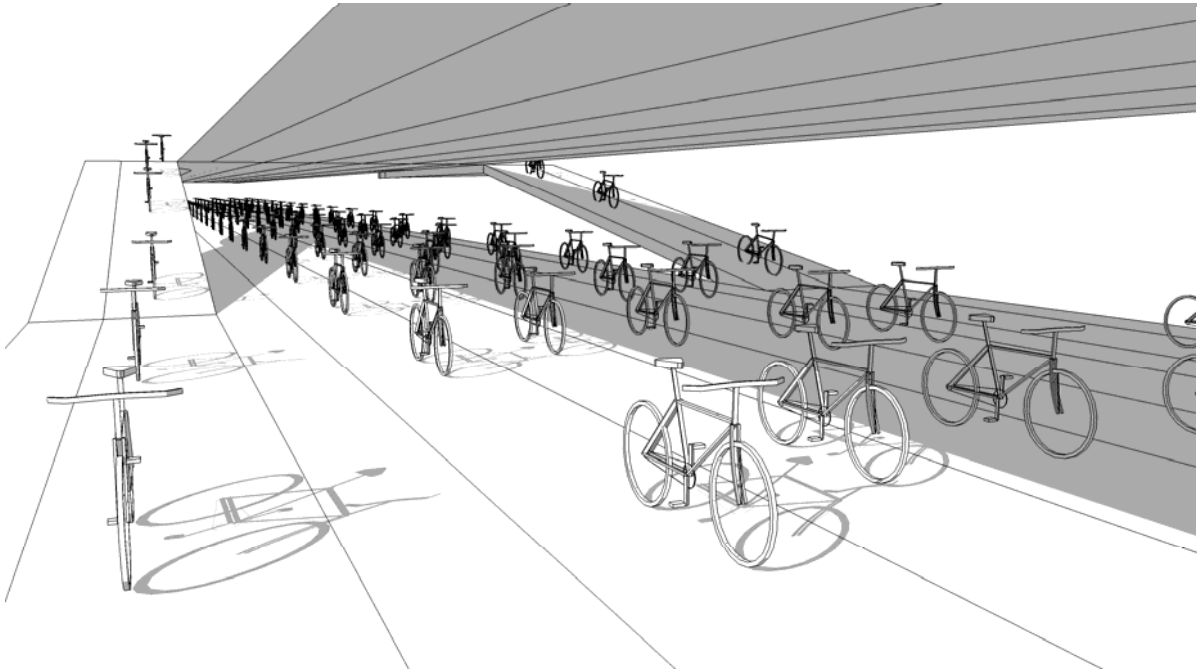
changing layer
up 2,5 %
h=2,8 m, a=112 m
down 15 %
h=2,8 m, a=17 m

