Project 3

Bicycle design for a theme park

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Co-Guide : Prof P Kumaresan

IDC | IIT Bombay

Preface

- Promoting bicycle by making it fun to ride
- Making children and elder ones experience the pleasure of the ride

Source: http://previews.123rf.com/

Project focus

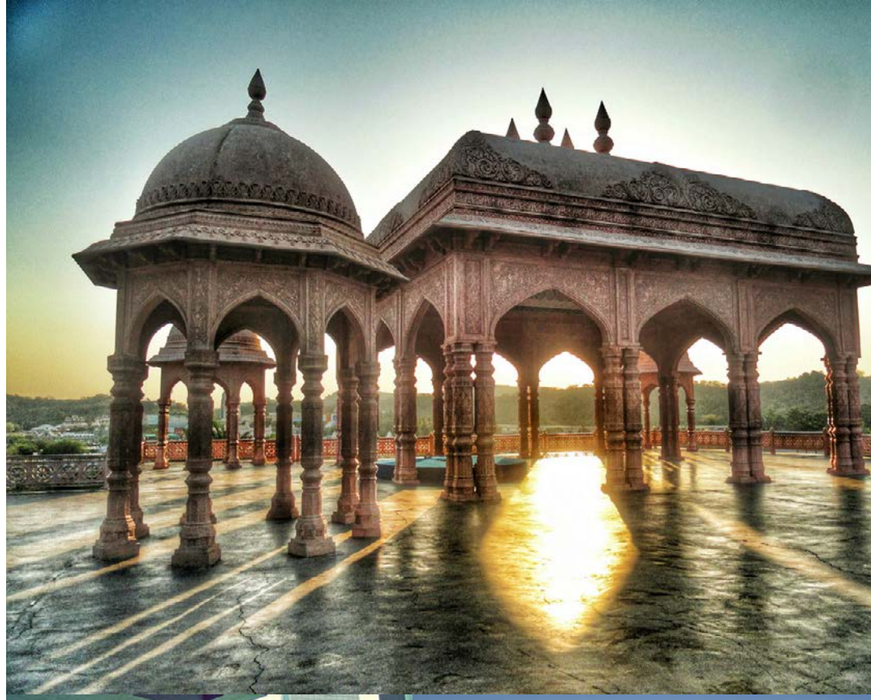
Fun
Novelty
Experience
Joy
Rideable over a small area
Charactered to the context

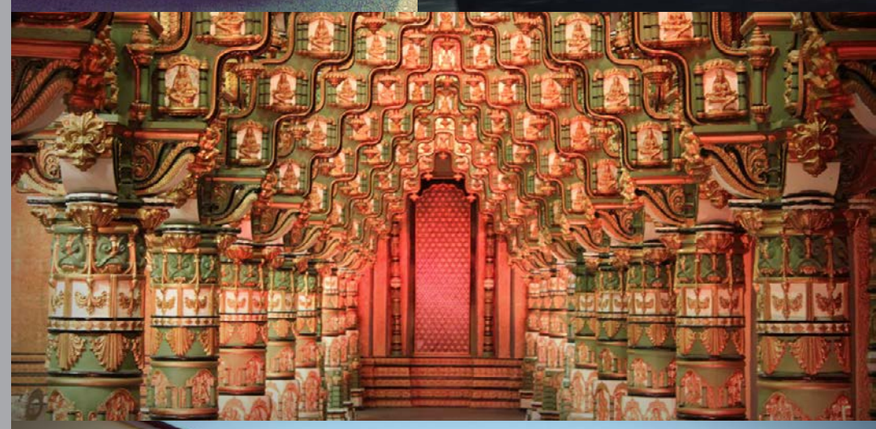
Source: http://behappytips.com/habits-fun-relationship/; https://img.thailandholidayhomes.com/uploads/attractions/img_298.jpg

Context

Ramoji Film city

- Located at Anajpur in Hyderabad, Telangana
- Largest integrated film studio complex in the world
- A popular tourism and recreation center
- Houses an adventure park and a bird park





Source: Author

People and their experiences at Ramoji

Scale of the park

People and their experiences at Ramoji

Scale of the park

A world of worlds

People and their experiences at Ramoji

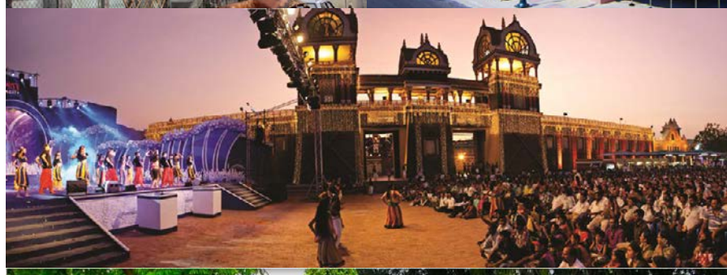
Scale of the park

A world of worlds

A variety of experience

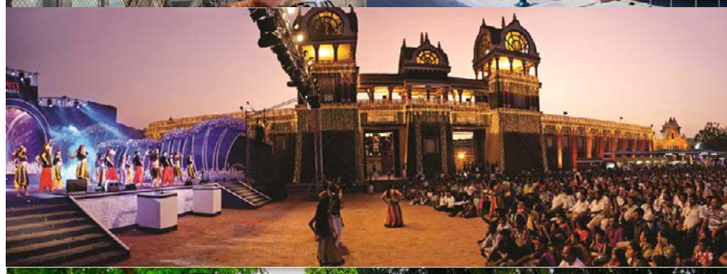
People and their experiences at Ramoji

Scale of the park
A world of worlds
A variety of experience
Greenery



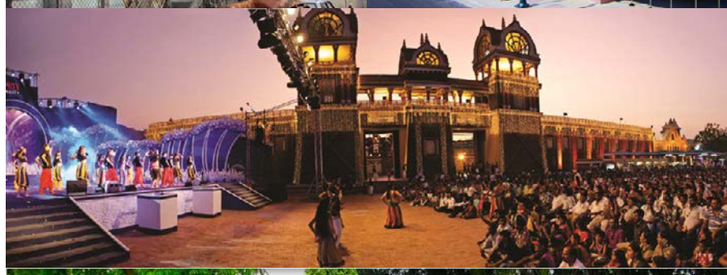
People and their experiences at Ramoji

Scale of the park
A world of worlds
A variety of experience
Greenery
All of India in one place
Photo ops



People and their experiences at Ramoji

Scale of the park
A world of worlds
A variety of experience
Greenery
All of India in one place
Photo ops
Color and vibrance
Games
World of Indian cinema



Experiential Elements at Ramoji

Gardens
Film themed sets
Architectural replicas
Sculptures
Kids area
Color
Adventure park
Bird park
Live shows




Source: Author

Insights

Greeneries to off road terrain

Abstract sculptures to
life size comic heroes

Vintage cars to hi-tech ATVs

Source: Ramoji film city archive,Author

Mythology + Actuality

Monotone + vibrance

Vintage + modern

Illusion + real

At Ramoji

Vintage bus for guided tour

Giving the user an yesteryear feeling

Own exploration of the hop off areas.

Design Objective

Provide an experience of fun ride through a novel bicycle design.

Design Brief

A cycle (pedal driven) concept for a theme park

Fun and novel in terms of the visual experience

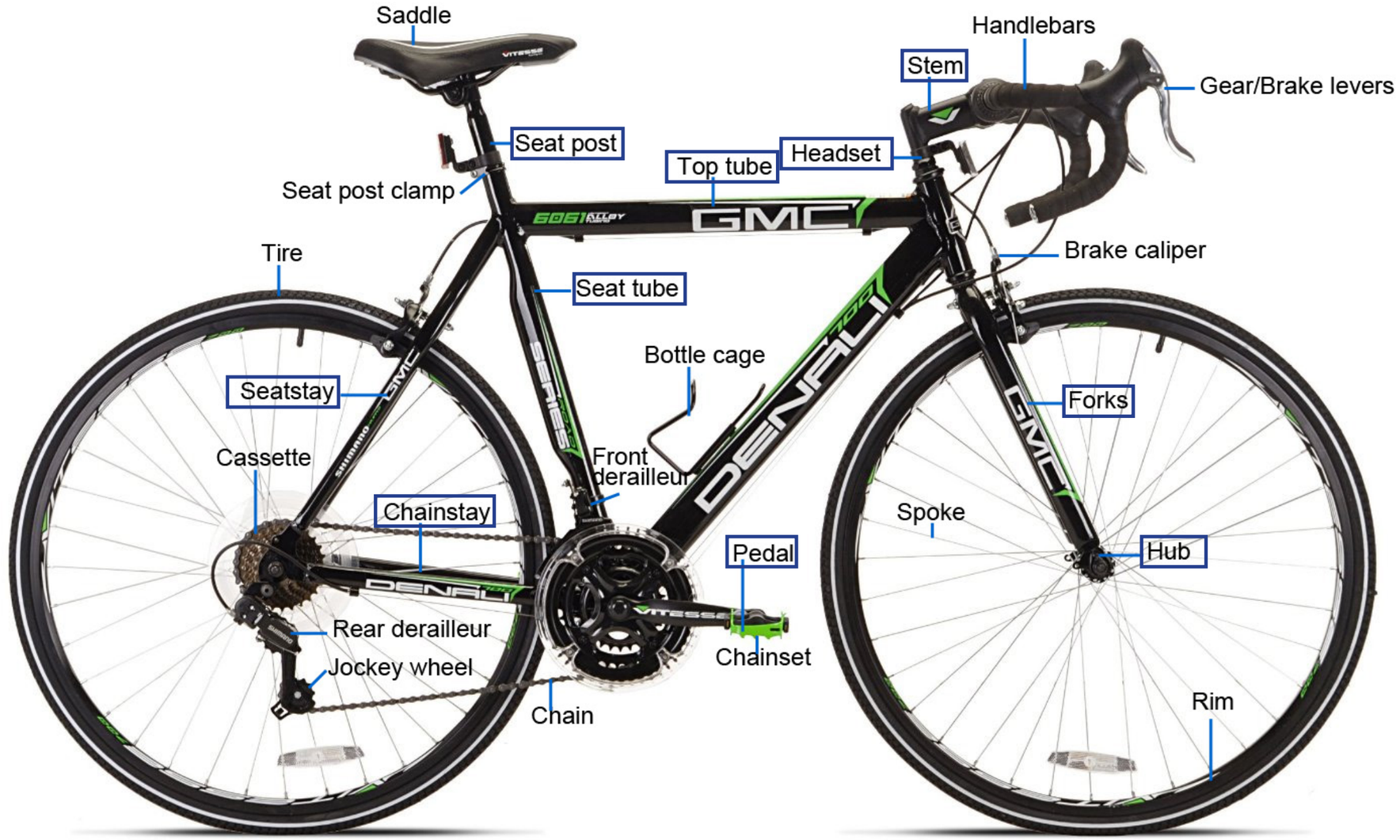
Provides the user with experiential and fun ride

Can be ridden through the hop off areas (flat terrains) of the guided tour

Secondary research

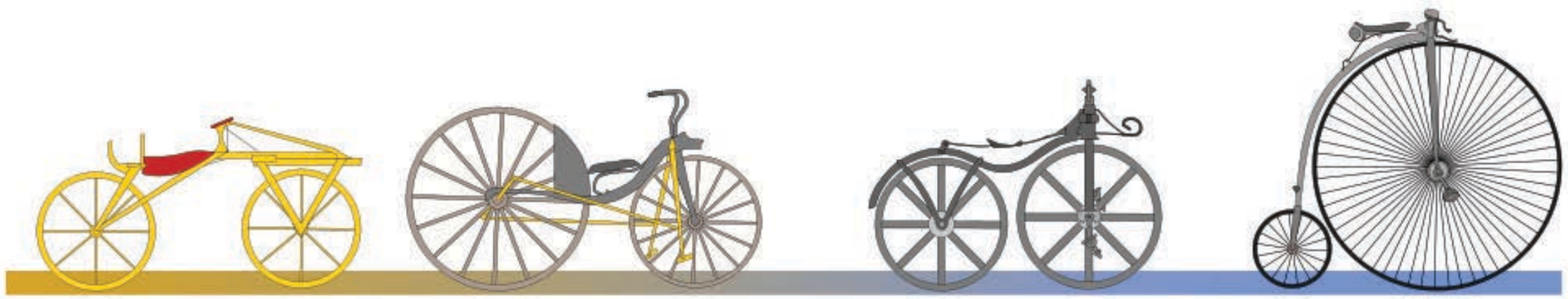
- Bicycle anatomy
- Bicycle history
- Study of previous projects
- Bicycle design case studies
- Fun bicycles
- Fun and experience in similar contexts

Bicycle Anatomy



Source: http://www.bestcommuterbikereviews.com/wp-content/uploads/2014/02/bike_parts1.png

Bicycle History



1818
draisine
Karl von Drais
Germany

1830
two-wheel velocipede
Thomas McCall
Scotland

1860
pedal-bicycle
Pierre Michaux
France

1870
high-wheel bicycle
James Starley
France

1885
safety bicycle
John Kemp Starley
England

1960s
racing bike
...
USA

Mid 1970s
mountain bike
...
USA

Source: http://journal.yeslerapparel.com/the-under-appreciated-history-of-the-bicycle/

Previous projects

Campus bicycle for IIT Bombay

Quadricycle

Family cycle for joy ride

Electric hybrid commuter

Design of sheet metal bicycle

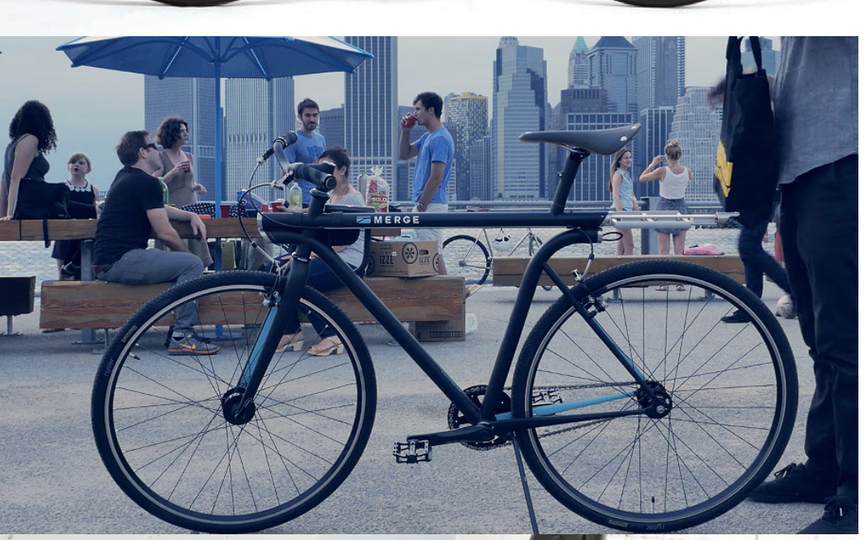
Promoting human powered mobility

Source: IDC library archive

Case studies

INDUSTRY

TEAGUE



PENSA

MNML

HUGE
DESIGN LLC

IDEO

Source: http://oregonmanifest.com/

Fun bicycles

Artikcar

- *play value through aesthetics*

Fun bicycles

Artikcar

- *play value through aesthetics*

Feats per minute

Play with a different sence

Fun bicycles

Artikcar

- *play value through aesthetics*

Feats per minute

Play with a different sence

Bicycle experiments by Todd Kundl

- *wacky ideas to pedalling*

Fun bicycles

Artikcar

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Feats per minute

Play with a different sence

Bicycle experiments by Todd Kundl

- *wacky ideas to pedalling*

Roller Shuttle

play value through riding fashion

Fun bicycles

Artikcar

- *play value through aesthetics*

Feats per minute

Play with a different sence

Bicycle experiments by Todd Kundl

- *wacky ideas to pedalling*

Roller Shuttle

play value through riding fashion

Shopping cart bicycle

- *bicycle function to a similar object*

Fun bicycles

Artikcar

play value through aesthetics

Feats per minute

Play with a different sence

Bicycle experiments by Todd Kundl

wacky ideas to pedalling

Roller Shuttle

play value through riding fashion

Shopping cart bicycle

bicycle function to a similar object

Snowboard bike

play value through riding fashion

Fun bicycles

Merry go round bicycle

- *play value through group riding*

Fun bicycles

Merry go round bicycle

- *play value through group riding*

Mini Bicycles

play with over all size

Fun bicycles

Merry go round bicycle

- *play value through group riding*

Bicycle by Sudha cars museum

- *play with over all size*

Mini Bicycles

play with over all size

Design Process

- Ideations
- Understanding Minions
- Configuring the bicycle
- Rig testing
- Working with montage
- Designing around hard points
- Detailing

Ideation | Level 1

How to bring in novelty?

