STYLING OF ELECTRIC COMMUTER MOTORCYCLE FOR URBAN YOUTH

Design project II (MVD.II - 28)

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Guide
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2016

Declaration

I Declare that this written submission represents my ideas in my own words and where others' ides or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misinterpreted or fabricated or falsified any idea/data/fact /source in my submission. I understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper submission has not been taken when needed.

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Mobility& Vehicle design

28/12/2015

Approval Sheet

This Mobility & Vehicle Design project report titled Styling of Electric Commuter motorcycle for Urban Youth by Ajithlal C M is approved in partial fulfilment of the requirements for Master of Design degree in mobility and Vehicle Design.

Project Guide :

Chair Person :

Internal Examiner : (FOR PROF ER)

External Examiner :

Date : 8/01/2016

Place : Mumbai

Acknowledgement

In acknowledgement, I would like to thank Prof. Nishant Sharma for guiding me in the project. I am very thankful for his support, patience and valuable inputs during this project.

I would also like to thank my family, my teachers and all my friends from IDC, for being a constant source of support and inspiration.

Ajithlal C M

Contents

Abstract

India is a young nation. 50% of India,s population are of under 25 years of age. Young people wish to express themselves through the things they own. Especially so in the case of vehicles. Even if India is the second largest motorcycle market in the world, it is dominated by commuter motorcycles. For youngsters who live in urban area, the choice is normally any of the mainstream commuter motorcycles, which is aimed at a larger demographic. The project is about styling an electric urban commuter motorcycle for the youth which reflects their lifestyle. Electric drivetrain is preferred because it allows more form exploration.

Interviews with potential customers were conducted in order to obtain their insights. These combined with the pre research led to the formation of the concise design breif : ‘ Styling of an electrically powered commuter motorcycle for the urban youthof India’. A vehicle architecture was chosen after comparing and studying different motorcycles that can possibly fulfil the customer needs. Based on the chosen platform, the space and form arrangements are explored and arrived in a final design is derived after concept explorations and evaluation.

The deliverables would be the project report, photorealistic renders of the finalized concept and a 1:3 physical model of the same.

1. Pre research

1.1 Scope for Project

India has a very large young population. A motorcycle is the most appropriate mean of travel for many of them, as motorcycles provide easiness of travel, low cost and mainly the fun of riding. Motorcycles also have an aspirational value to them. . They can be the extension of one's personality.