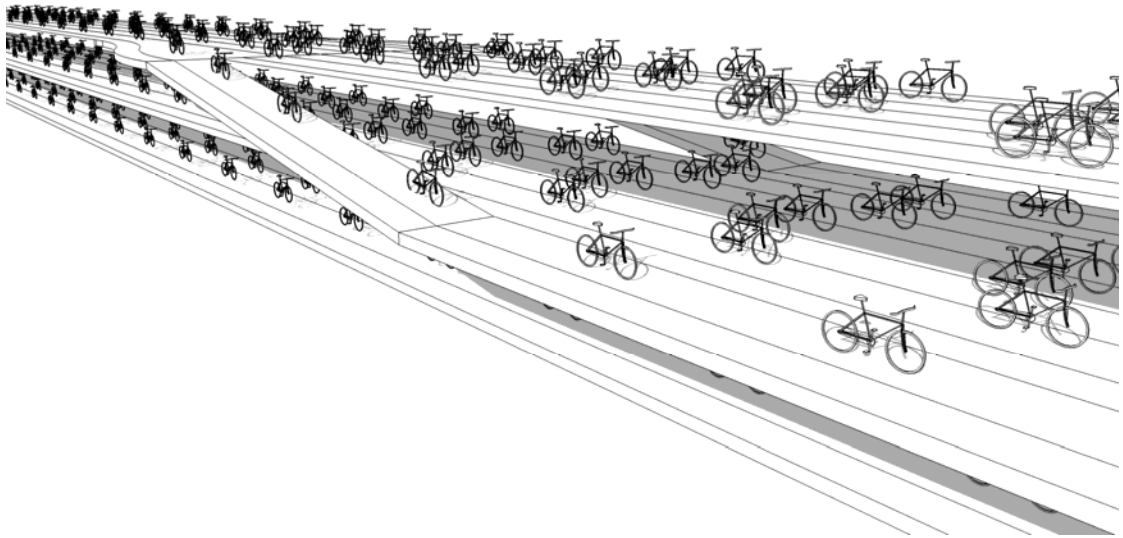


purpose:
changing layer



2.1.3.1.1 Bike City – Merging and weaving zones: changing layers



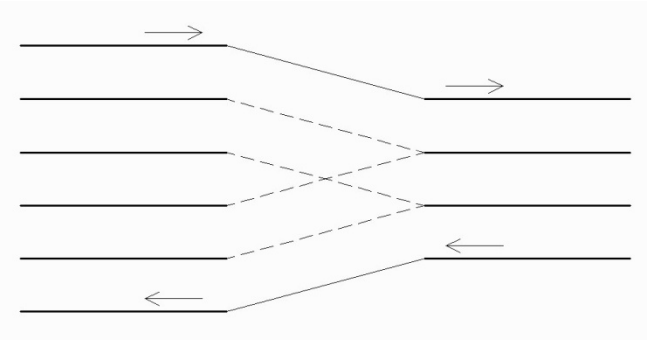


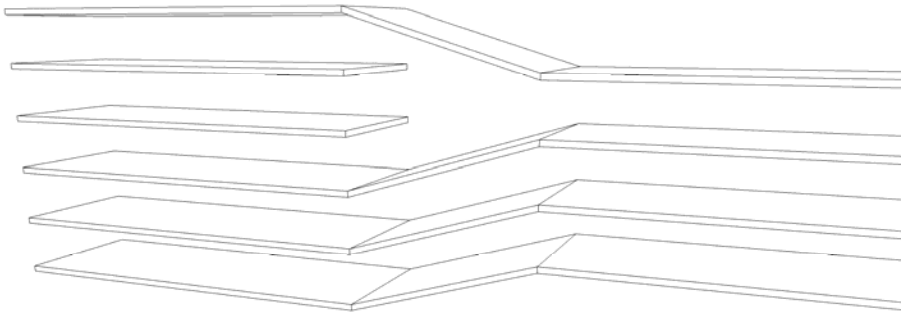
2.1.3.1.1 Bike City – Merging and weaving zones: smart road

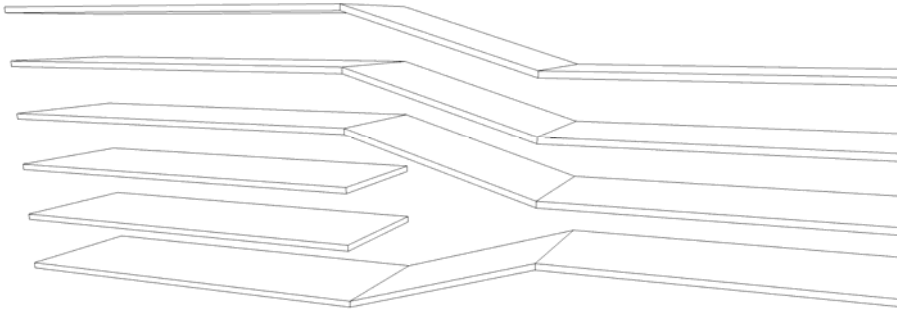
purpose:

changing road direction according to the need

usage of going down slope (increase of speed)