Mind map

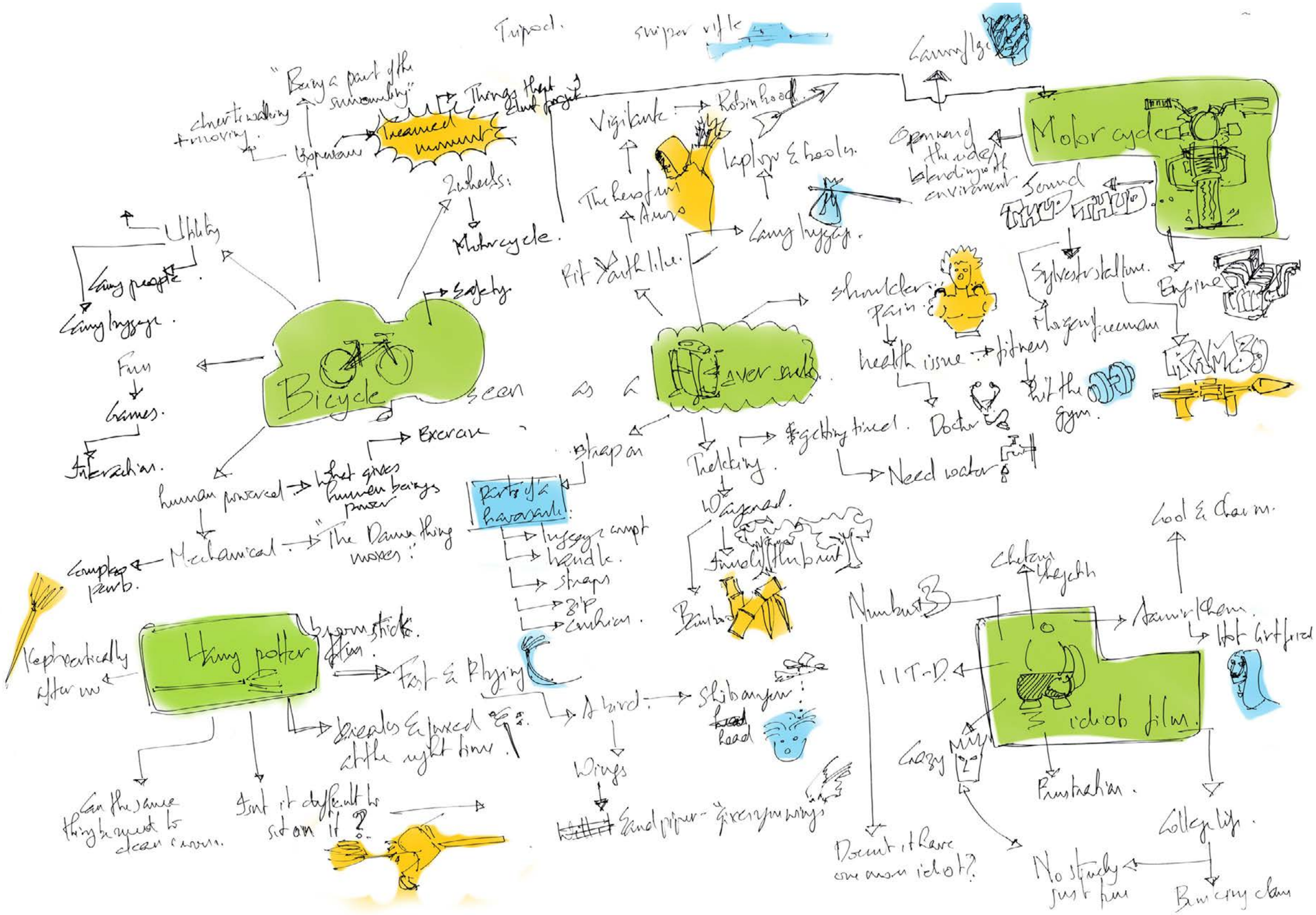
Use of analogies

- Direct

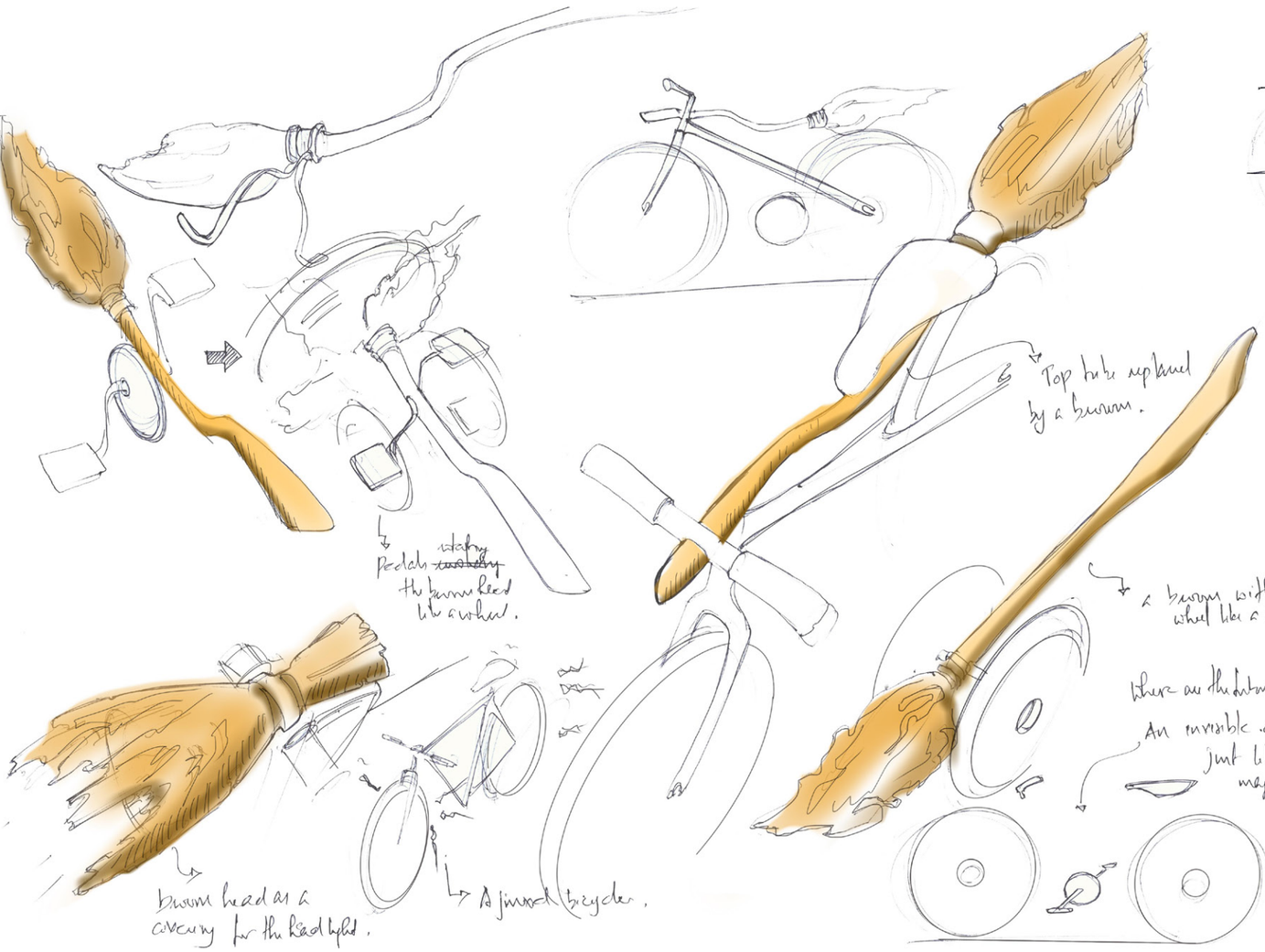
- Indirect

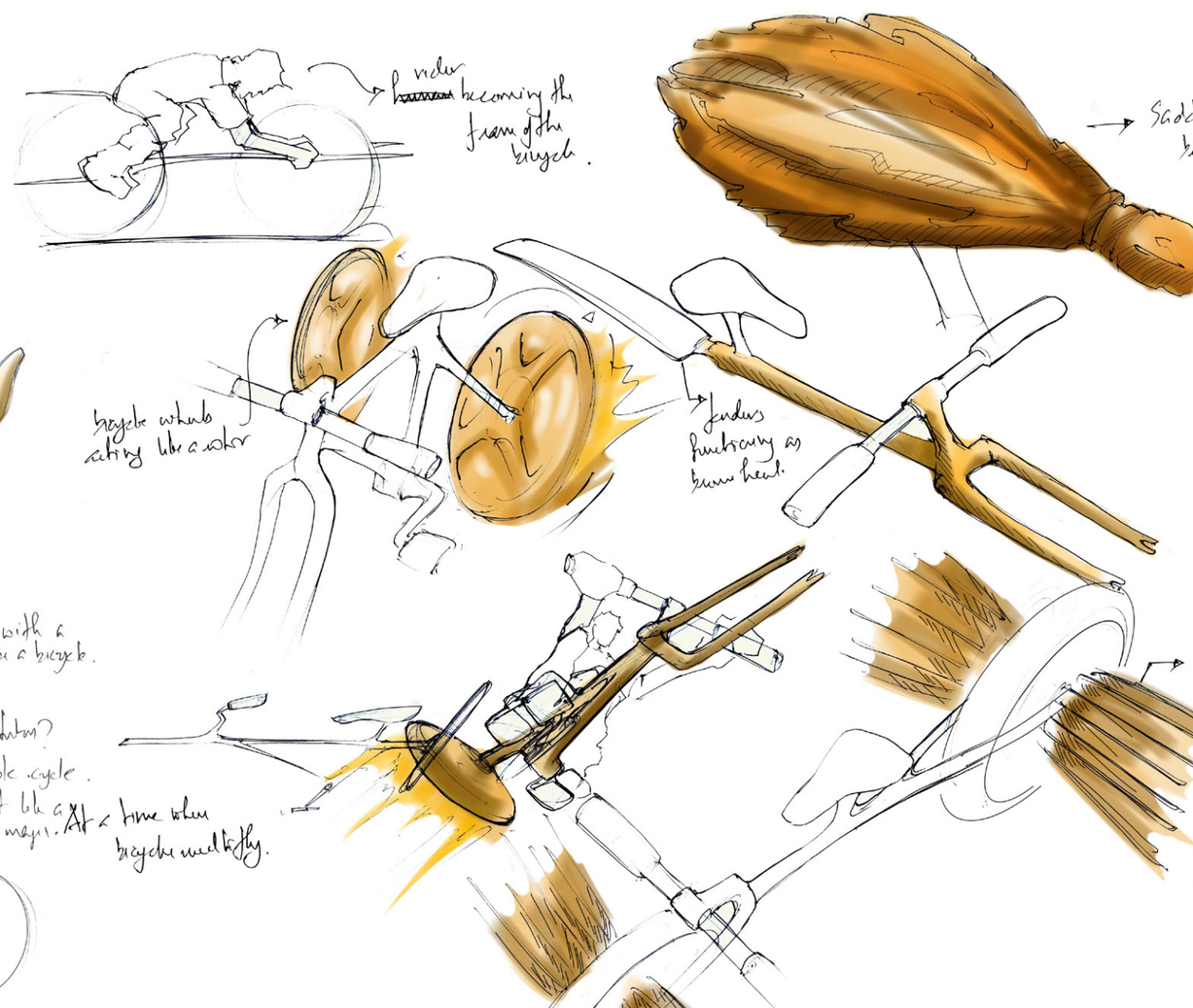
- Fantasy

Ideation | Mindmap

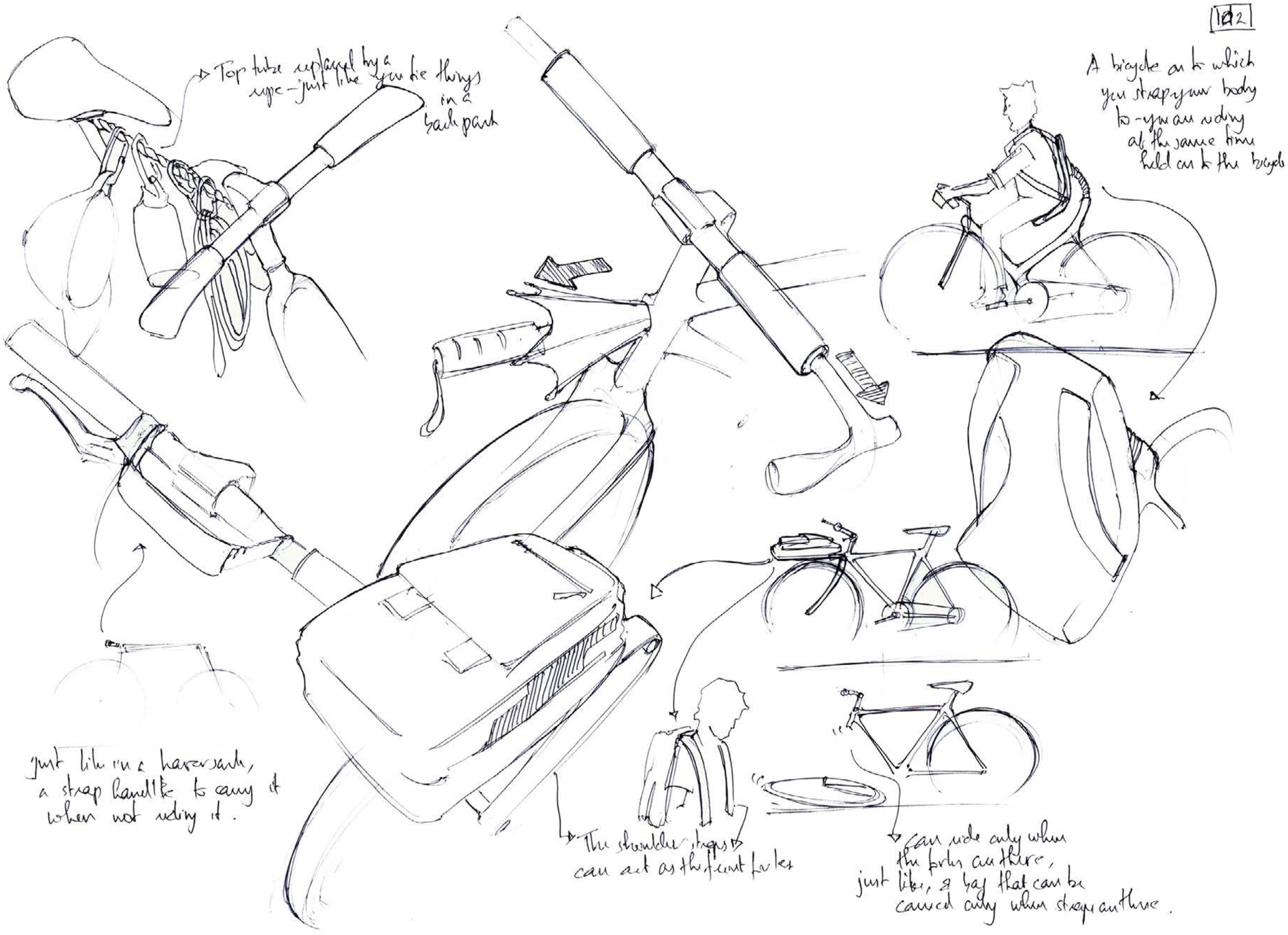


Ideation | Fantasy analogy - Harry potter broom stick

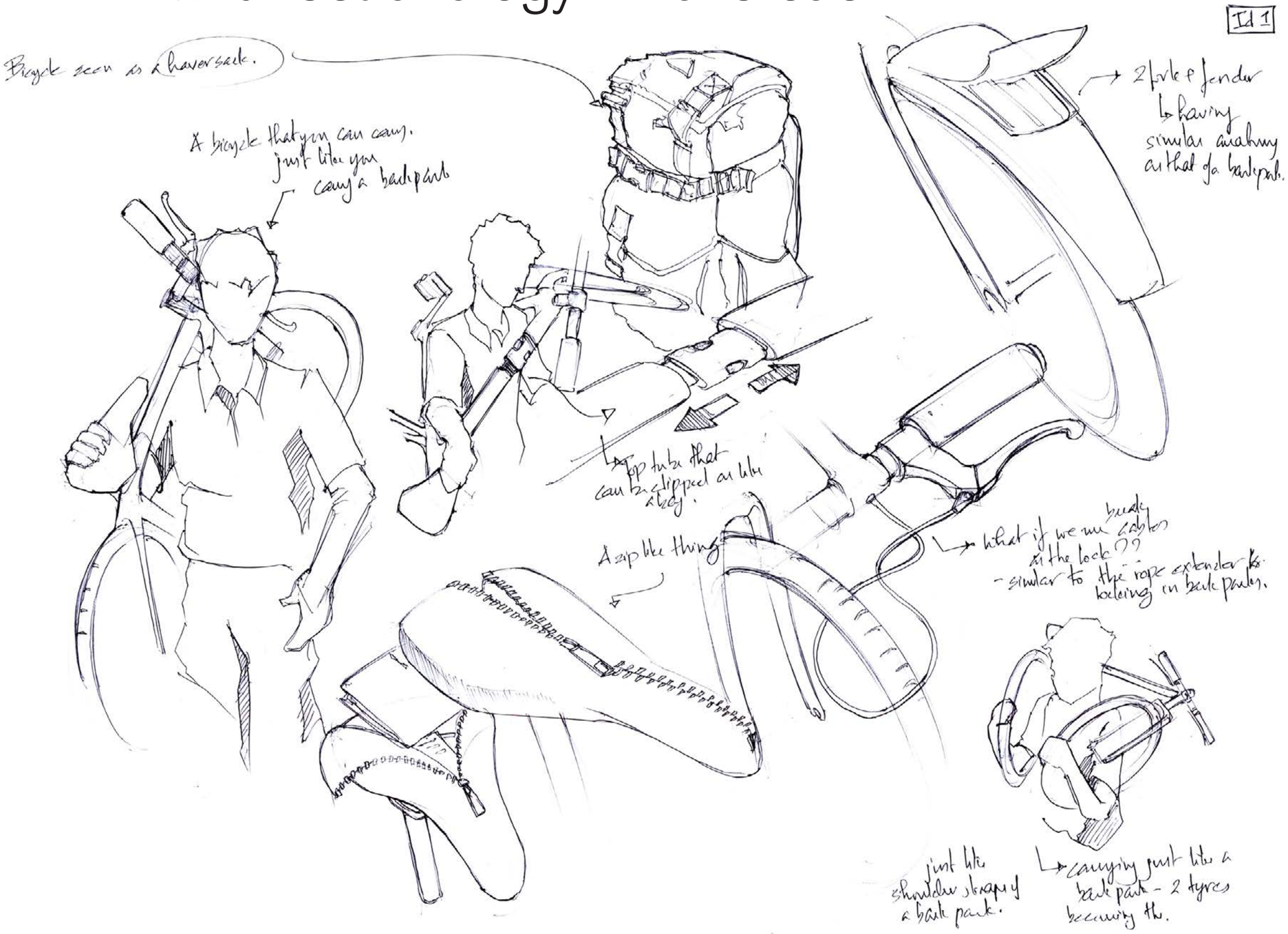




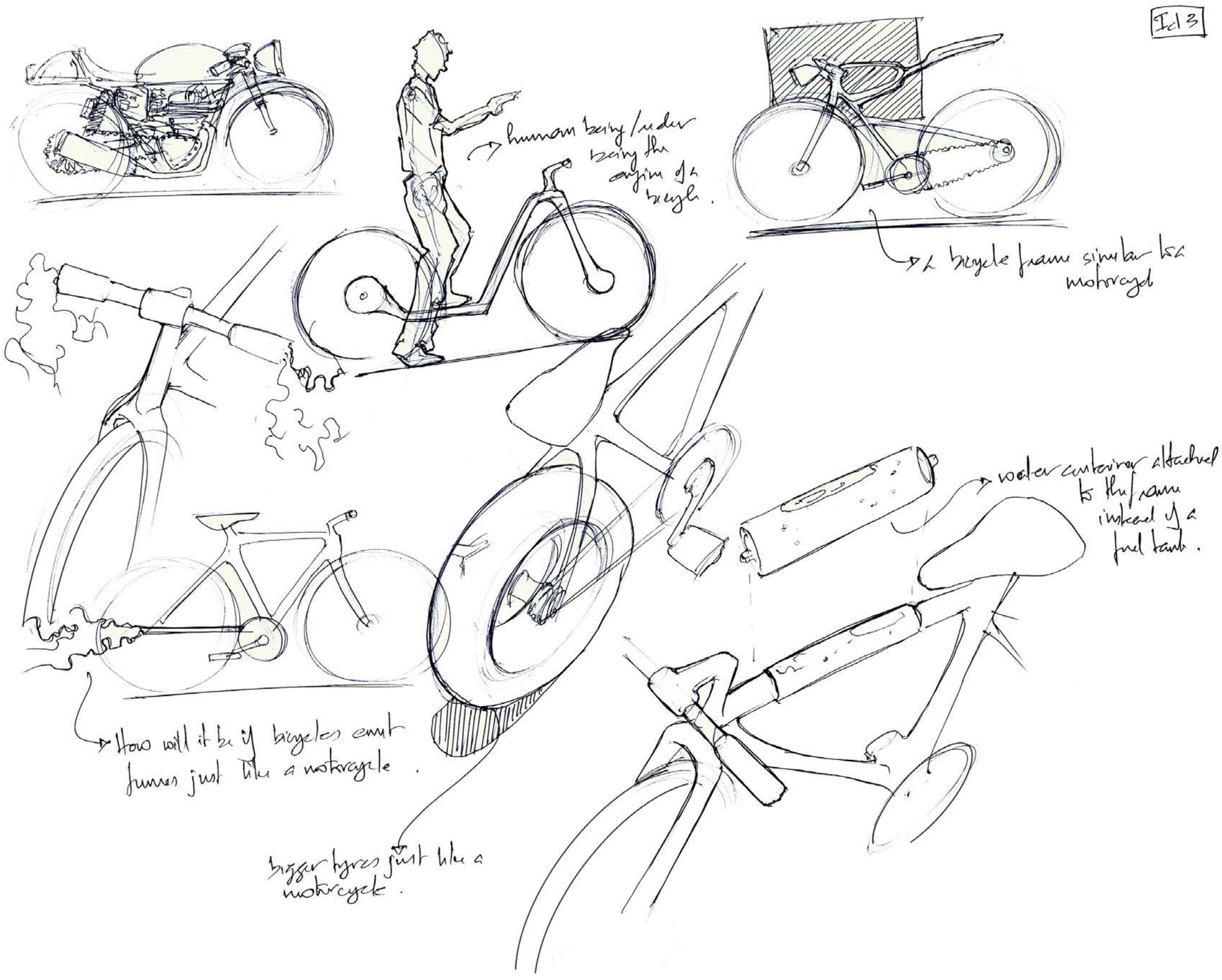
Ideation | Indirect analogy