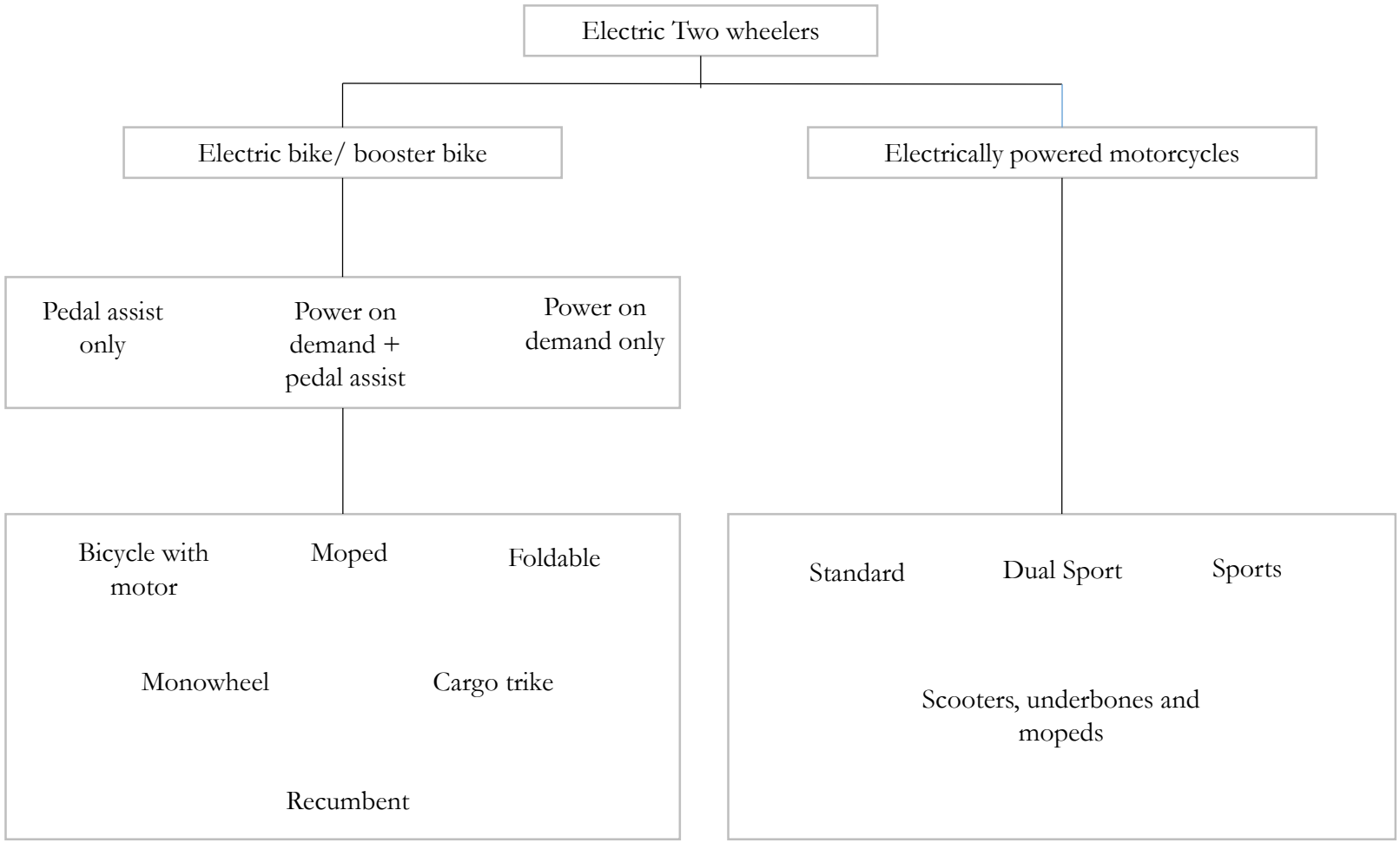
As in the case of any other consumer product, there are different types of motorcycles for different lifestyles. Our market is getting saturated with similarly styled models. It is getting increasingly difficult to get the right motorcycle for those who wish to make a statement other than the popular one.

Since India is becoming the biggest motorcycle market in the world, the leading manufacturers are competing to create new segments and come in the lead. Electric motorcycles are the most overlooked segment here. Considering the fact that India is becoming a urbanized country like china, which accounts for 76% of all of the electric two wheelers sold in the world, this segment has immense potential.

Doing a project on a vehicle of this segment will help one understand the users and their needs, learn more about the types of motorcycles, what goes into making an electric motorcycle etc. Due to advancement in technologies and minimum moving components, the electric drivetrain gives more freedom for more experiments with motorcycle forms. Which, in the case of a styling project is a very welcome addition to have.