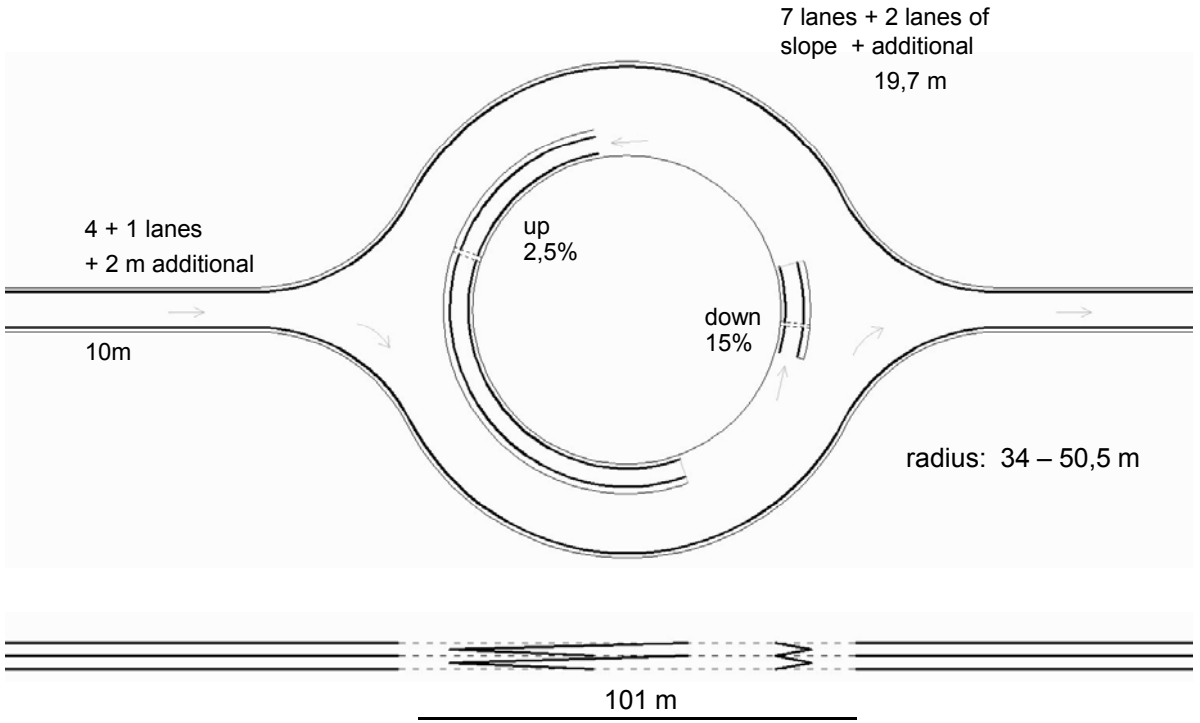


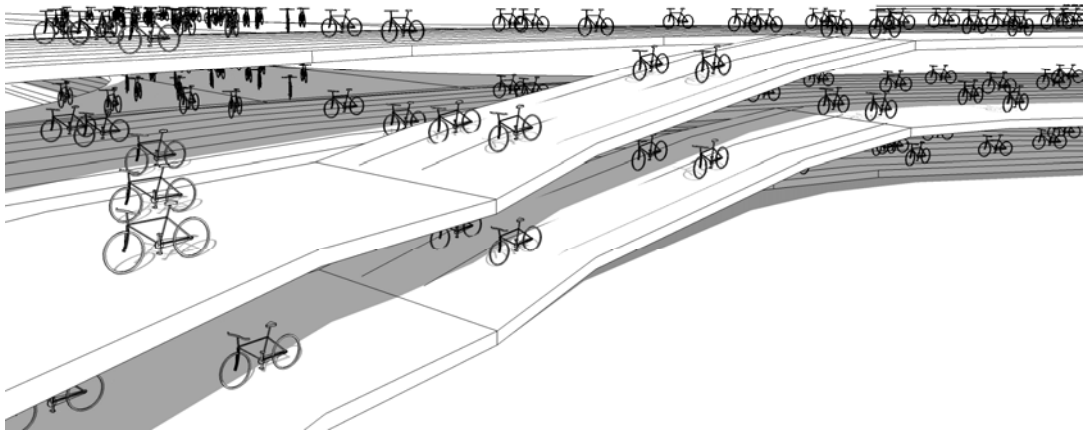


2.1.3.1.1 Bike City – Merging and weaving zones: turning back

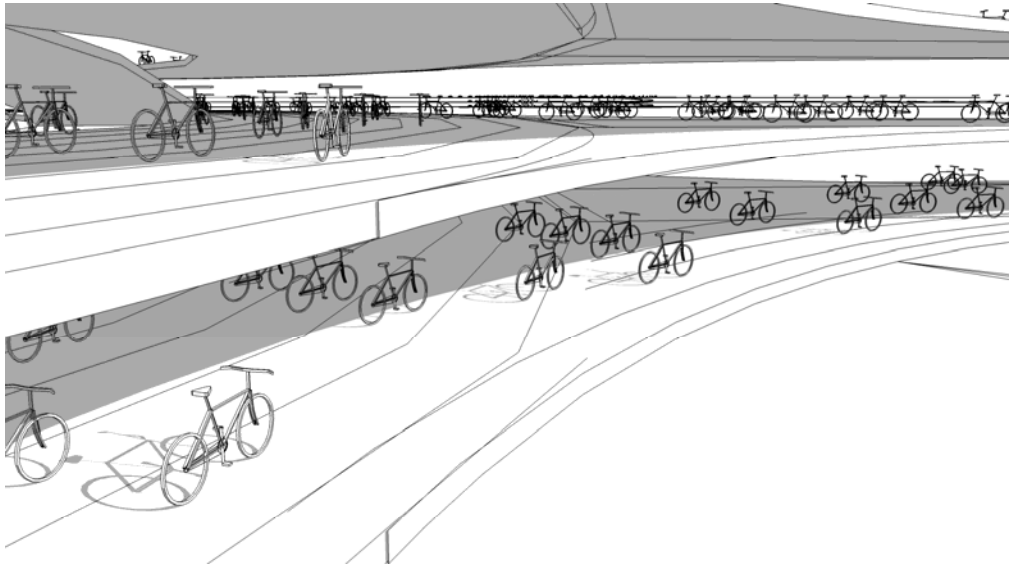
TURNING BACK
up 2,5 %
h=2,8 m, a=112 m -> 0,52 rotation
down 15 %
h=2,8 m, a=18,7 m -> 0,09 rotation

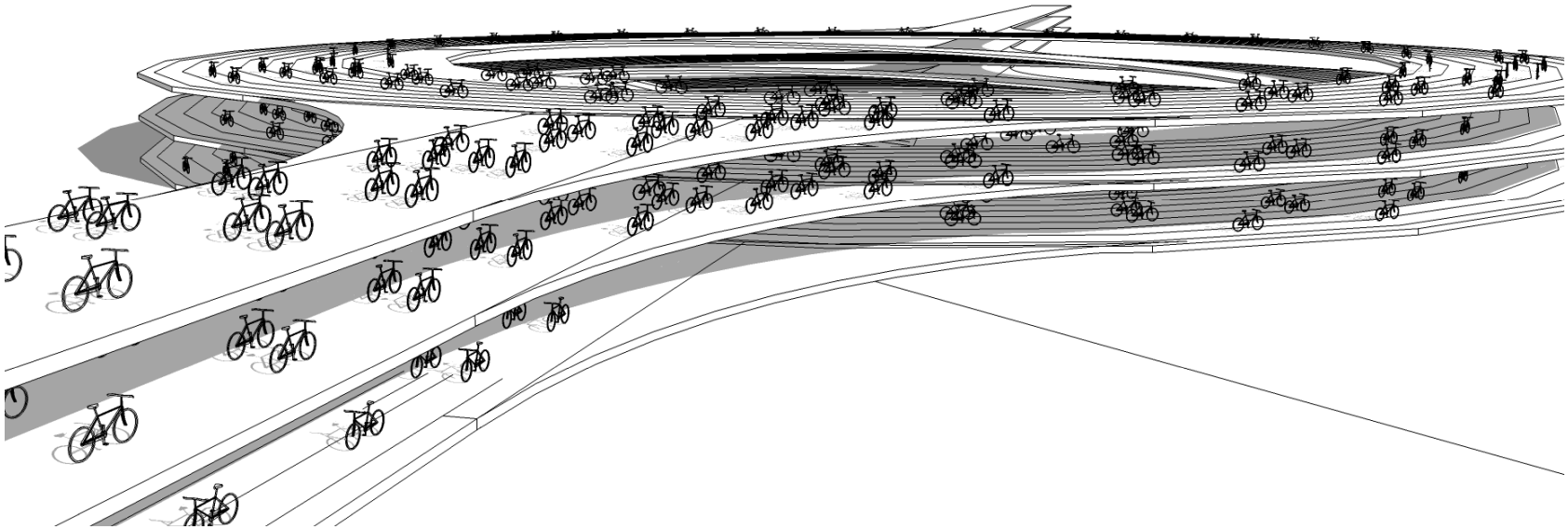
purpose:
going straight
turning back
changing layer