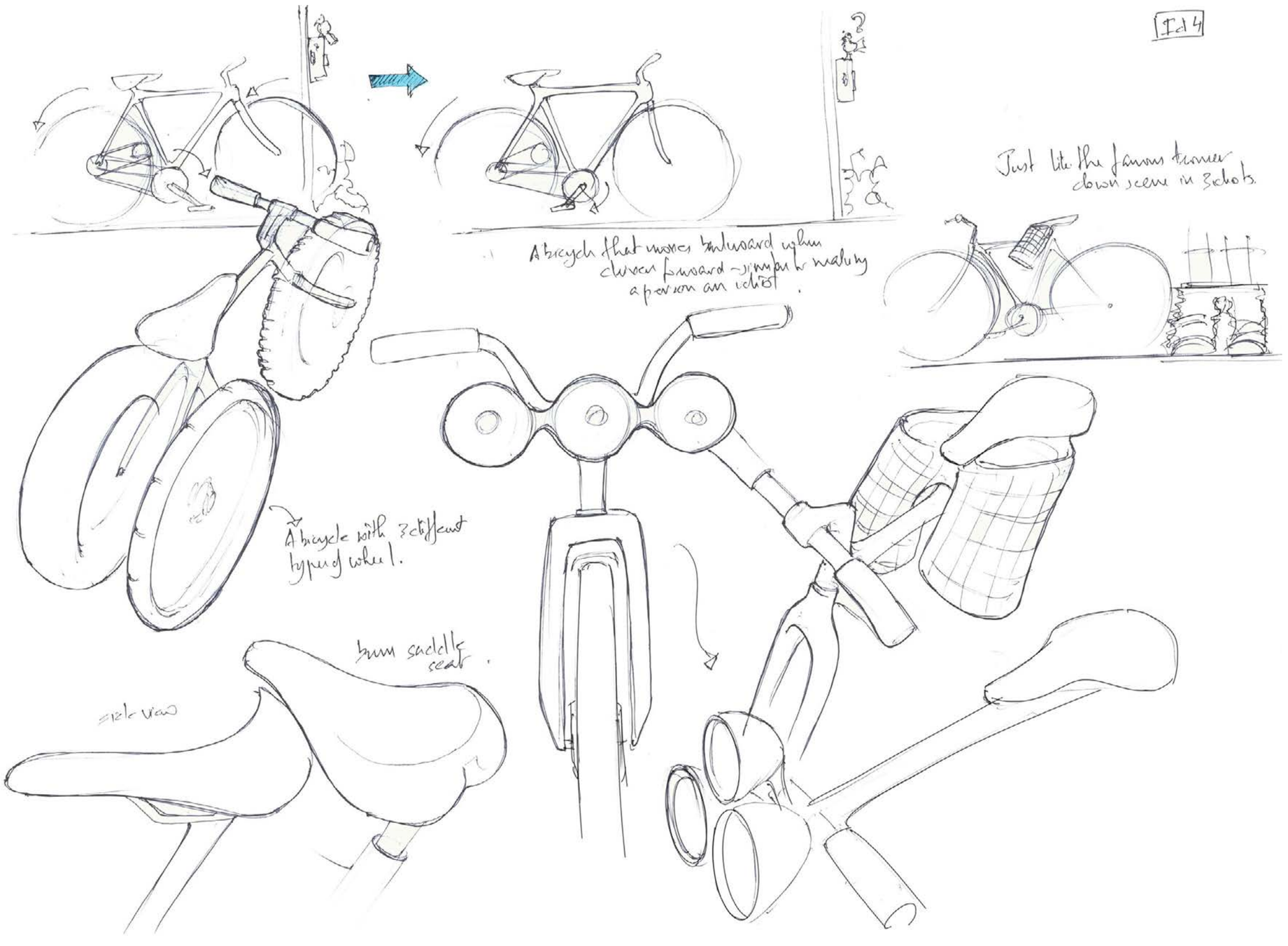
Ideation | Indirect analogy - Haversack



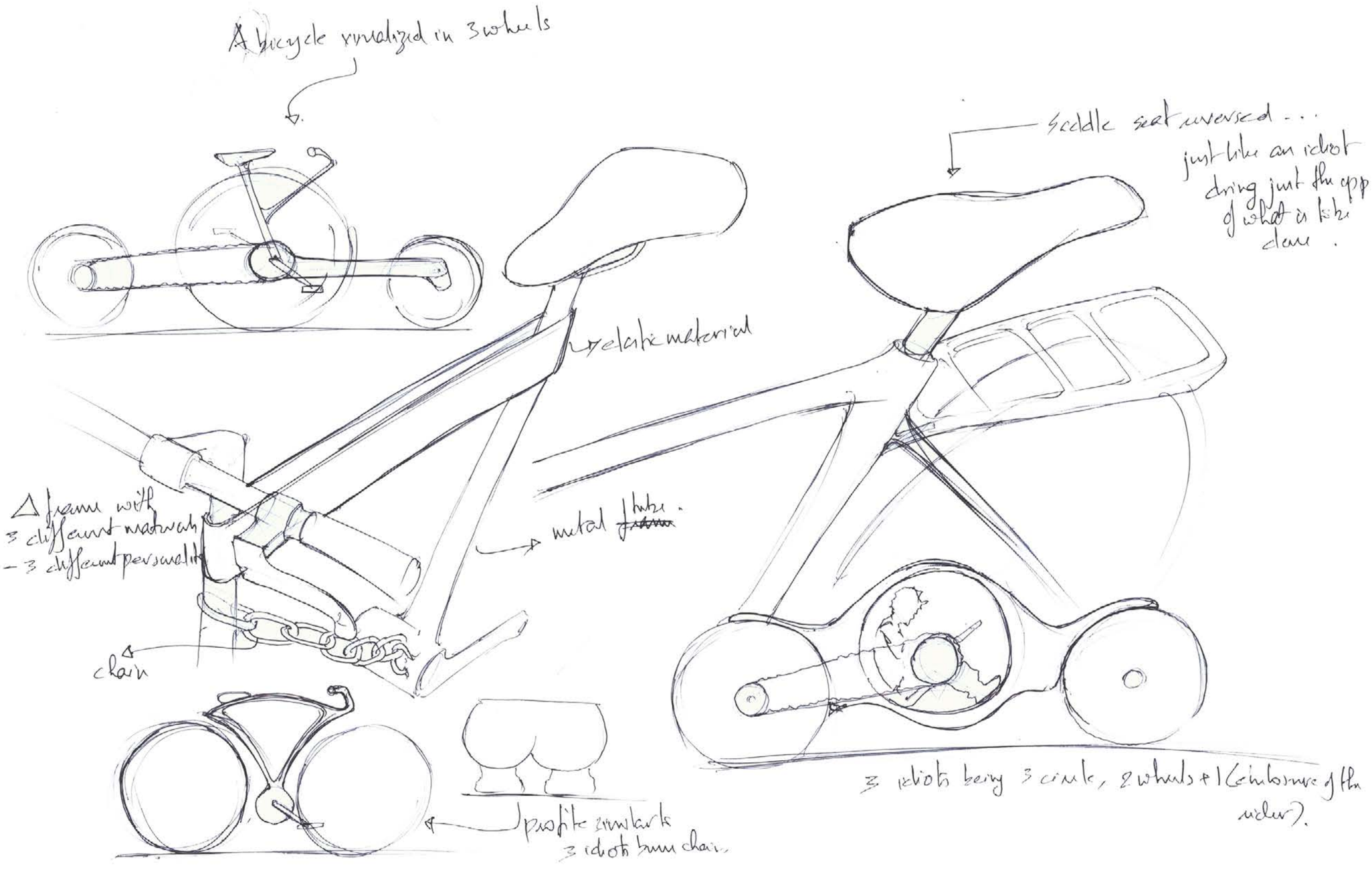
Ideation | Direct analogy - Motorcycle



Ideation | Direct analogy - 3 idiots film



Ideation | Direct analogy

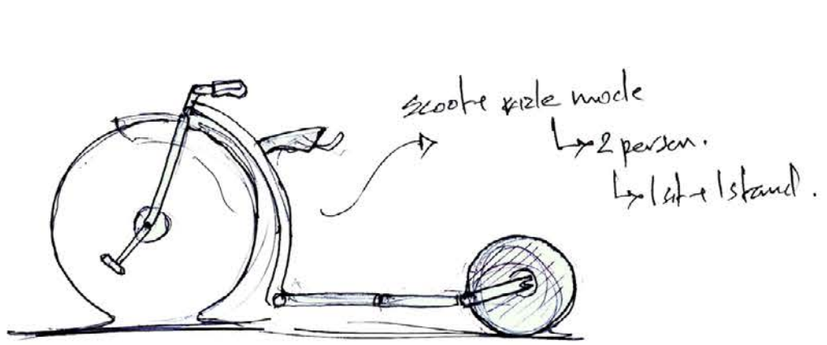


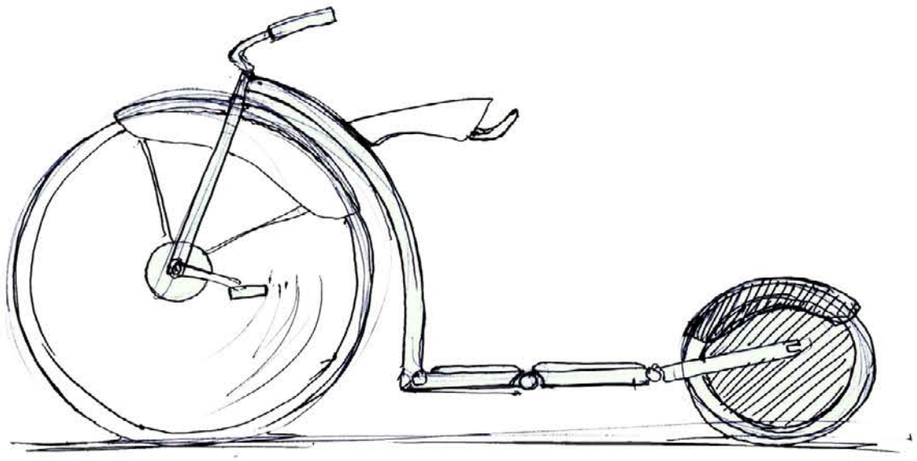
Clustering

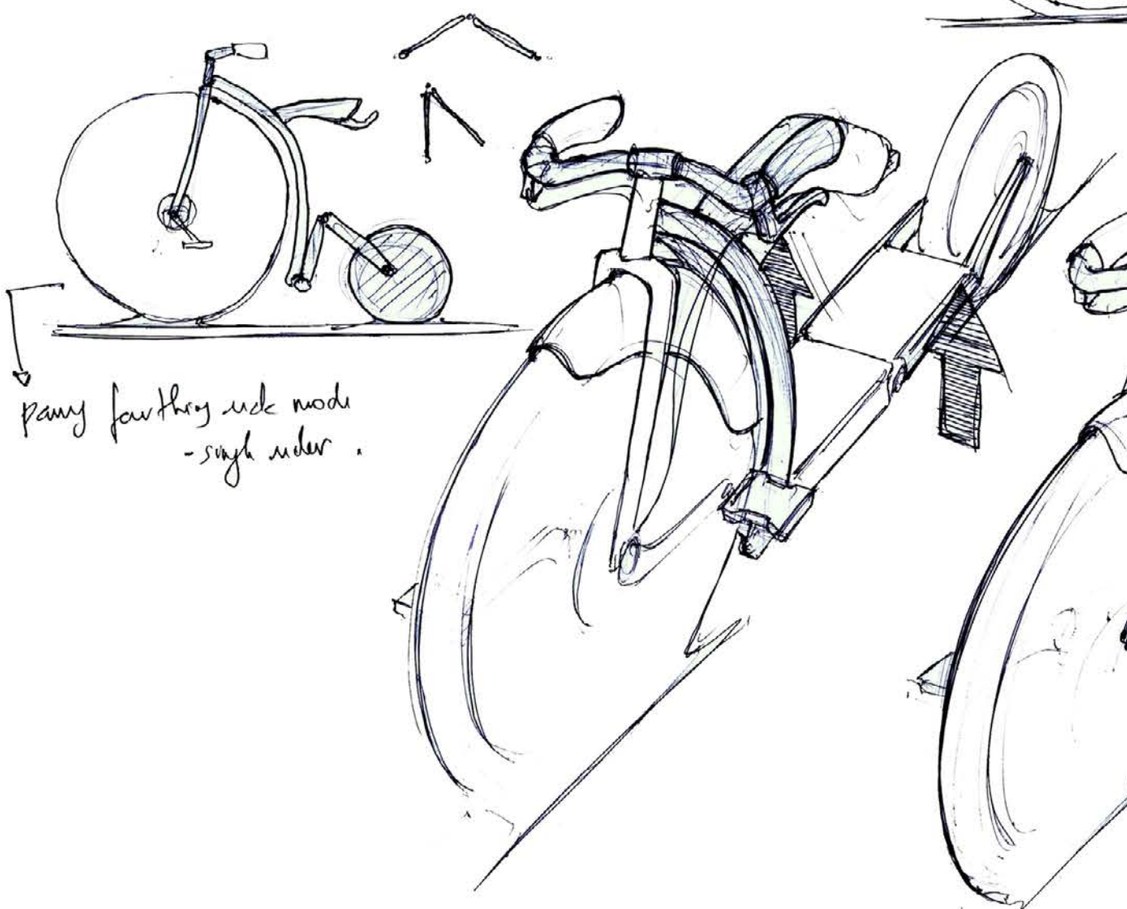
- Visual aesthetics, structure, theme
- Movement, ride
- Experiential