2.1.3.1.1 Bike City – Merging and weaving zones: turning back



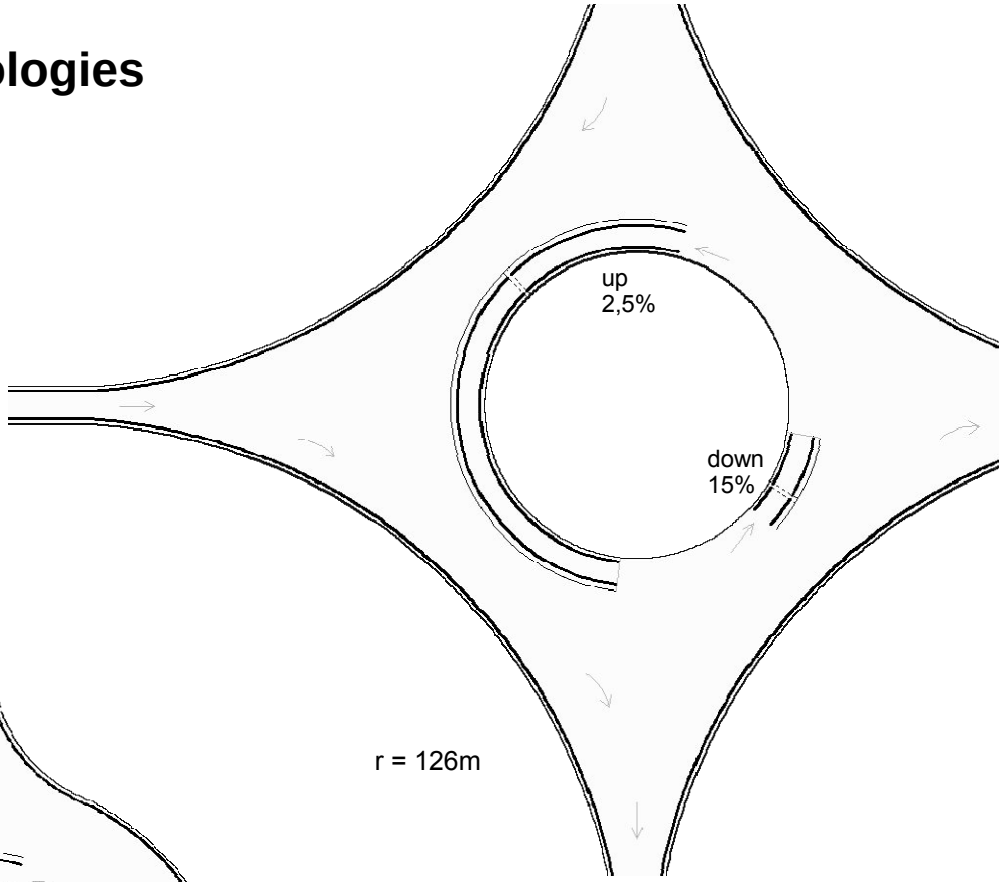


2.1.3.1.2 Bike City – Crossing typologies

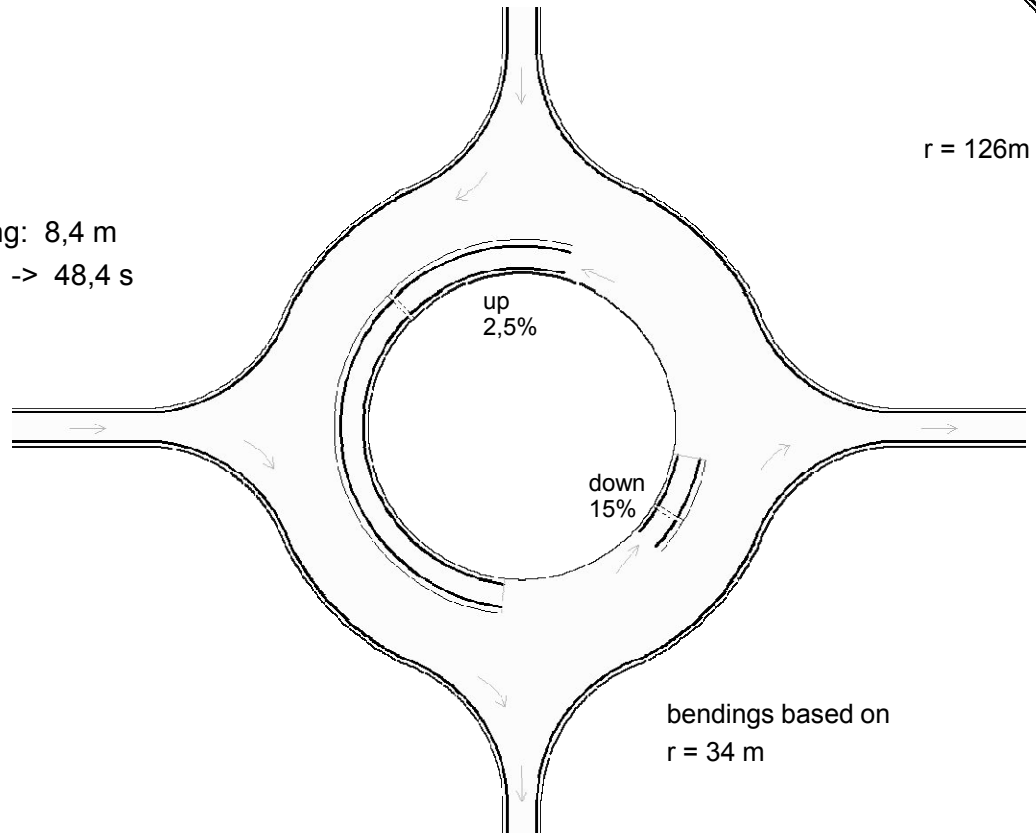
crossing
up 2,5 %
h=2,8 m, a=112 m -> 0,52 rotation
down 15 %
h=2,8 m, a=18,7 m -> 0,09 rotation
at each floor: 2 ingoing, 2 outgoing directions

purpose:
going straight
turning
turning back
changing layer

height of the crossing: 8,4 m
up: 48s, down: 0,4s -> 48,4 s



r = 126m



bendings based on
r = 34 m

access 10m
lanes : 3 + 1
+ 2 m additional

crossing 24,5 m
lanes: 10 + 3 (slope)
+ 3,5 m additional

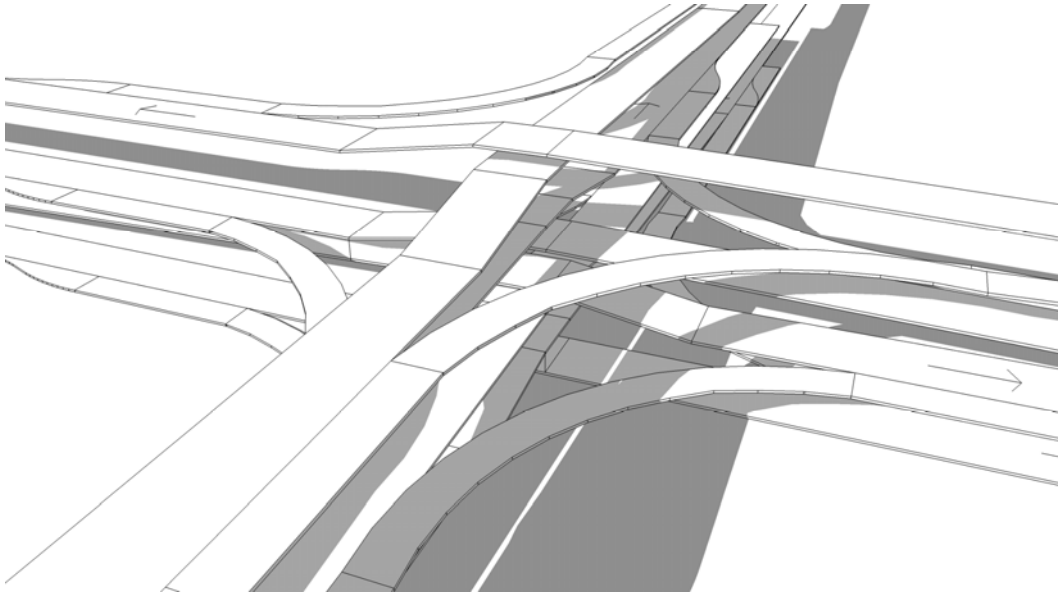
2.1.3.1.2 Bike City – Crossing typologies

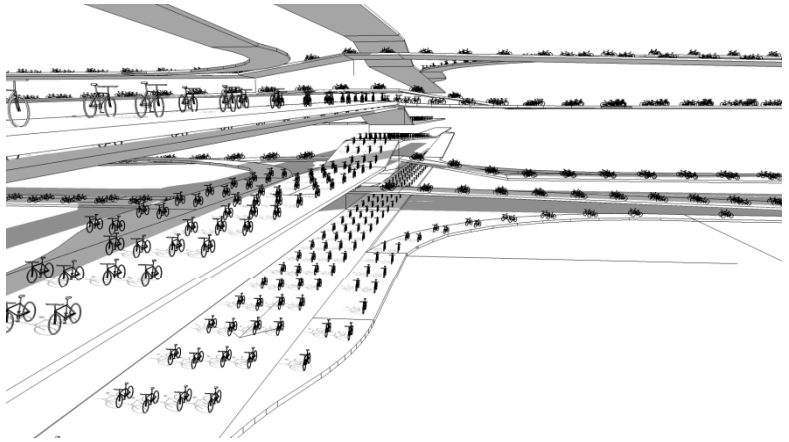
SPAGHETTI JUNCTION
4 directions, 8 layers,