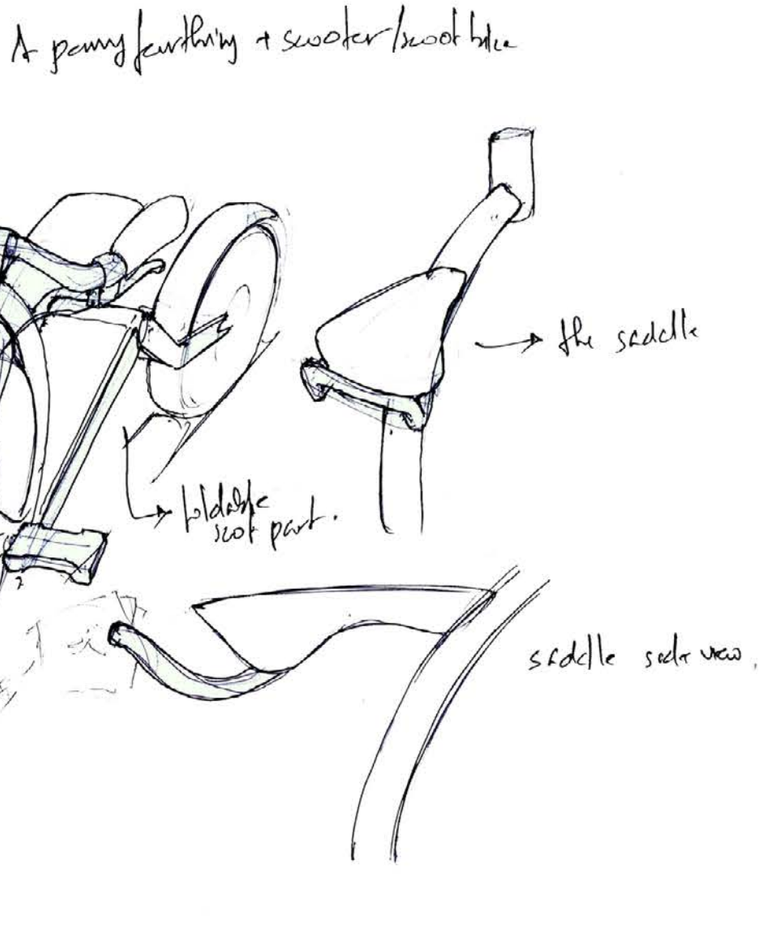
Source: author

Ideation | Design direction 1

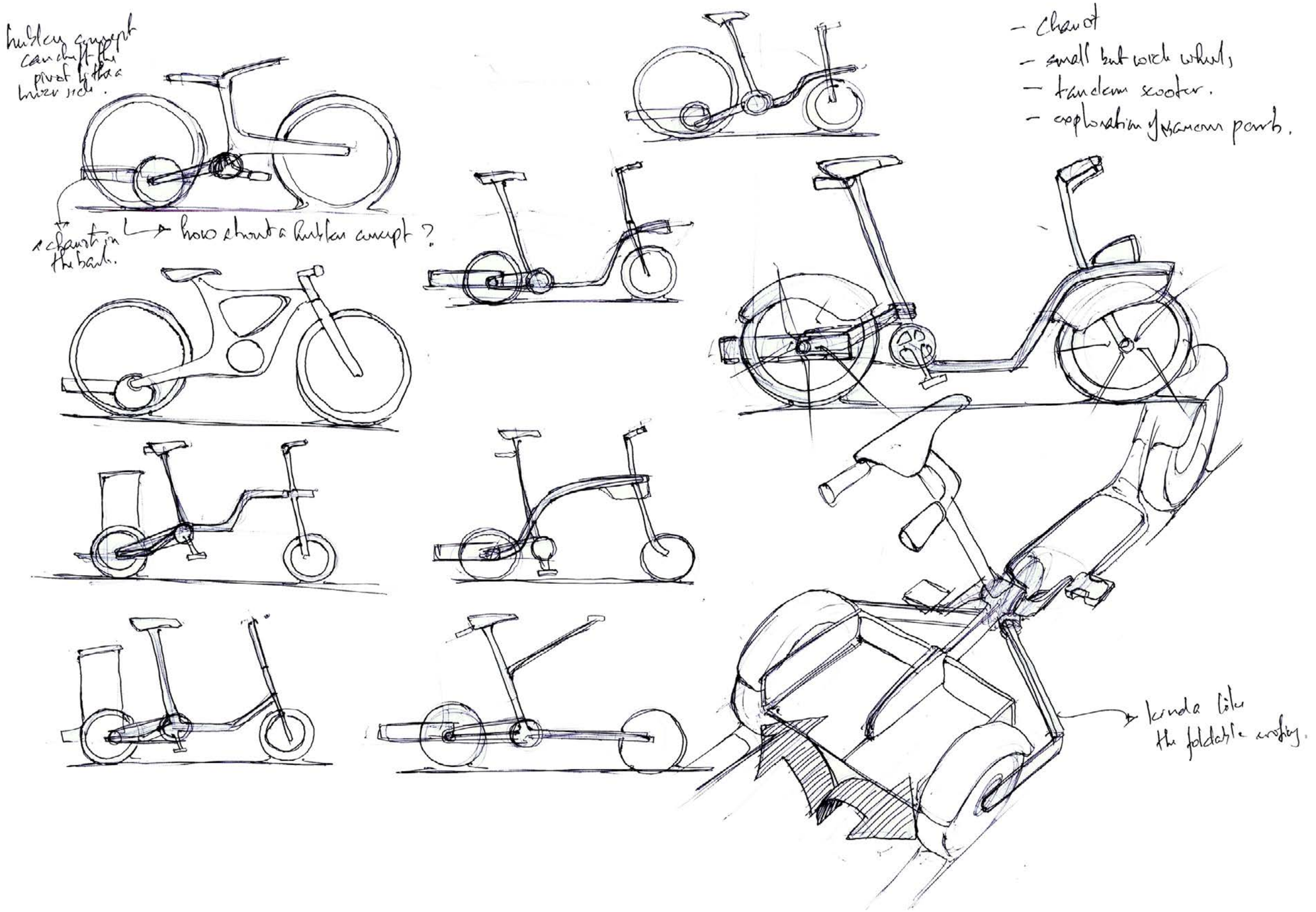




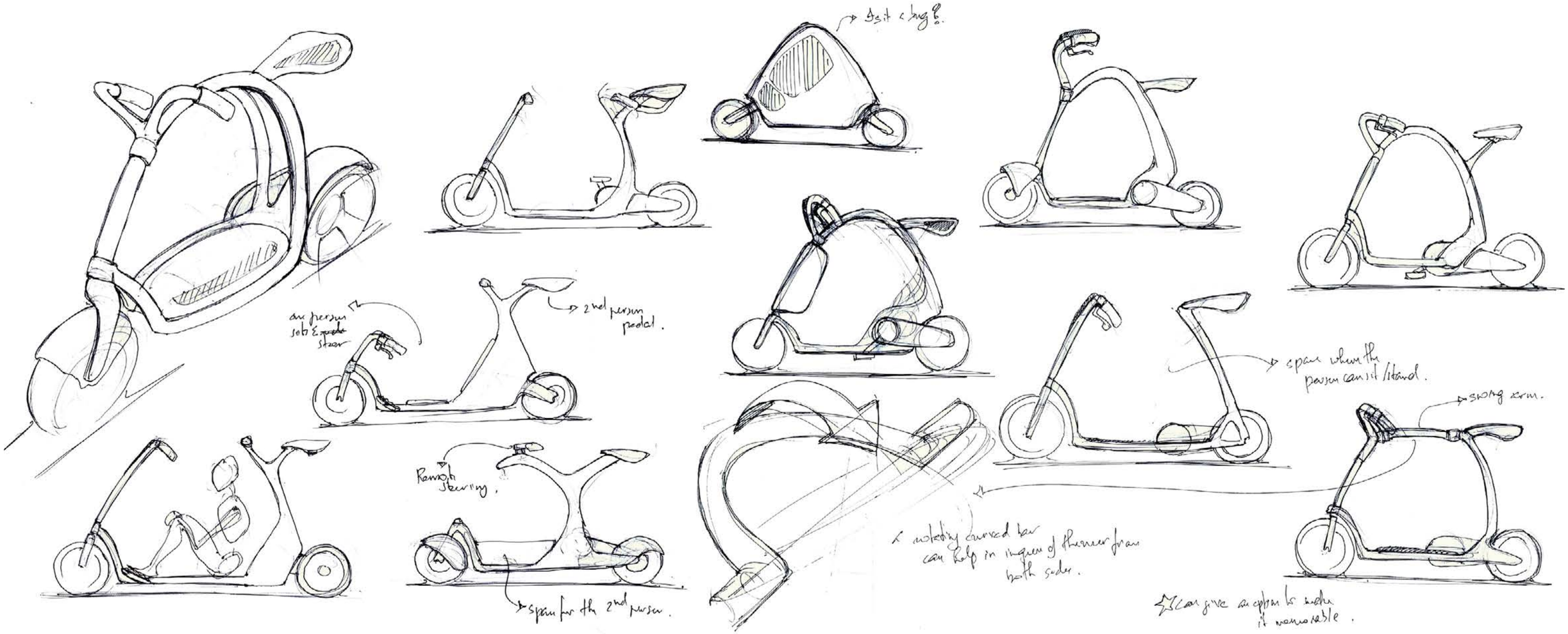




Ideation | Design direction 2



Ideation | Design direction 3



Concept selection

- Fun factor in terms of visual aesthetics
- Novel ride experience for the fellow rider.
- Better visibility for both riders

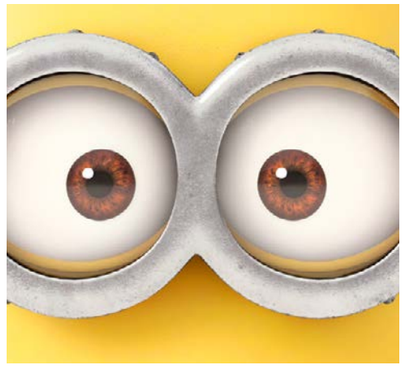
Design direction 3

Understanding minions

- Appearance
- Personality
- Color pallette

Appearance

- Small, yellow and cylindrical
- Single as well as double eyed
- Characteristic features:

Personality

- Serves the most despicable master
- Strange jabber to communicate
- Childish sense of humor
- Varied likes and dislikes

Color pallette

R 244
G 193
B 68

R 255
G 225
B 105

R 82
G 115
B 146

R 112
G 145
B 175

R 55
G 55
B 57

R 171
G 171
B 169

Working with montage

- Rendered the concept and scaled it up
- Understanding the scale and proportion
- Wheel size kept at 30 cm diameter
- Initial idea regarding the posture

Source: author

Working with montage

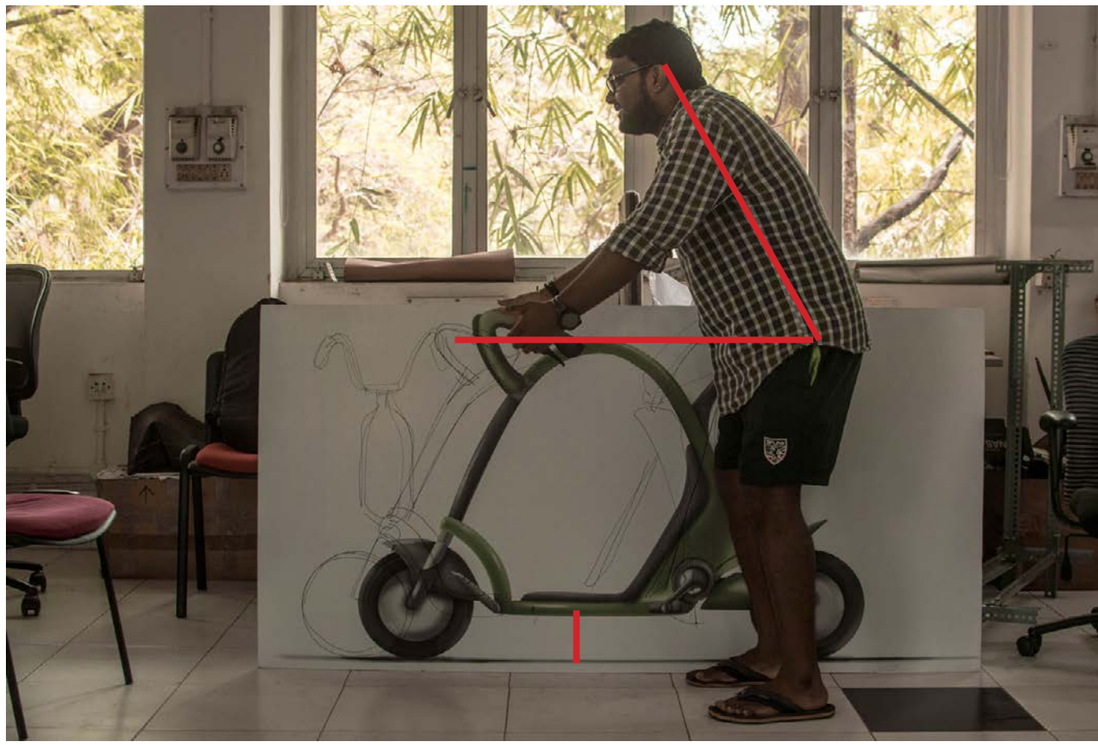
Posture analysis

Handle reach

Clearance of the bottom seat

Knee room

Wheel base



Source: author

Configuring the bicycle

- Fixing the posture
- Fixing the triangle
- Fixing the seating
- Fixing the wheel center

Fixing the posture

The posture should aid in stress free ride

The posture should facilitate good view of the environment

The posture should be ideal for short distance rides

Dutch bike posture

Cruiser bike posture

Trek bike posture

Road bike posture

source: http://www.ergotec.de/en/02_fahrstil.php

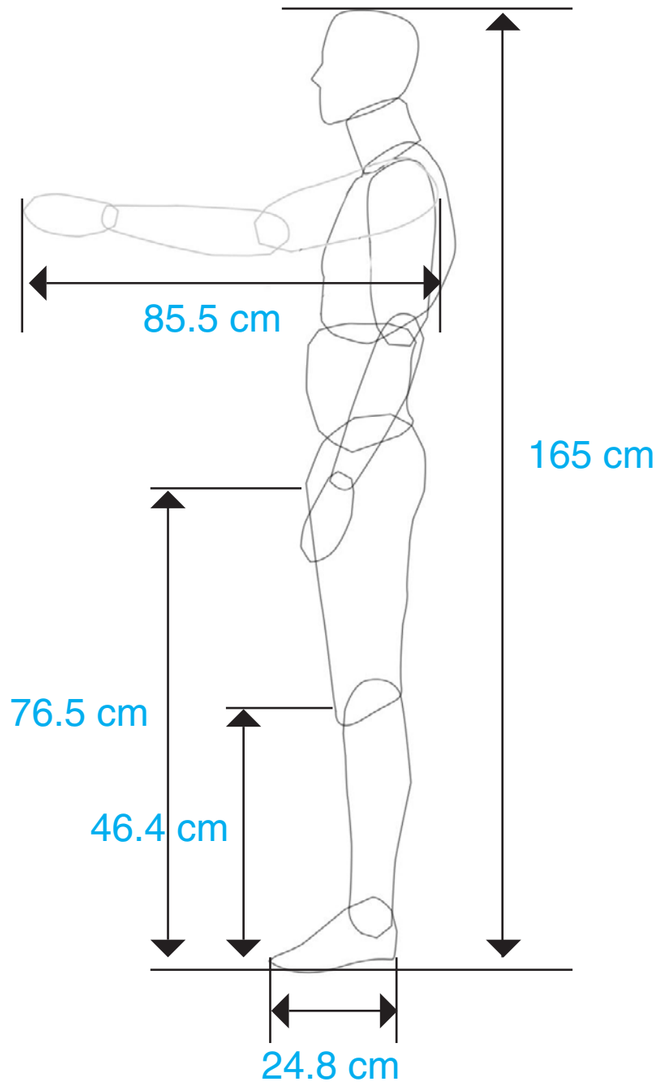
Fixing the posture

Cruiser bike posture advantages:

- Good visibility
- Ideal for short distance rides
- Low stress
- Adequate control

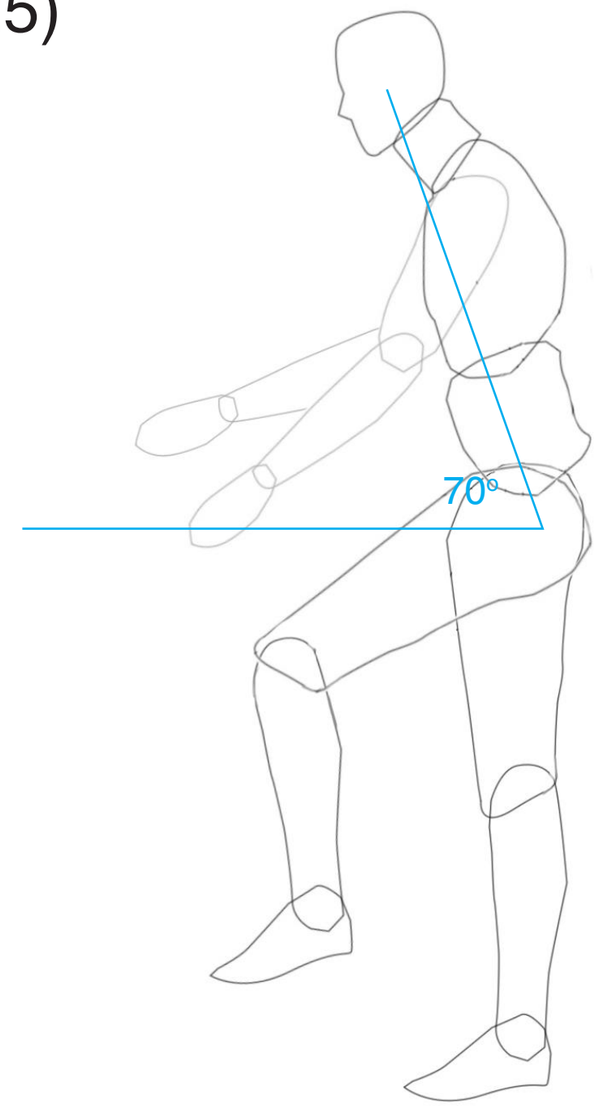
Fixing the triangle

- Fixing the bottom bracket, saddle point and handle
- Used a 50 percentile male mannequin (1:5)



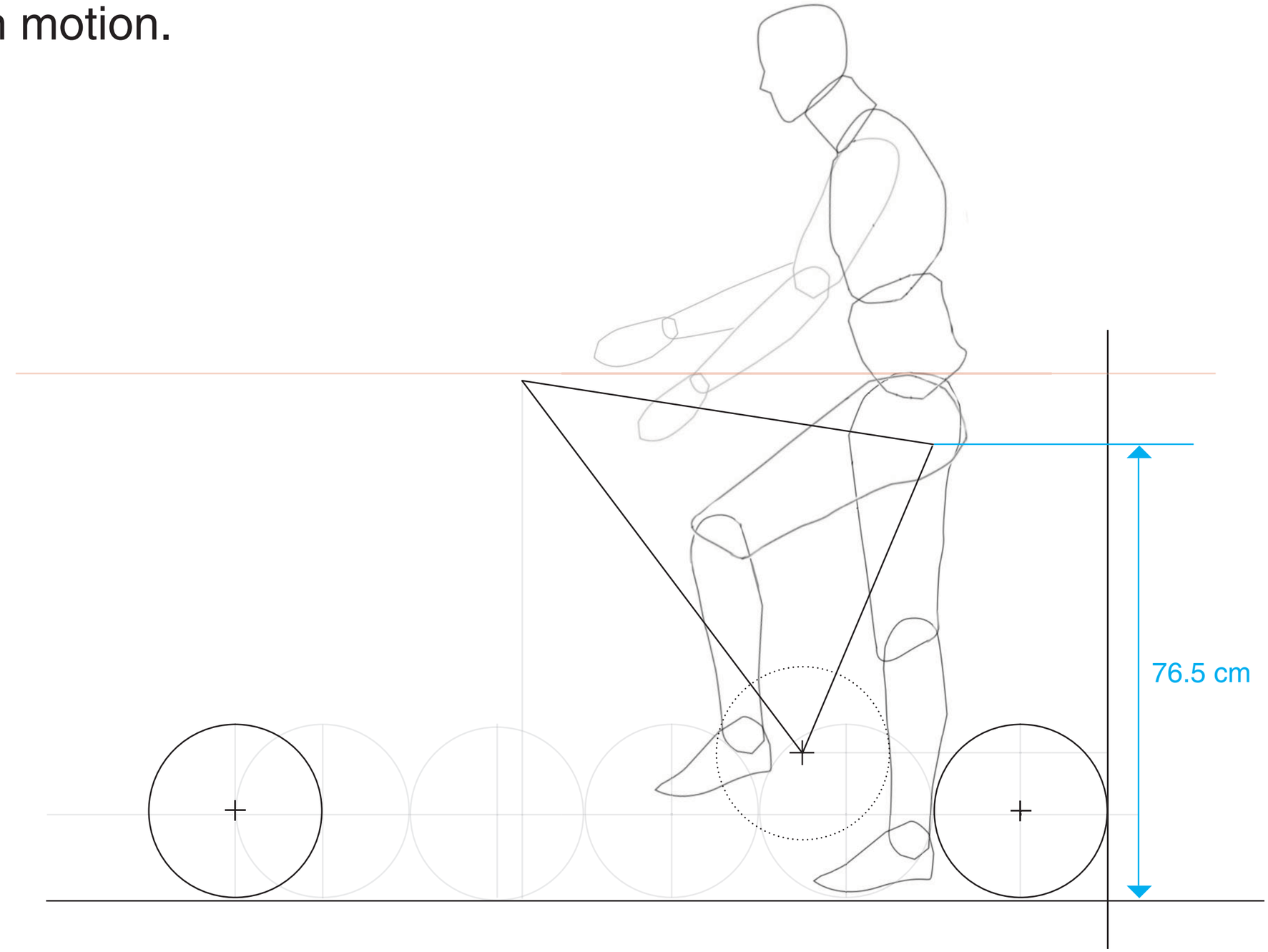
Fixing the triangle

- Fixing the bottom bracket, saddle point and handle
- Used a 50 percentile male mannequin (1:5)
- Chose a posture angle of 70^{o}



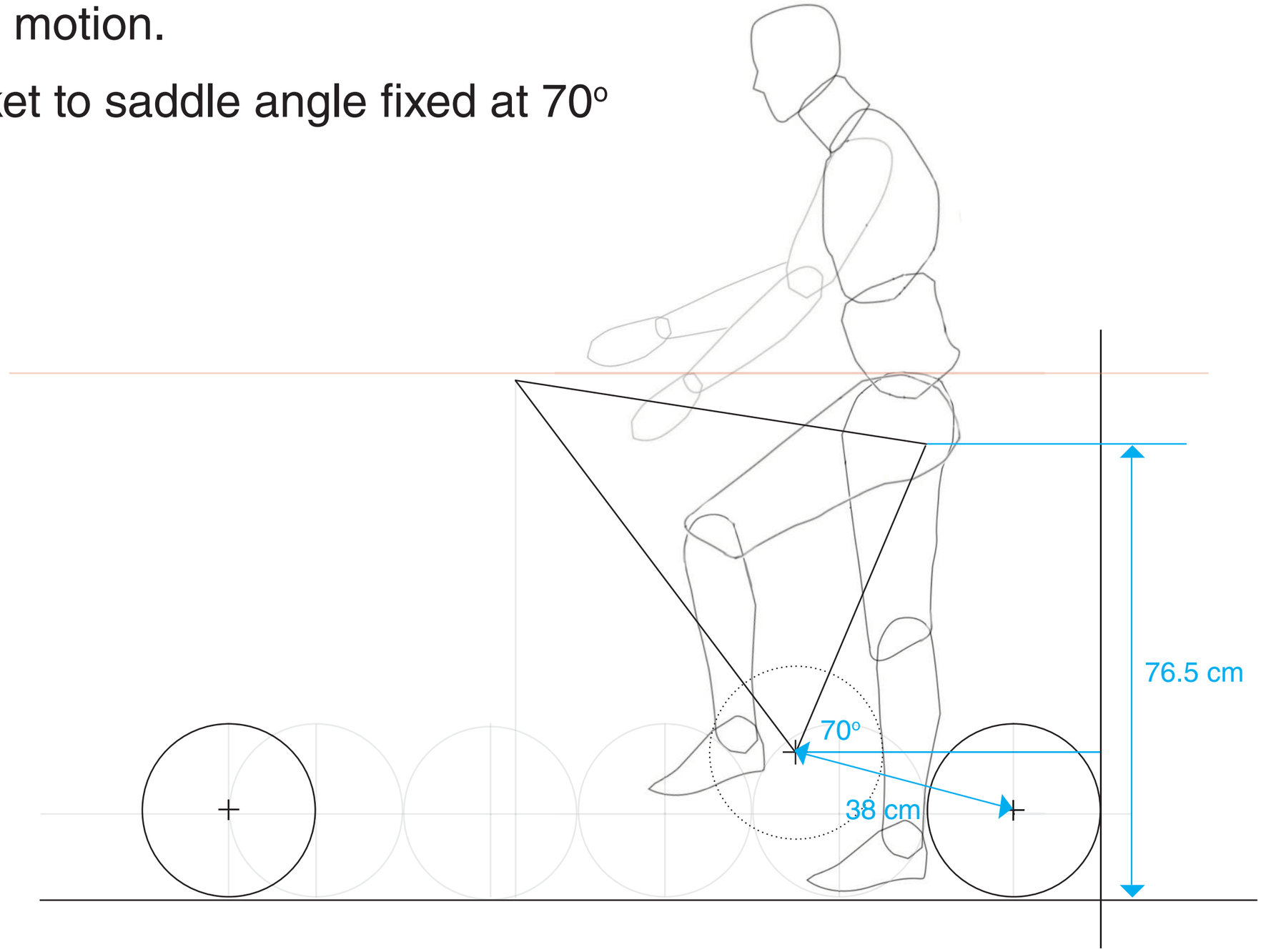
Fixing the triangle

- Saddle height fixed so that foot rests when bicycle not in motion.