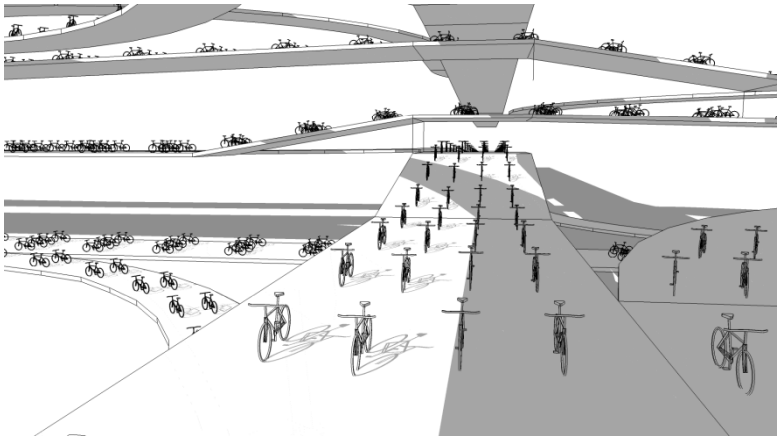
4 major lanes + 2 lanes to change direction
up 2,5 %, down 15 %

purpose:
going straight
turning

height of the crossing: 29,6 m
up: 2 min 50,5s, down: 1 min 1s -> 3 min 51,5 s







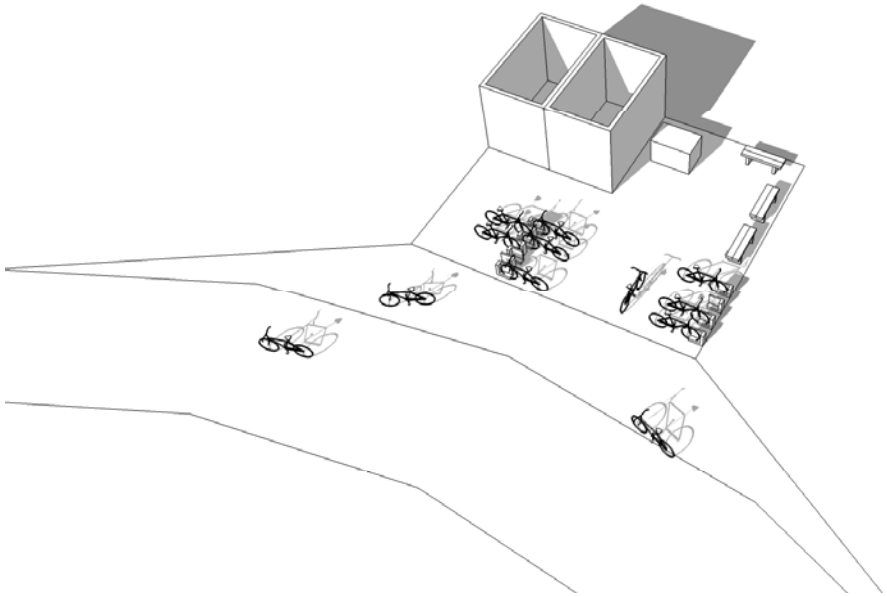
2.1.3.1.4 Bike City – Positioning of additional program: resting point

resting point

4x toilet
3x bench
11x bicycle stand
1x service
1x first-aid kit

11 x 9,2 m
+ stopping area

access: side road adjusted to max speed

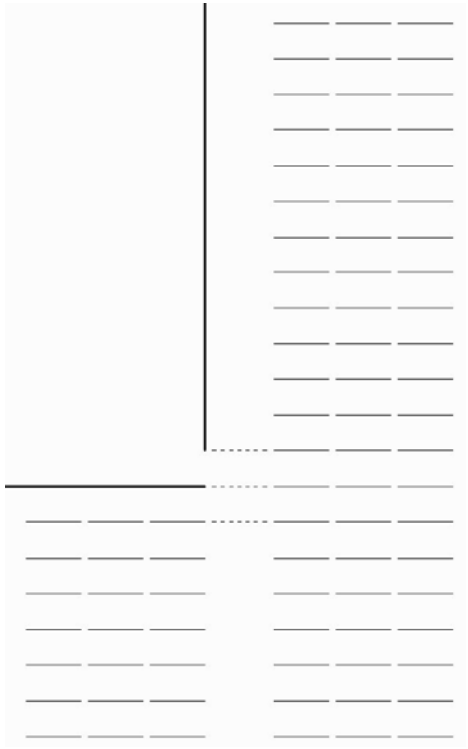


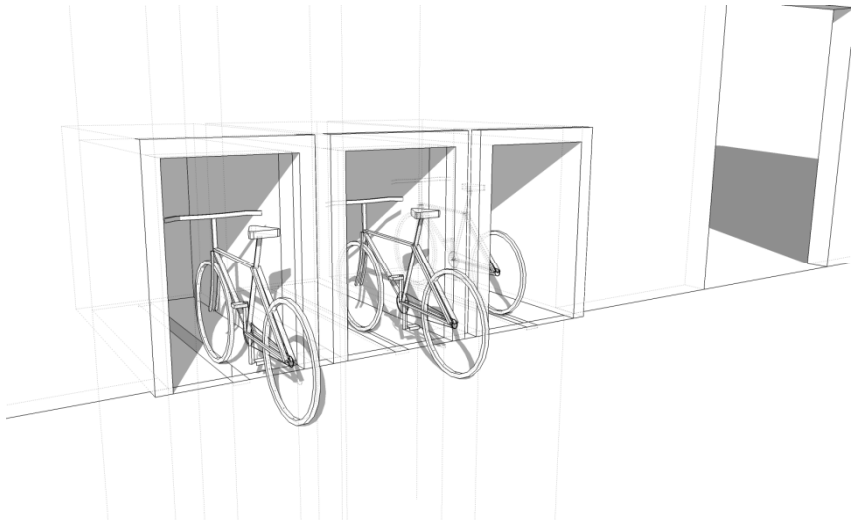
2.1.3.1.4 Bike City–Positioning of additional program:multistorey parking