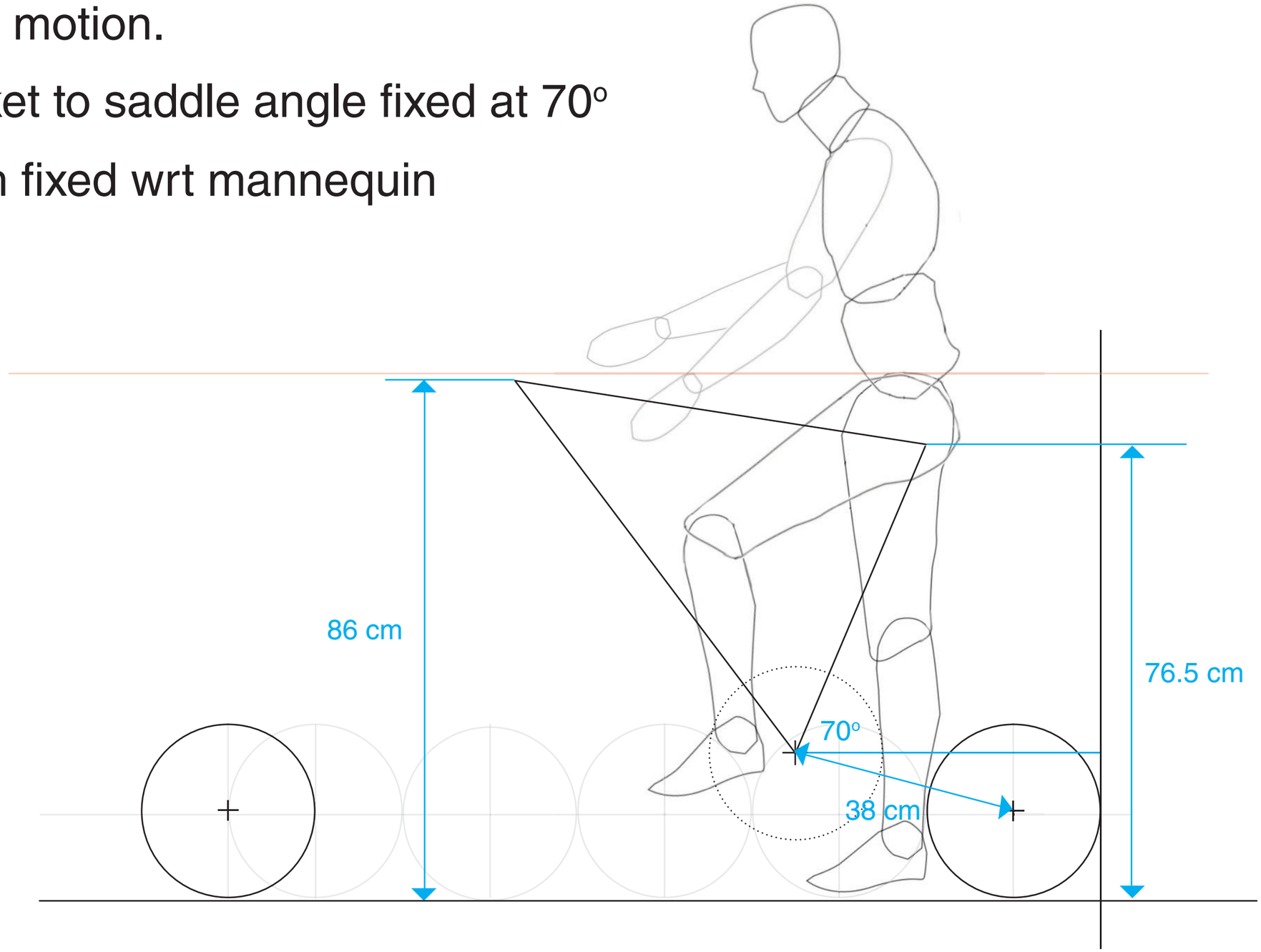
Fixing the triangle

- Saddle height fixed so that foot rests when bicycle not in motion.
- Bottom bracket to saddle angle fixed at 70°



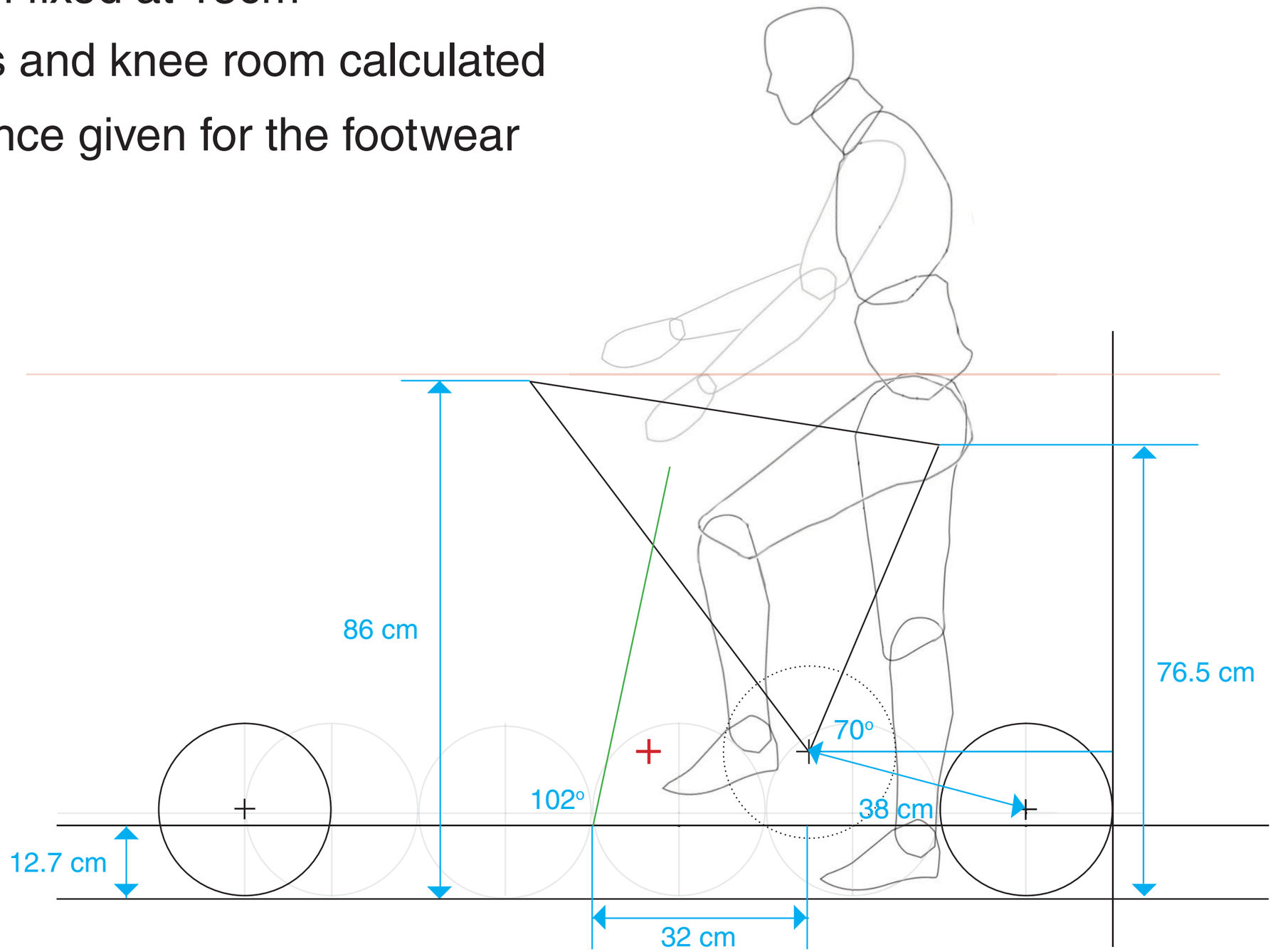
Fixing the triangle

- Saddle height fixed so that foot rests when bicycle not in motion.
- Bottom bracket to saddle angle fixed at 70°
- Handle reach fixed wrt mannequin



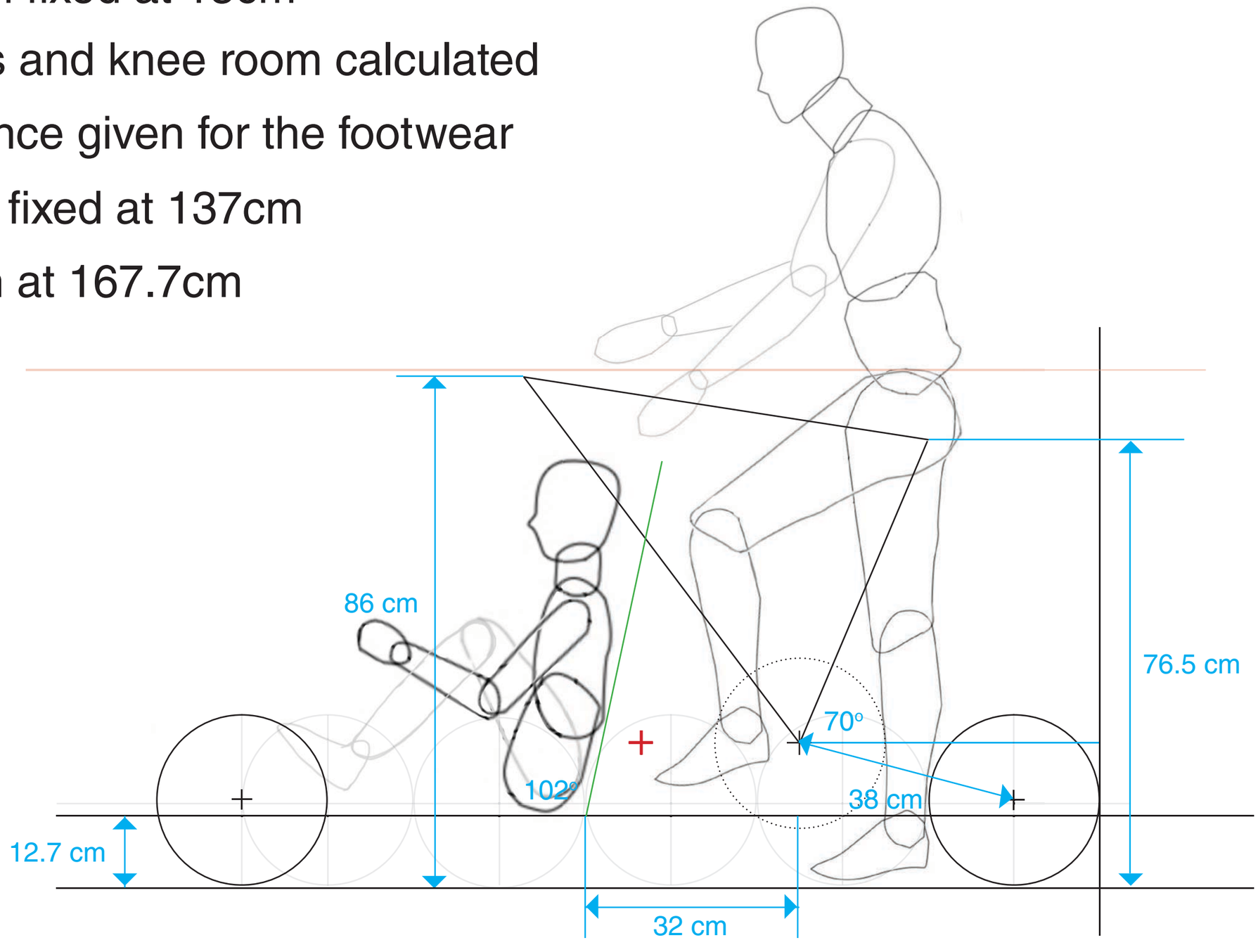
Fixing the bottom seat

- Crank length fixed at 15cm
- Pedal radius and knee room calculated
- 5 cm clearance given for the footwear



Fixing the bottom seat

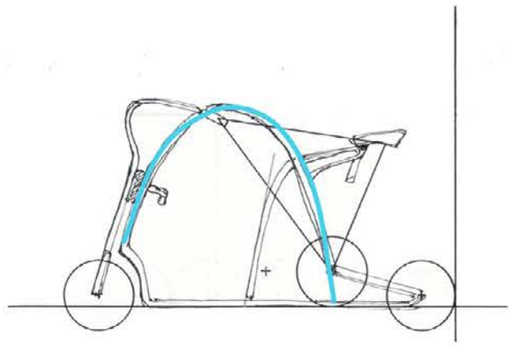
- Crank length fixed at 15cm
- Pedal radius and knee room calculated
- 5 cm clearance given for the footwear
- Wheel base fixed at 137cm
- Cycle length at 167.7cm

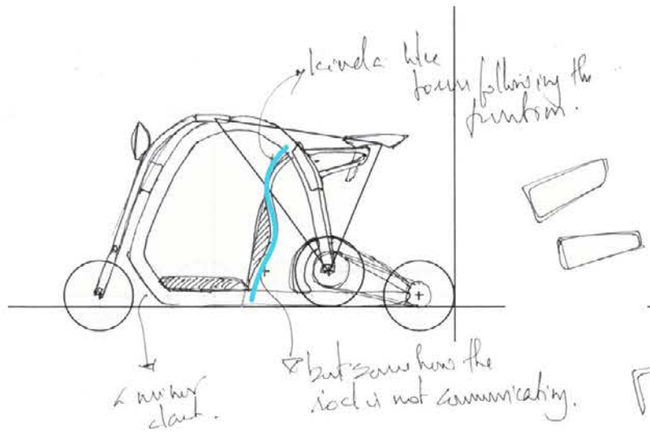


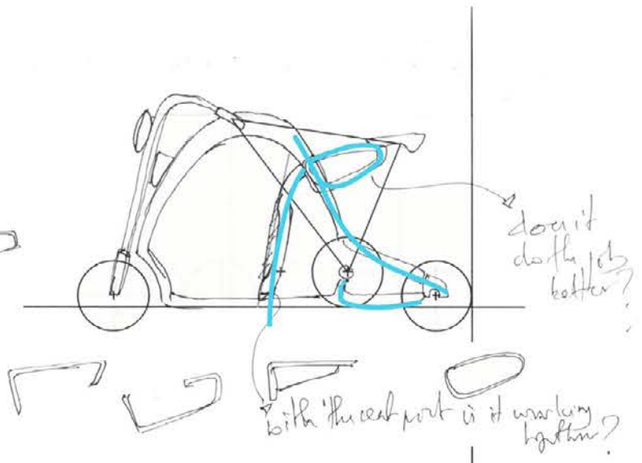
Working around hard points

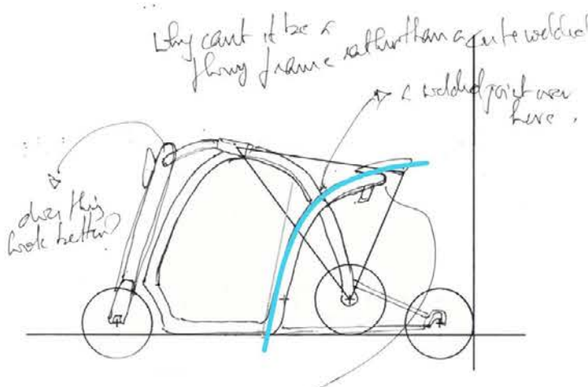
- Side profile
- Aesthetic factors and characteristic lines

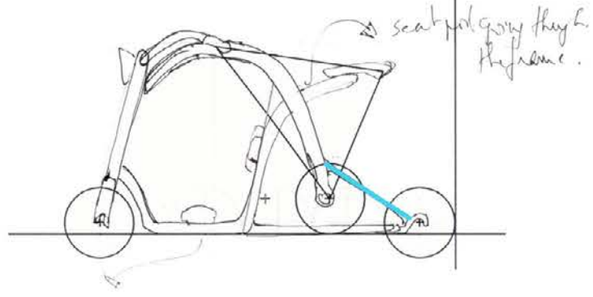
Lines and Curves

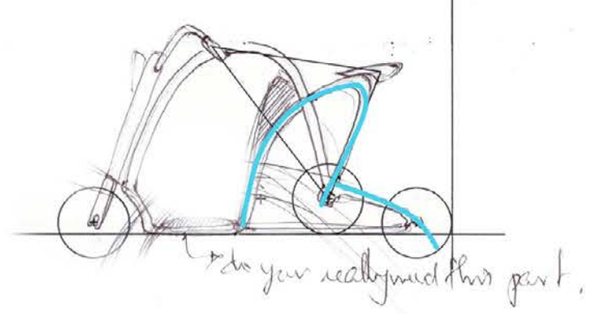


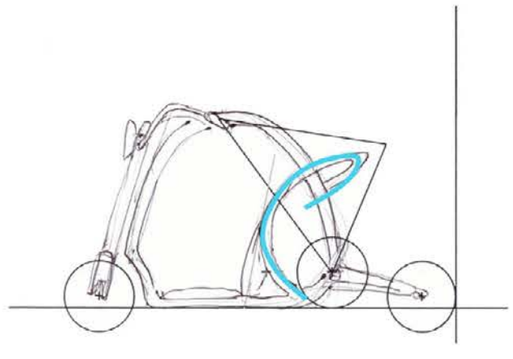


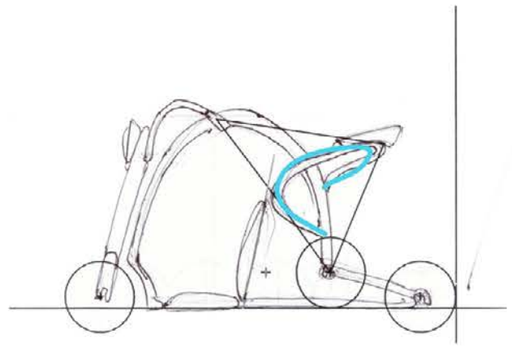


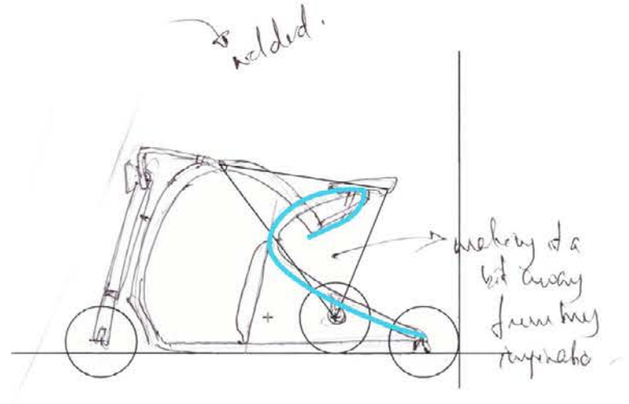




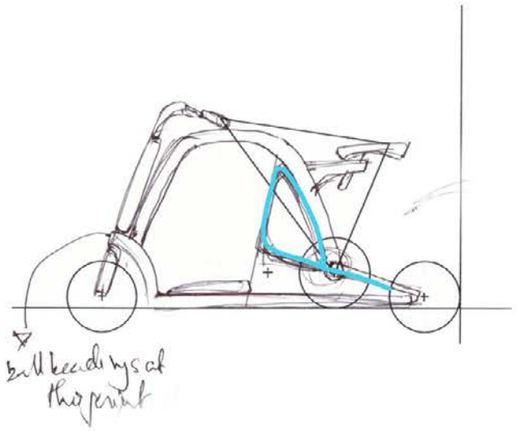


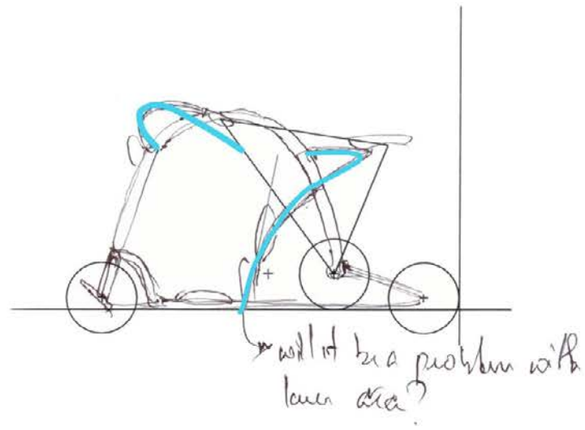


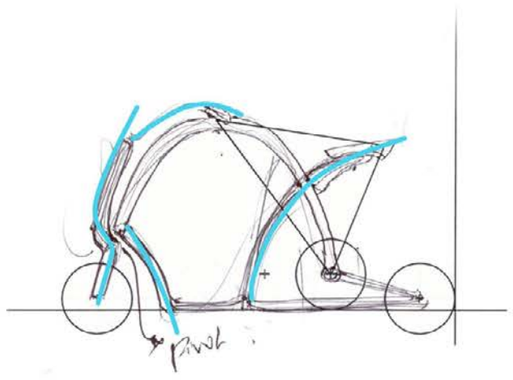


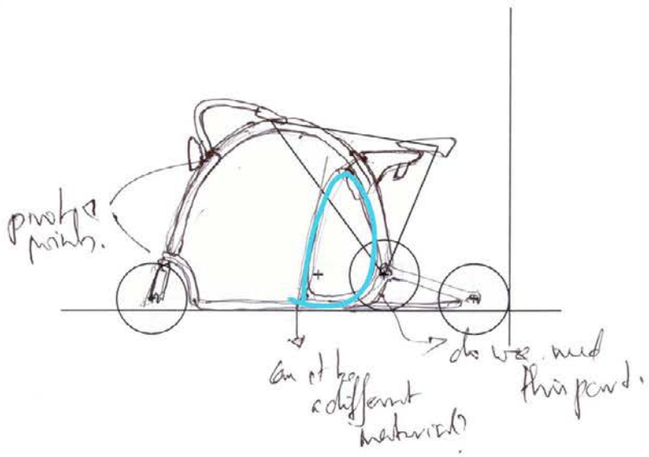


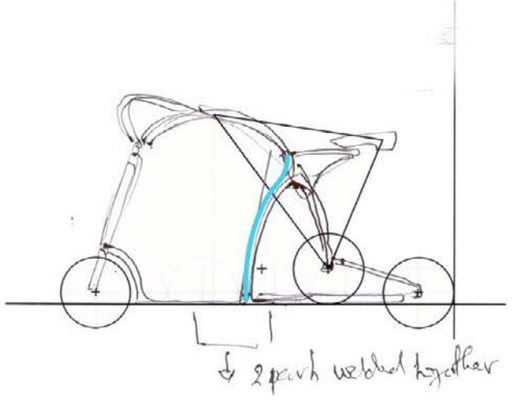
Lines and Curves

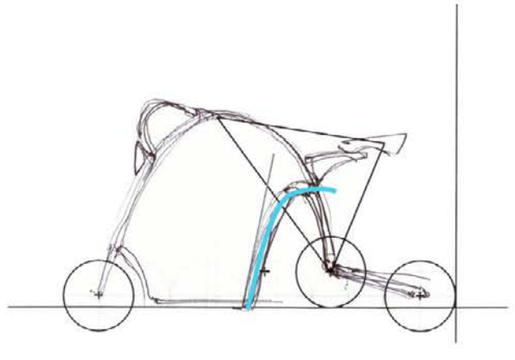




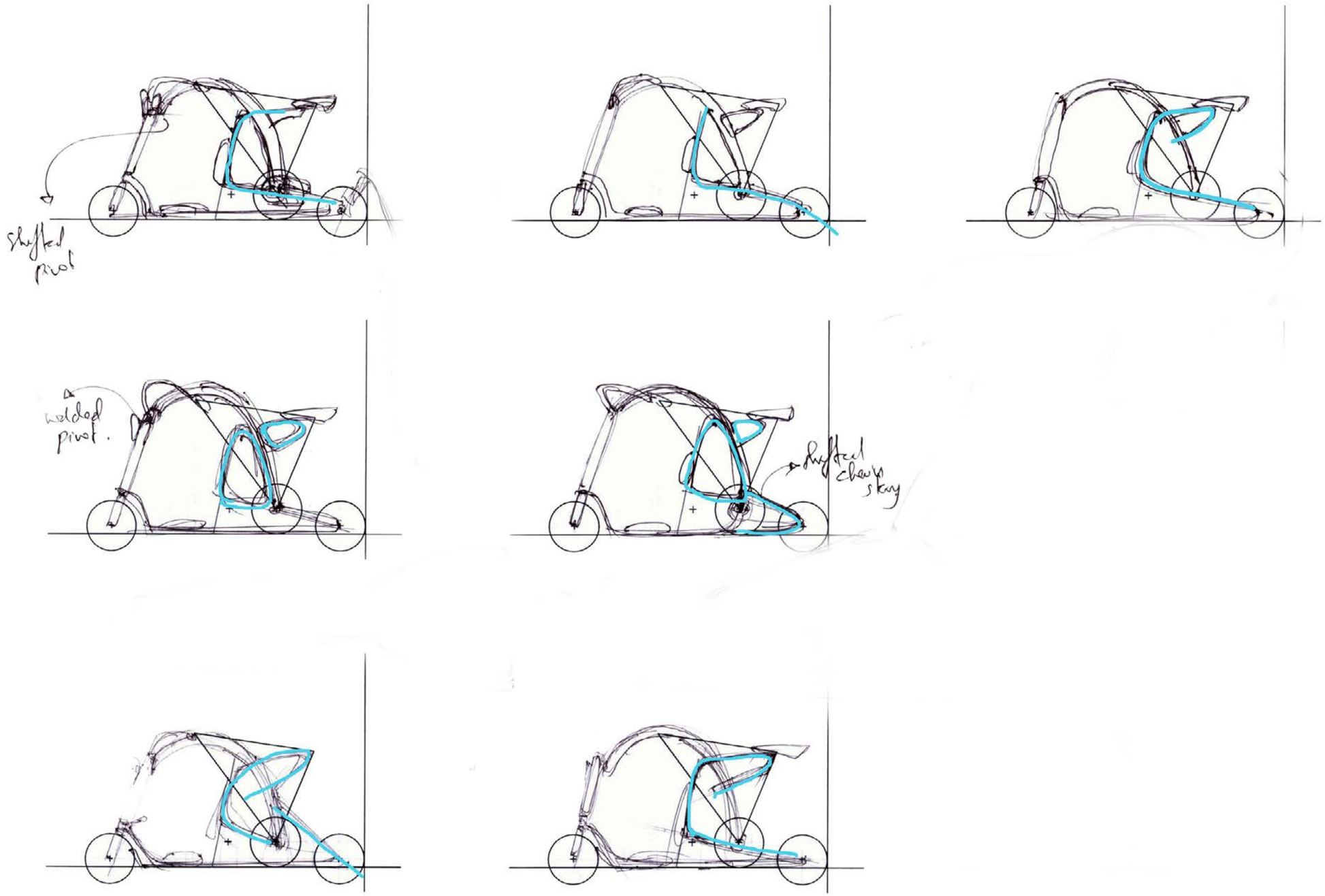




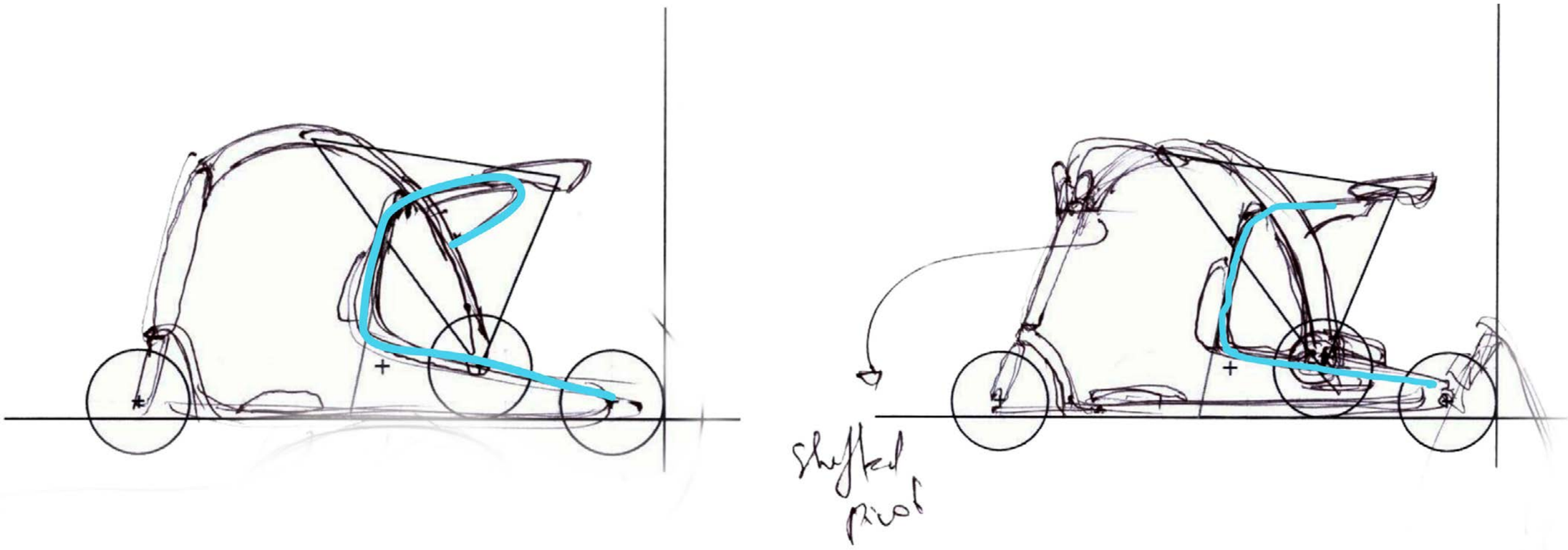




Lines and Curves

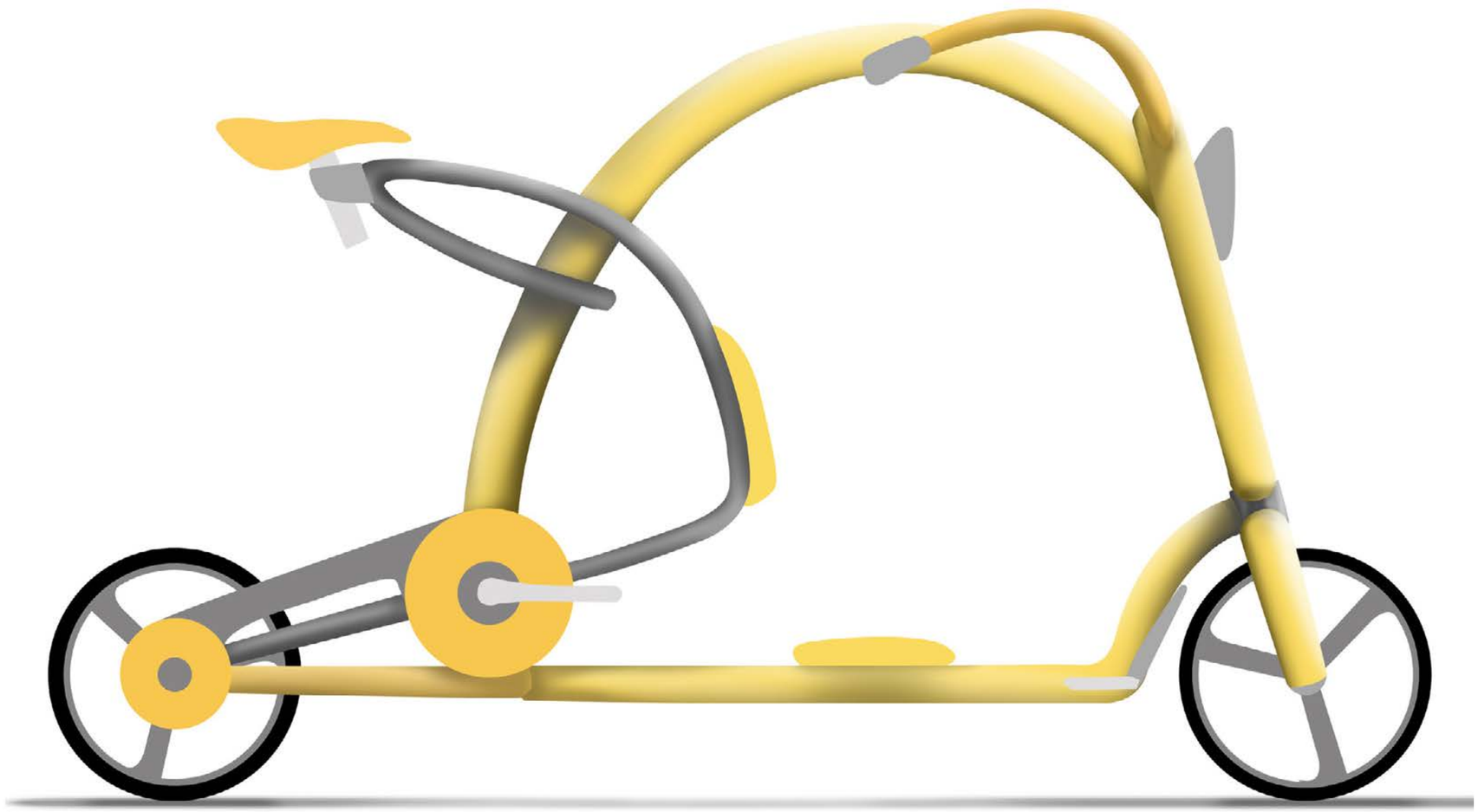


Lines and Curves



- Characteristic top tube
- Flow of curve from seat post to chain stay
- Down tube curvature following wheel profile
- Better play of lines and curves