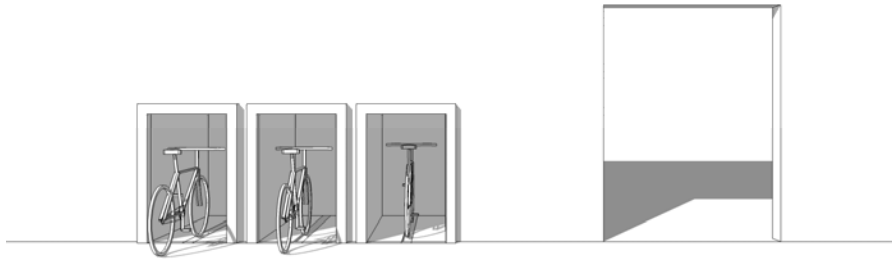
multistorey parking

applied to a building
3-decker bicycle lift

waiting time
from storage: 20s
to storage: 5,5s

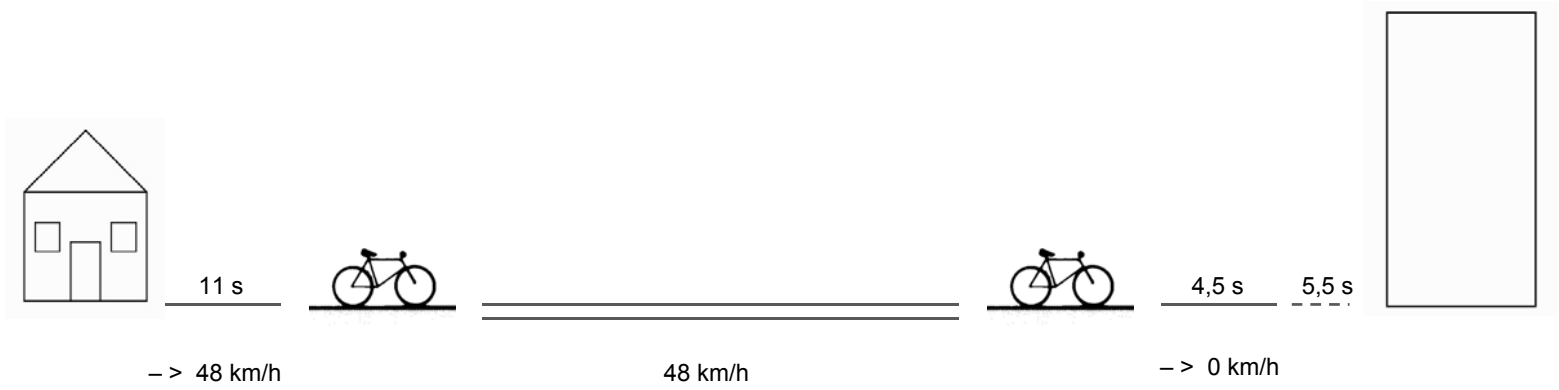


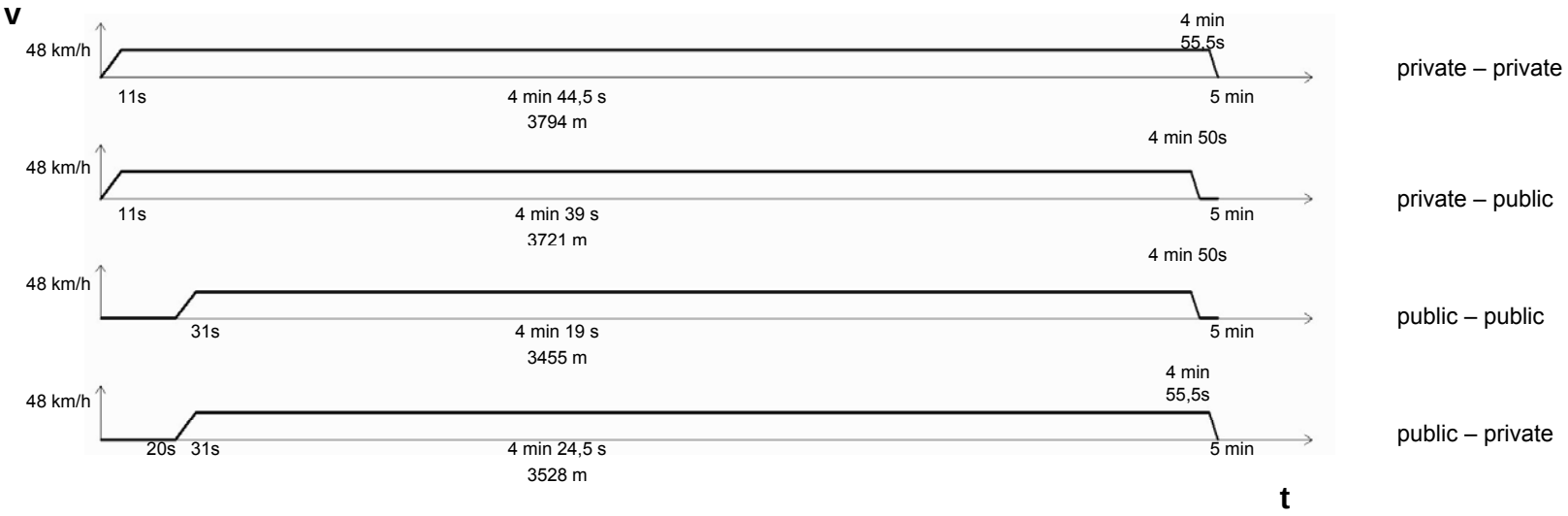




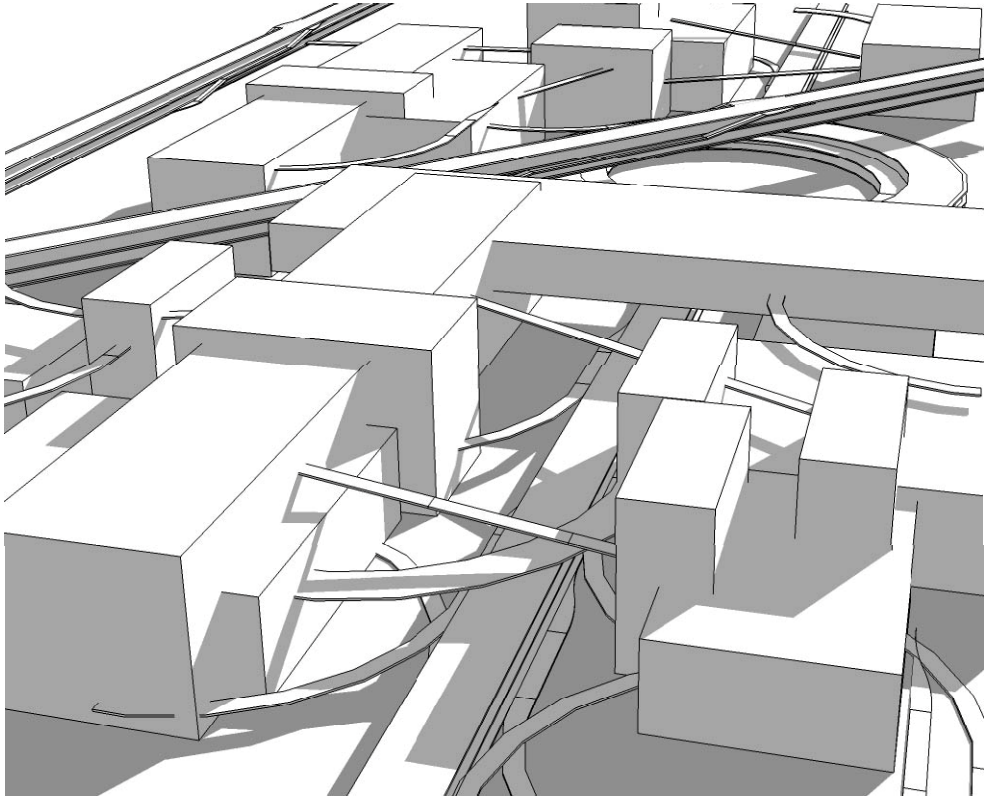