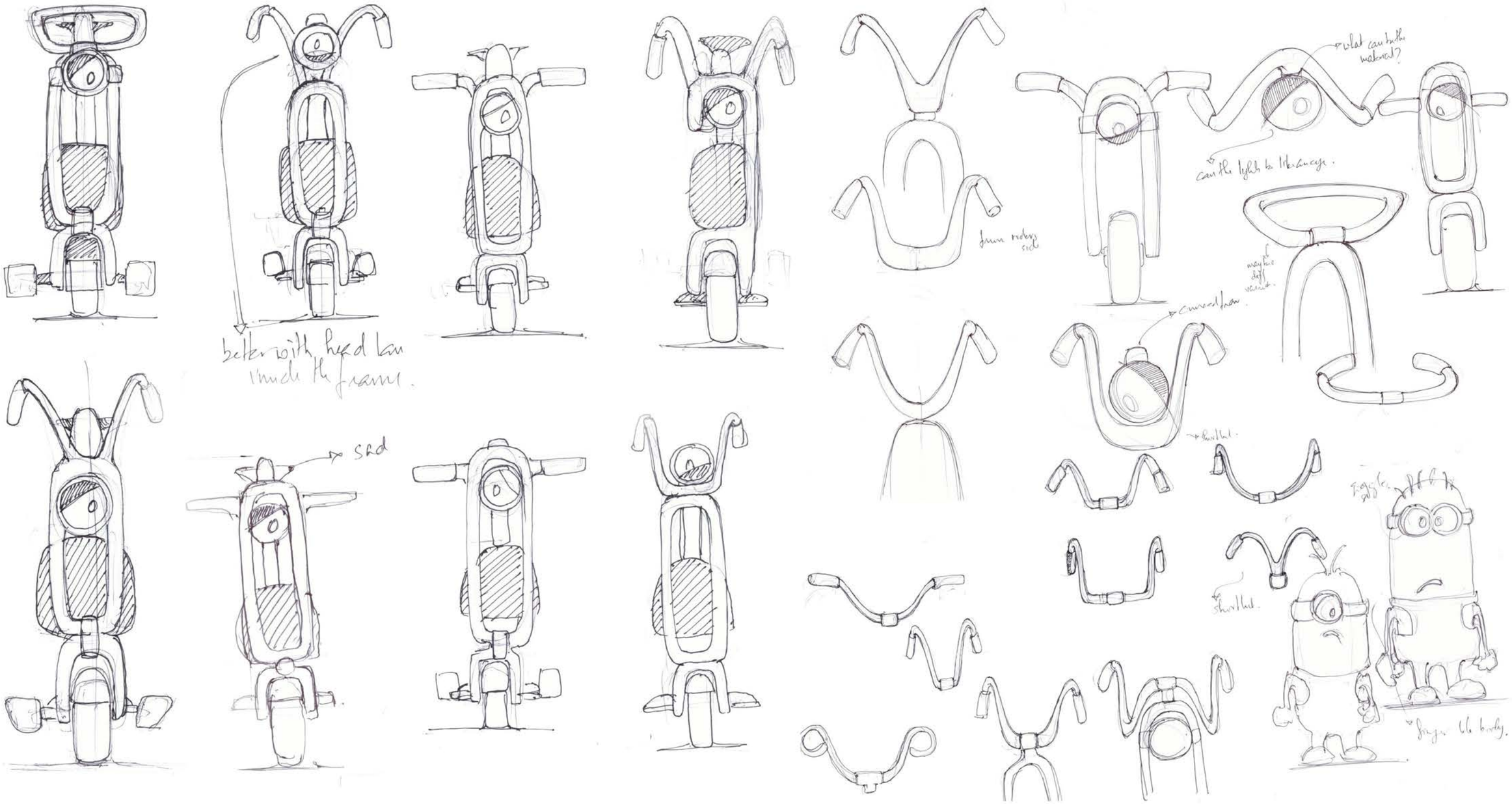
Side profile | Flat render



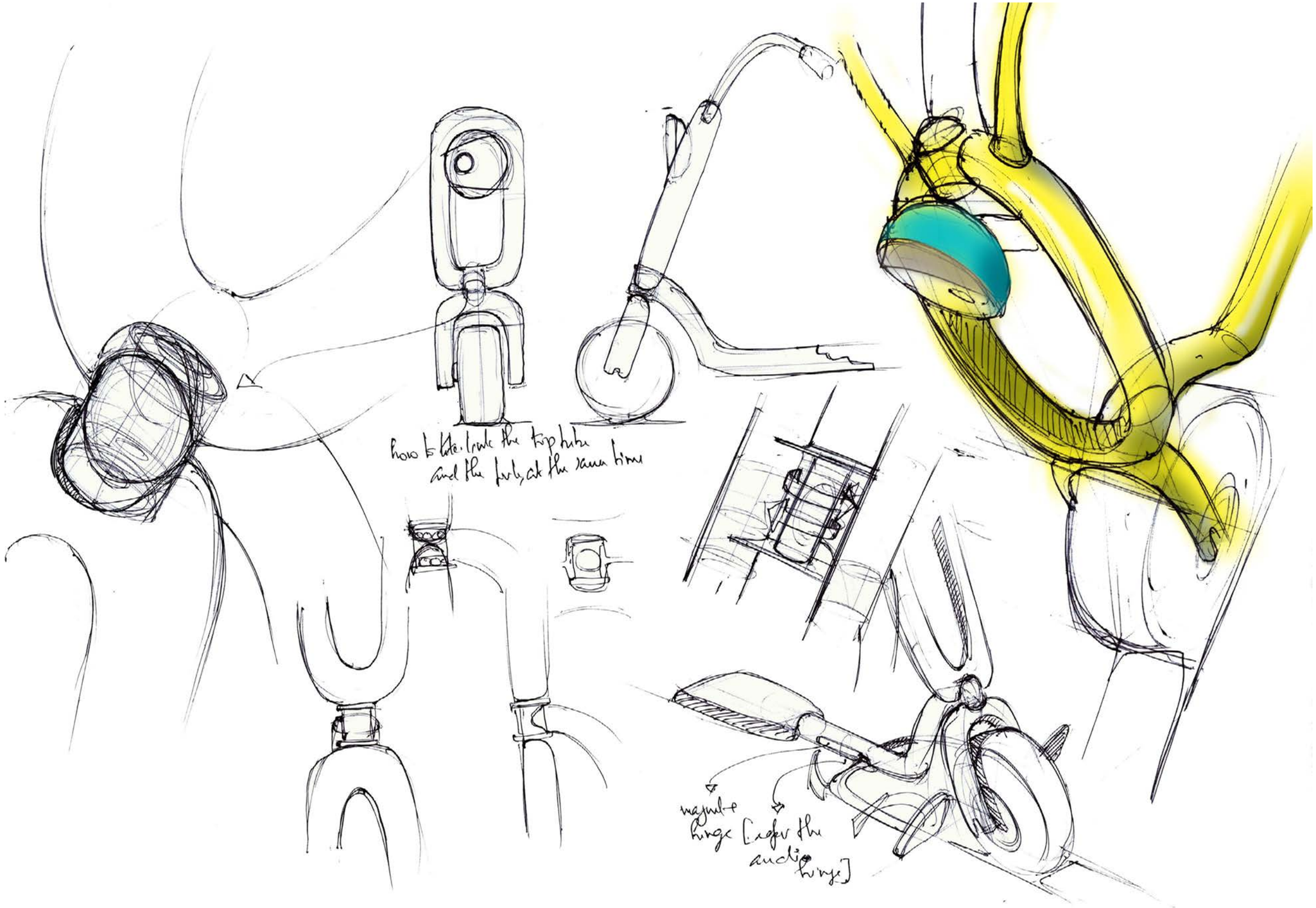
Detailing

- Frame
- Kids seat
- Kids handle + footrest
- Spokes
- Chain case

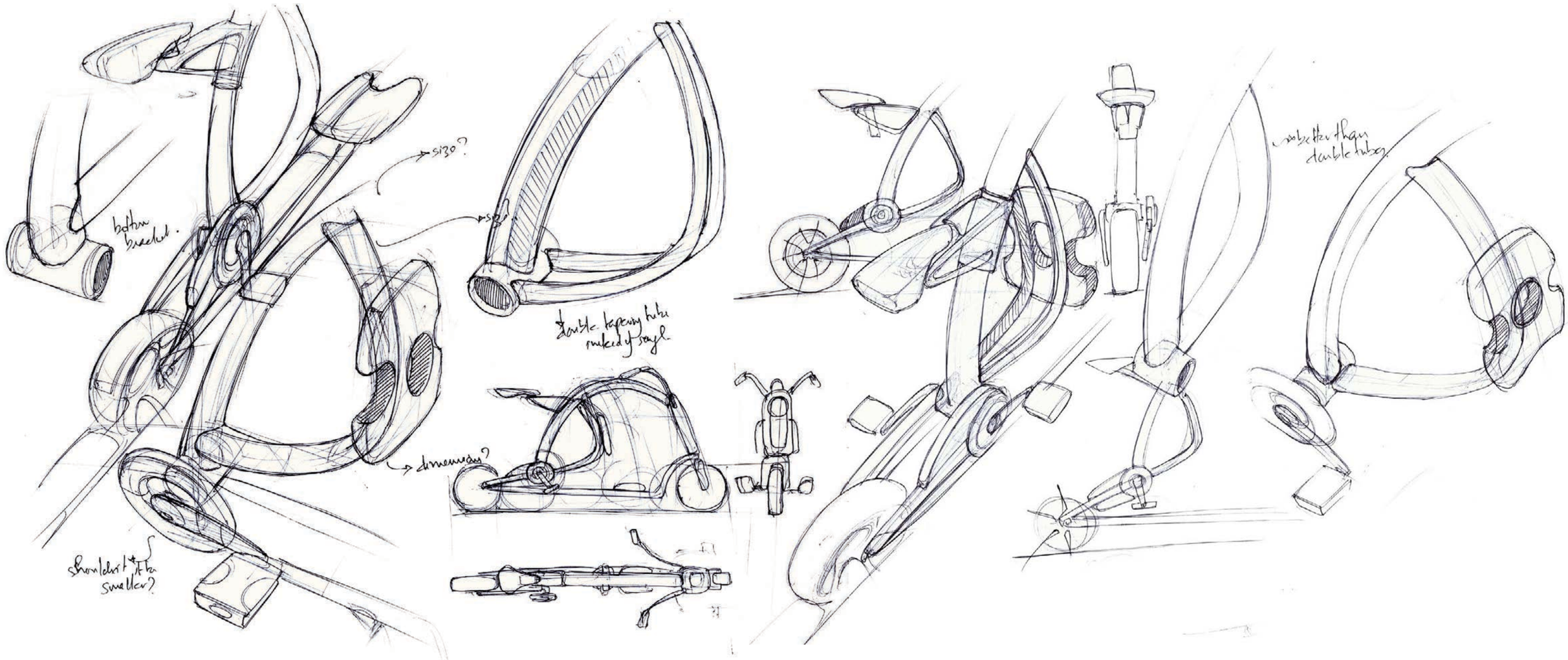
Detailing | Frame - Headtube + Handle



Detailing | Frame - Headtube + Handle

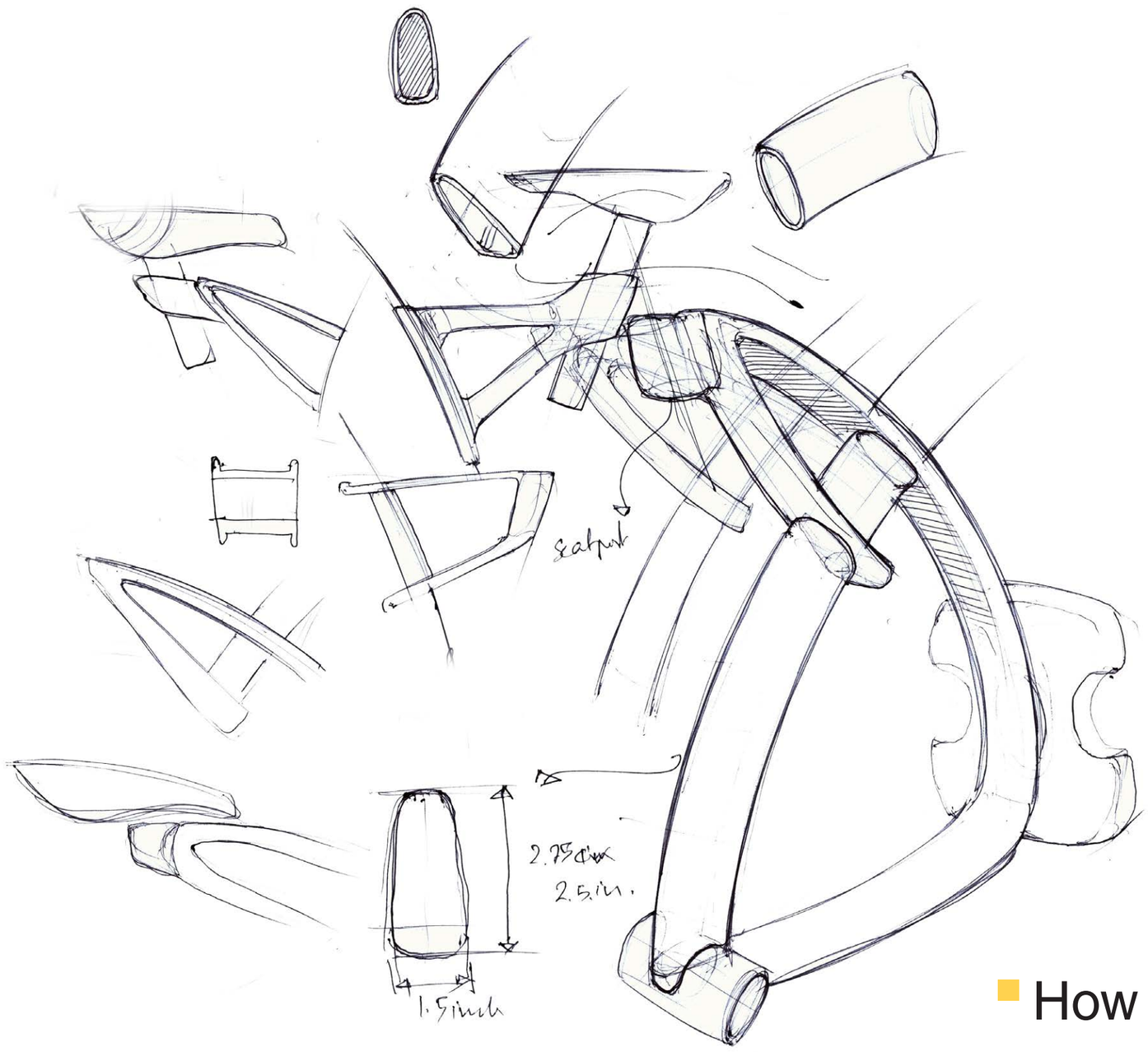


Detailing | Frame - seatpost



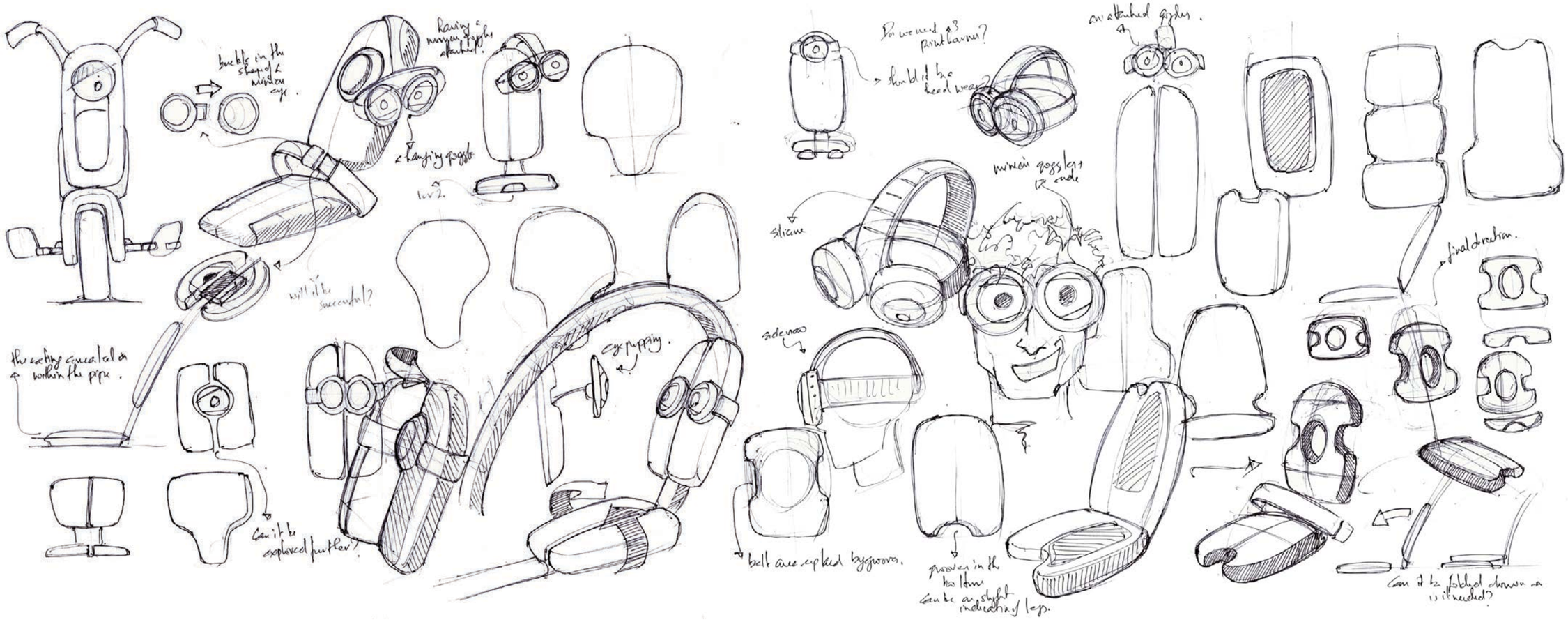
- Single tubes and double tubes

Detailing | Frame - seatpost



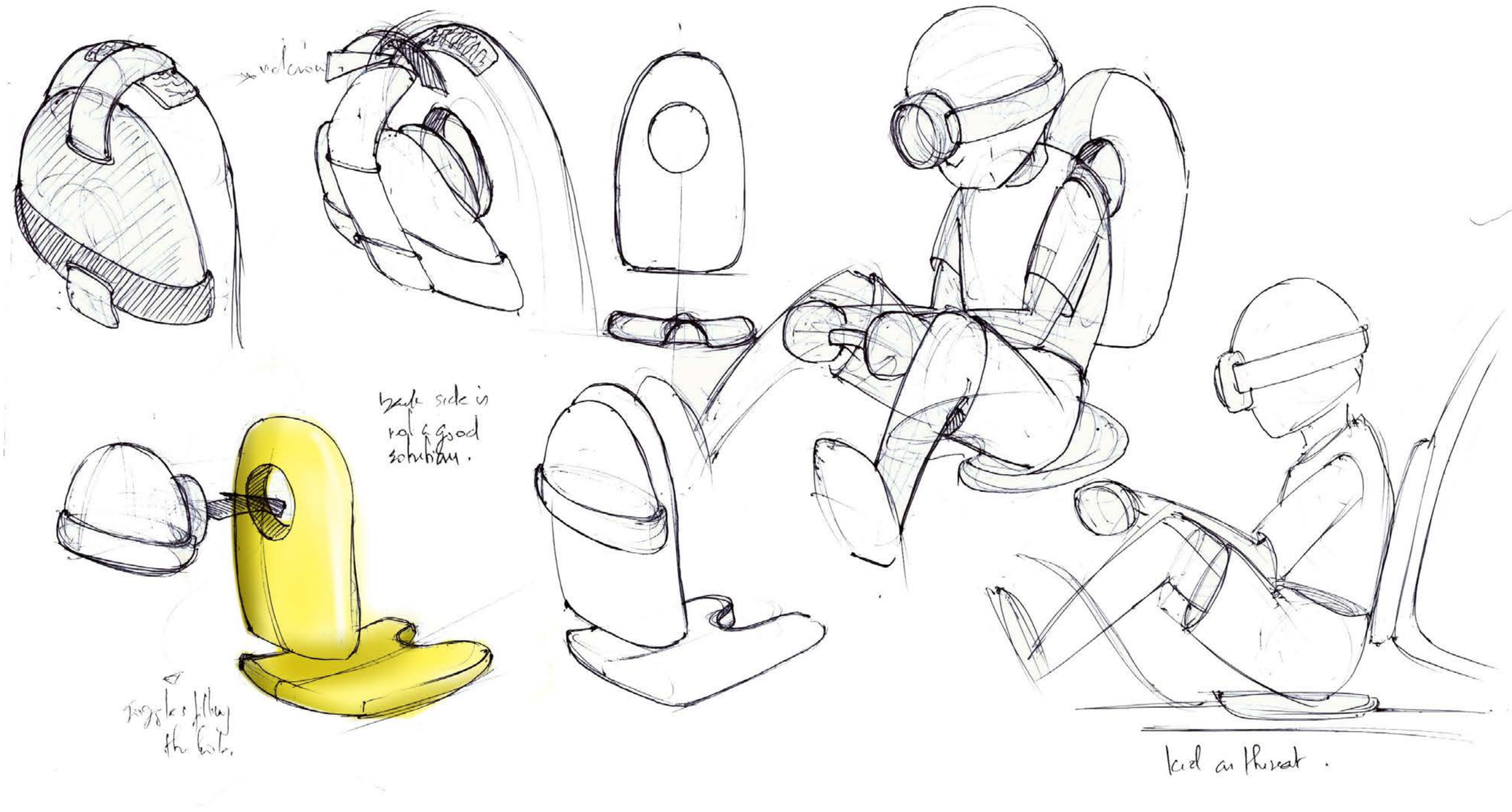
- How saddle joins the seatpost

Detailing | Kids seat



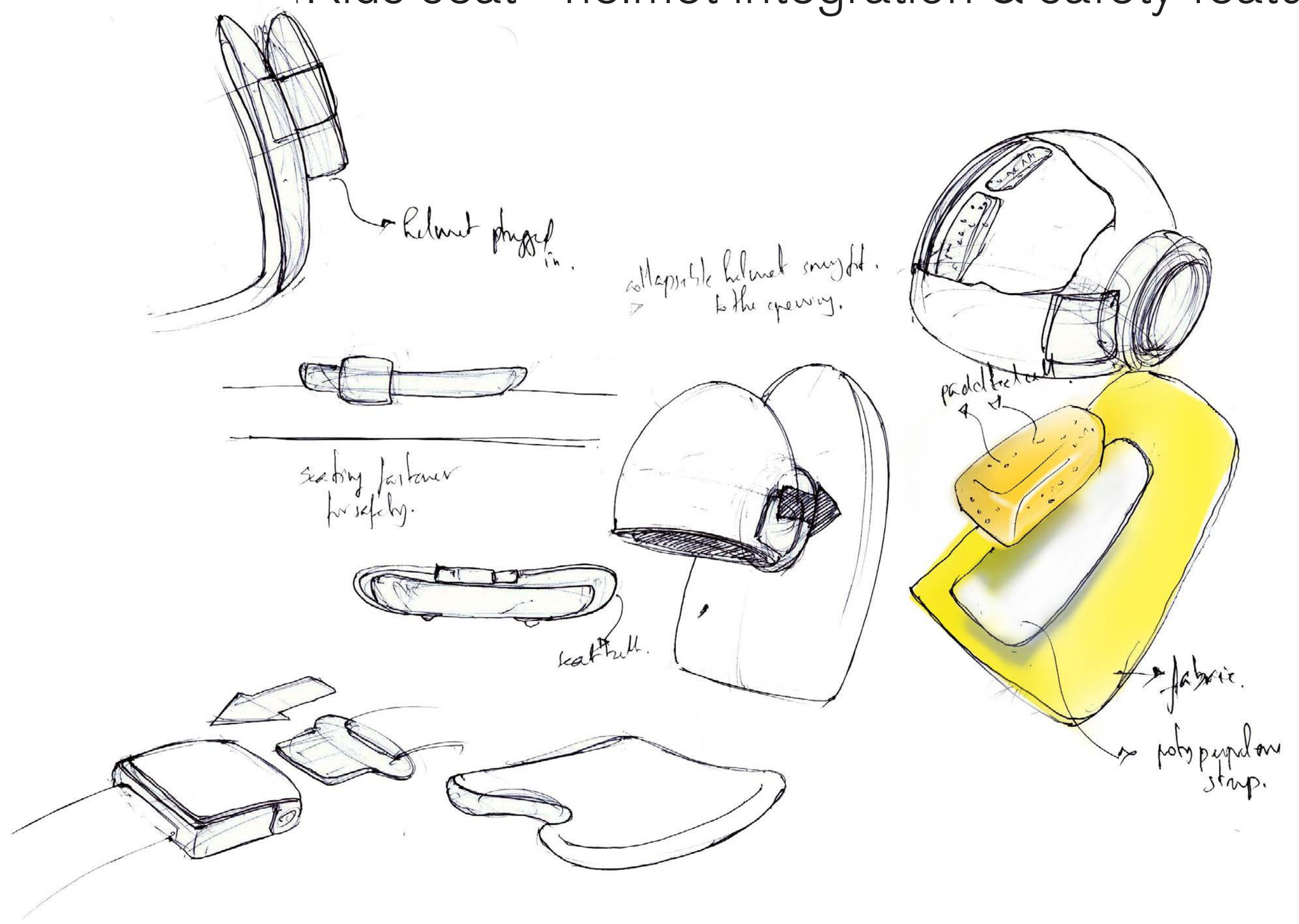
- How play elements could be brought into the seating