2.1.3.1.5 Bike City – Time expenditures

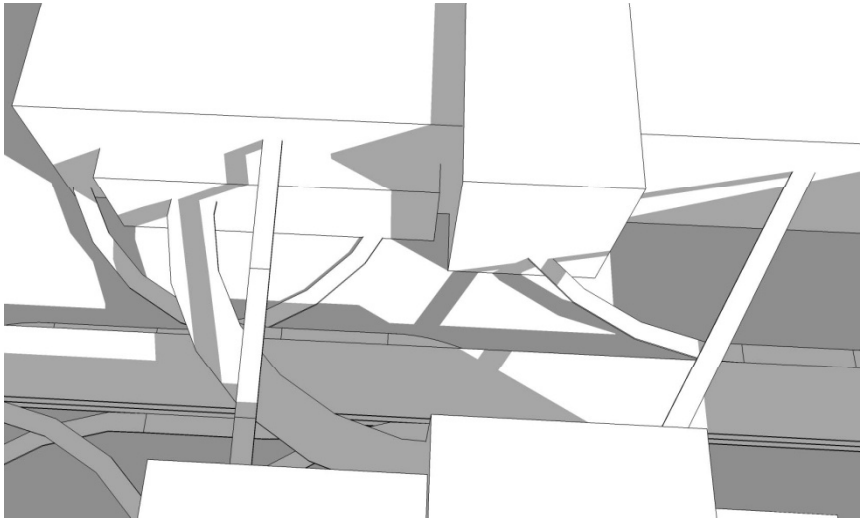
acceleration time: 11 s
deceleration time: 4,5 s
time to storage: 5,5 s
time from storage: 20 s

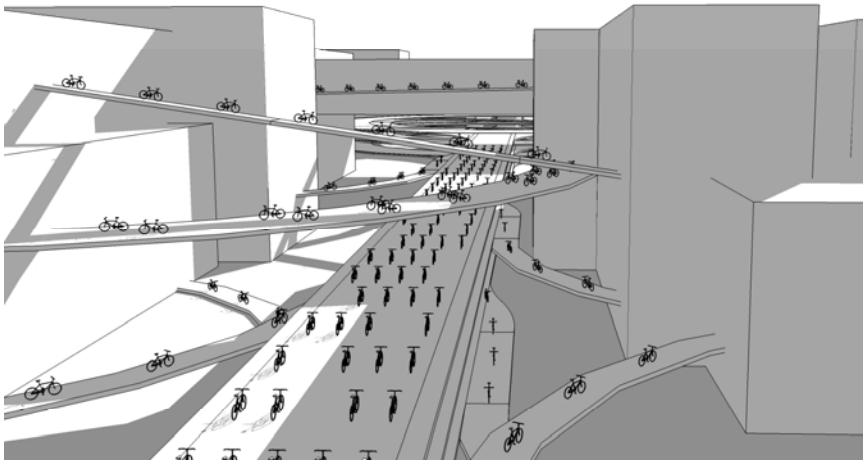




2.1.4 Bike City – Final image







2.1.4 Bike City – Final image