Detailing | Kids seat - fun factor

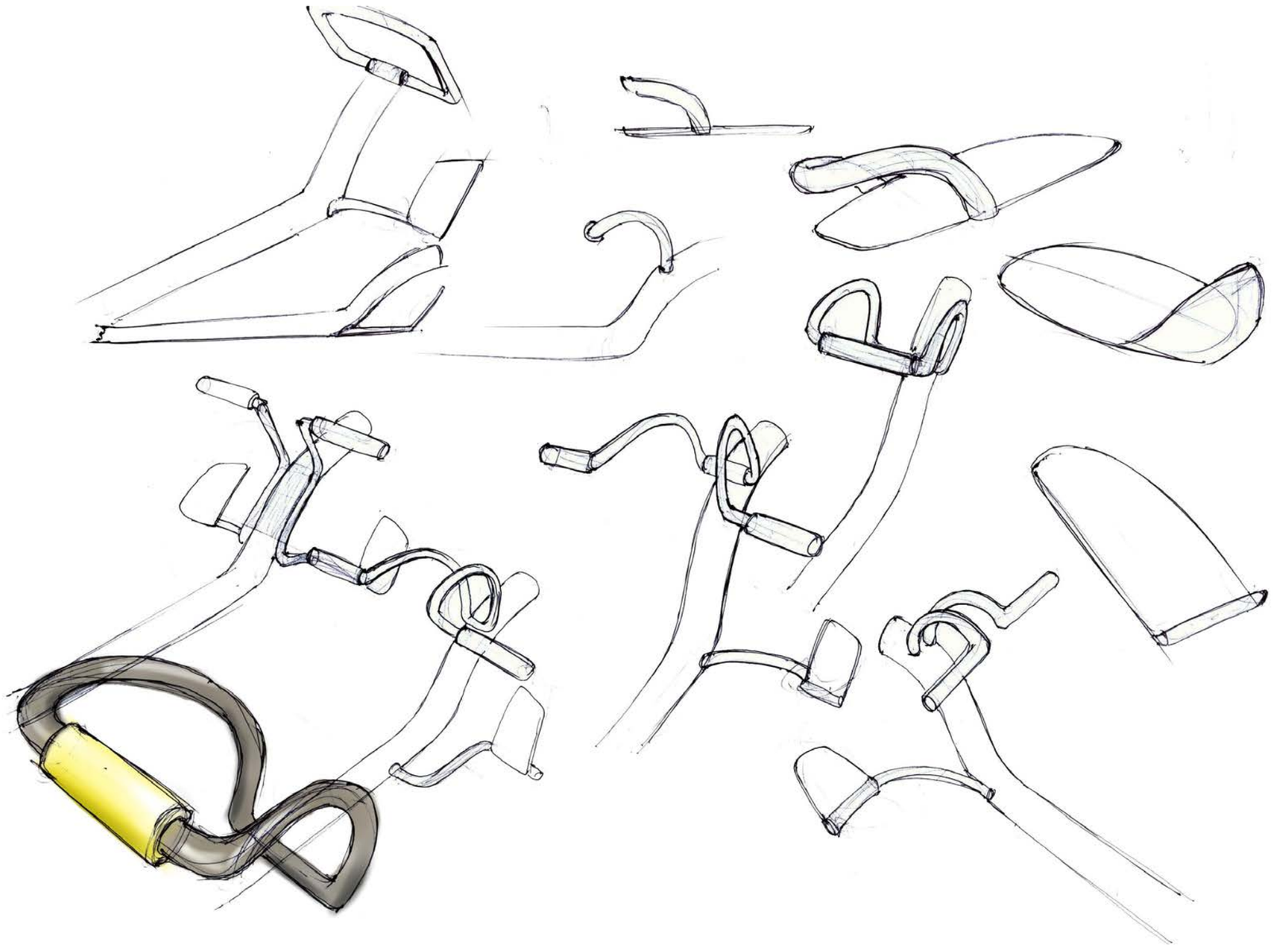


- How the rider could become the character

Detailing | Kids seat - helmet integration & safety features

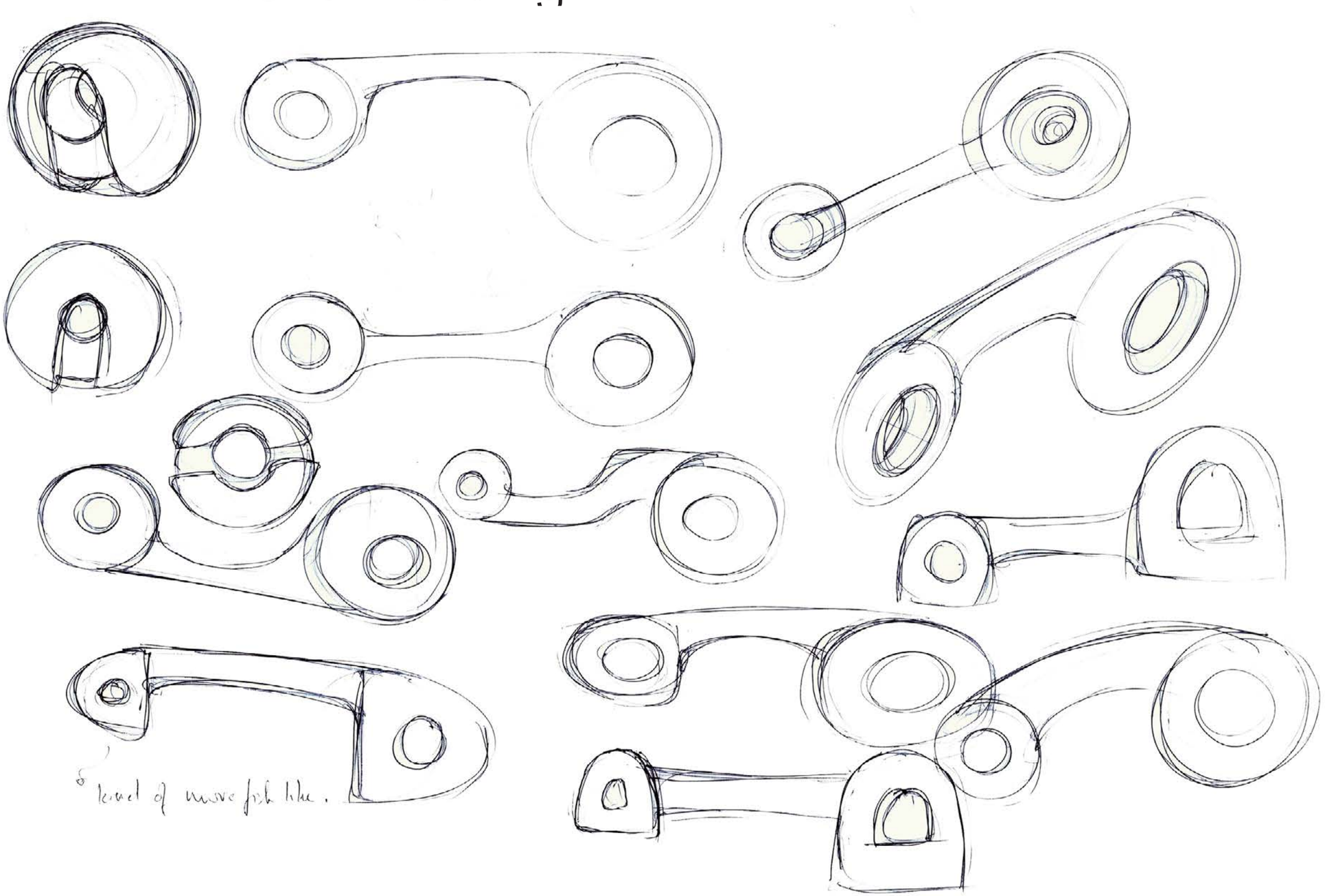


Detailing | Kids handle and foot rest



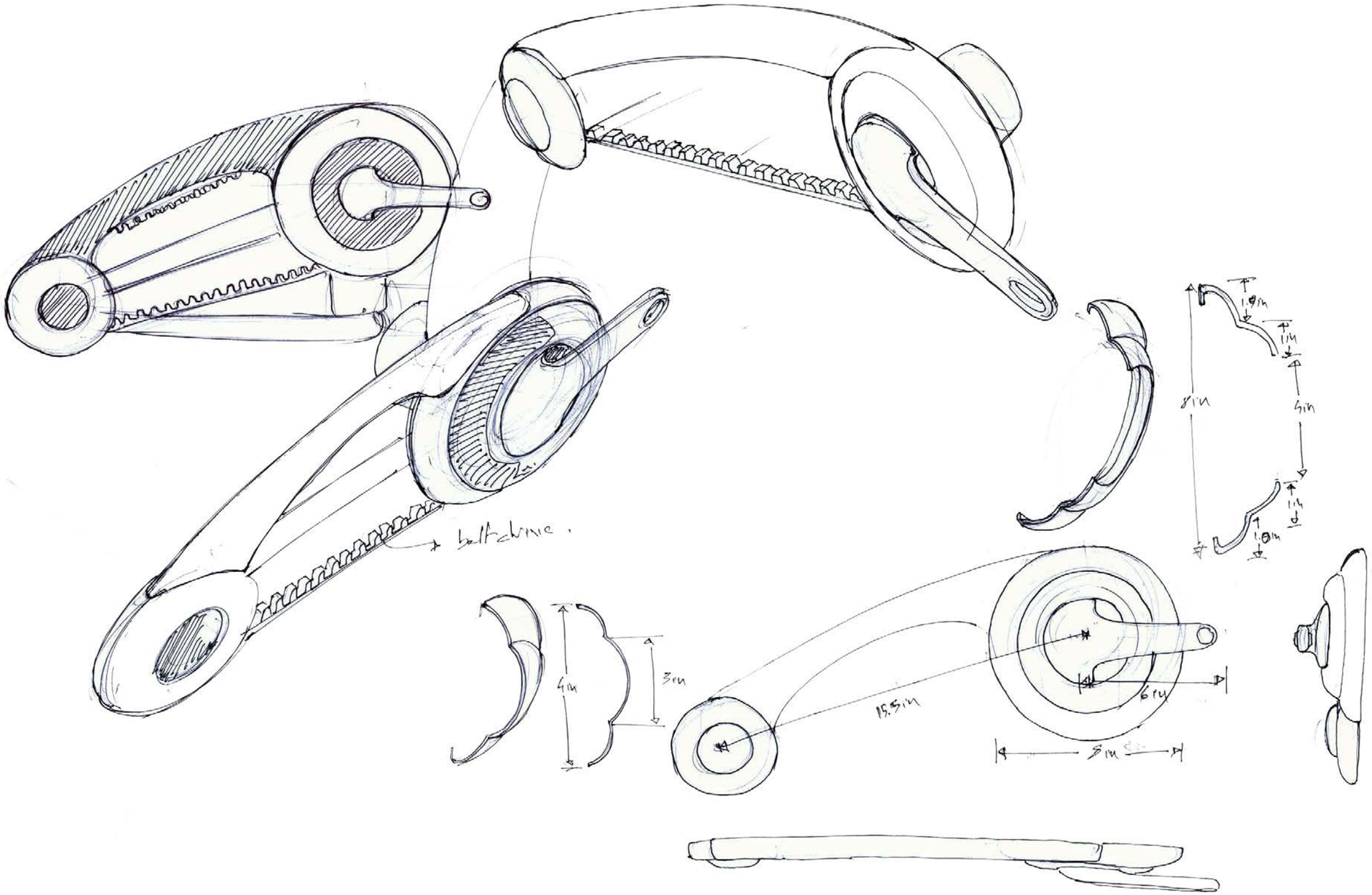
- Giving the kid, a rider like feel and ensuring his safety

Detailing | Chain casing



- Bringing in character to the chain cover

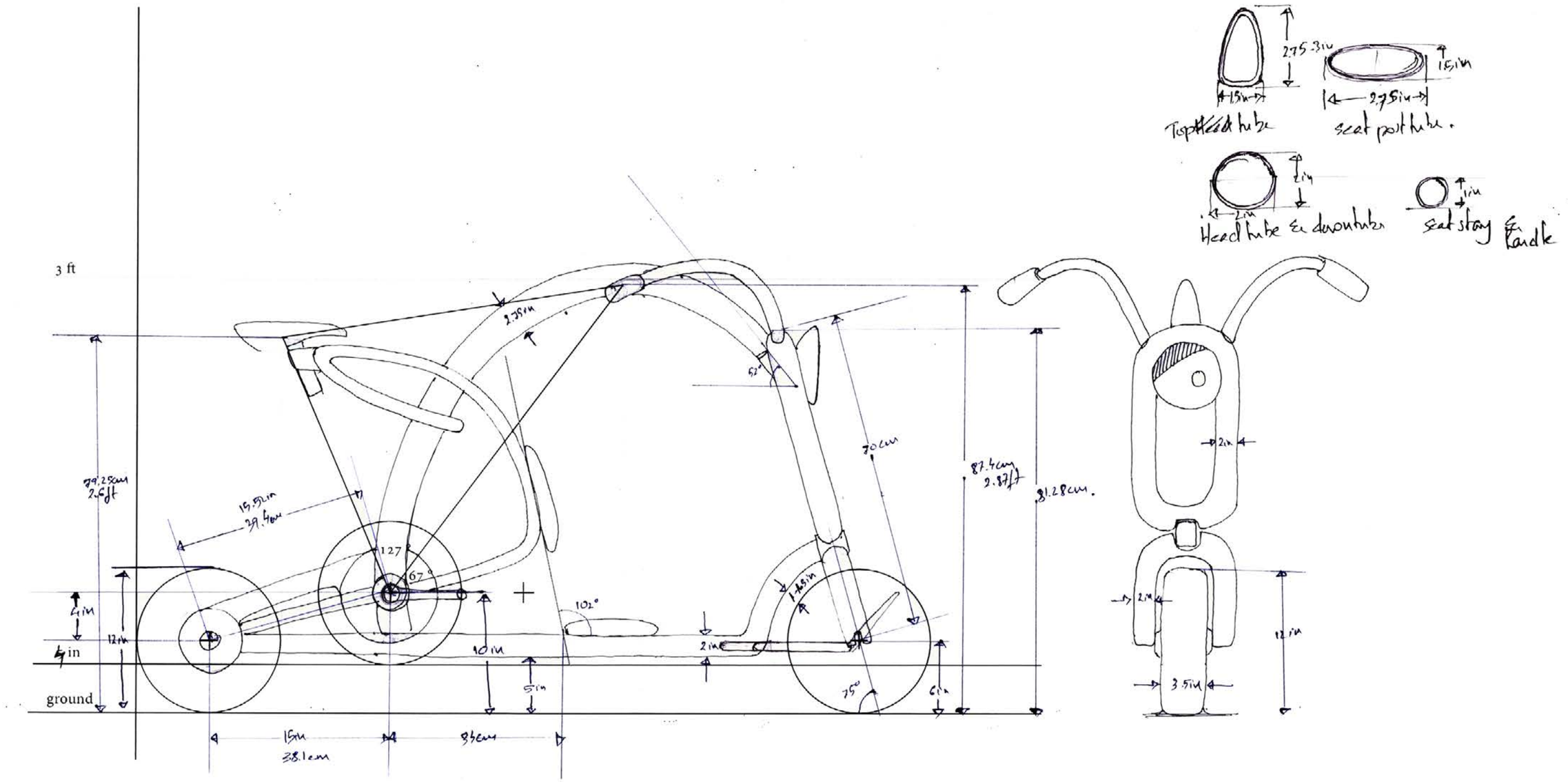
Detailing | Chain casing - final



Final design

- Blue print
- CAD model

Final Design | Dimensions



- Wheel base: 137 cm ; Bicycle length : 167.6cm ; wheel size: 30.5 cm

Final Design | CAD model

Final Design | Features

- Minion characterized head tube
- Handles inspired from minion hair
- Small wheels creating the fun and suspense
- Frontal space for the child
- Minion like pedalling through small crank
- Minion helmet with kids seat - Rider becoming character
- Characteristic flow of tubes

Final Design | different views

Prototyping

- Materials and process
- Frame building

Prototyping | Materials and processes

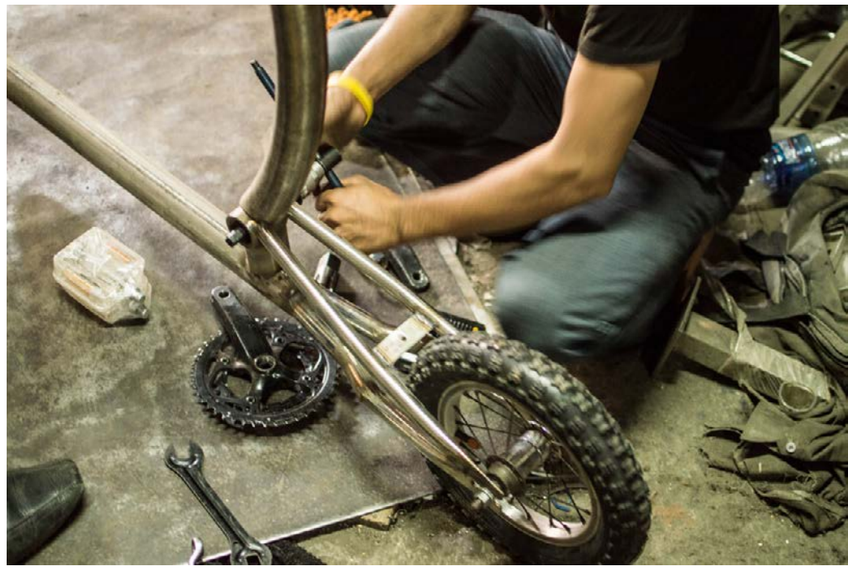
- Hydroforming
- Tube bending
- Tack welding
- Calibrating
- MIG welding

- Material used - stainless steel tubes

Prototyping | Frame building

- Fixing down tube and head tube

- Head tube connection top tube



- Fitting the bottom bracket and crankset

Prototyping | Frame building

- Checking the kids seat rear tube

- Welding the bends

- Correcting the connection and angle

Prototyping | Frame building

Top tube welding

Frame before seat post fixing

Finishing seat post support

Prototyping | Frame building

Seat post in position

Painting of frame

Final working model

Way forward

- Refining the prototype and getting user feedback
- Design of a range of bicycles
- Futher detailing in terms of fenders, drop outs, joineries etc.

Thank you