1.2 Literature review

1.2.1 Types of Electric two wheelers



1.2.2 Components

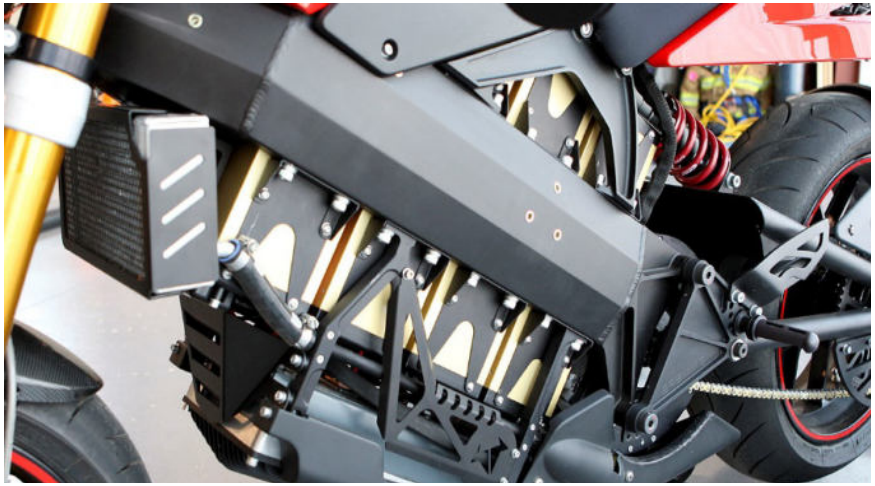
Power source

Most electric motorcycles and scooters today are powered by re-chargeable Lithium Ion, nickel- metal hydride or Lead acid batteries. Battery charging is done by either normal charging or battery swapping. The larger the capacity, the bulkier the battery pack is. This is a major design constraint. As the battery technology improves, the battery size and charging time are getting reduced.

Motor and Drivetrain

For electric motorcycles, the most commonly used motor is a DC brushless type. It may be placed on the frame or in the centre of the wheel (hub motor). Sometimes a reduction gear system is to help manage the torque. In the case of frame fixed motor, the power is transferred to rear wheels using a chain or belt drive.

[1]



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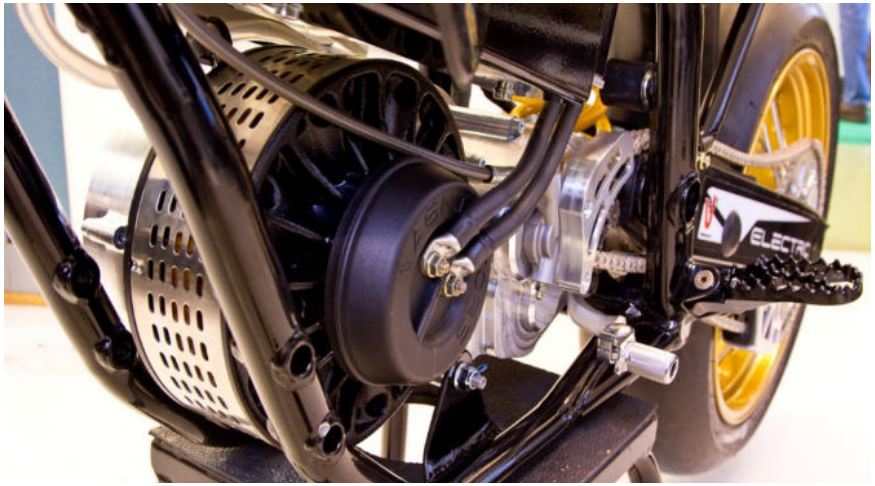


[1] http://g02.a.alicdn.com/kf/HTB1J3cSJXXXXXacXFXXq6xXFXXXx/Greentime-36V-48V-500W-600W-30Amax-BLDC-Motor-Controller-Electric-Bike-Tricycle-Controller-Driver.jpg

[2] http://media.zeromotorcycles.com/press-2011/small/ds/studio-detail/2011_zero-ds_detail_motor_1680x1200_press.jpg

Control Unit

A motor controller is a device or group of devices that serves to govern in some predetermined manner the performance of an electric motor. A motor controller includes a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and protecting against overloads and faults. It helps the rider to control the power output of the motor as he desires.

[1]

Charging Unit

As the name suggests, it charges the battery using external power supply. Different capacity batteries require specific rated chargers to charge efficiently. Some electric vehicles does have inbuilt charger. Instead they provide with an external charger.

[2]

[1] http://www.aliexpress.com/item/1500W-72V-DC-30-MOFSET-brushless-motor-speed-controller-BLDC-motor-controller-Ebike-E-scooter-EV/32451210189.html

[2] https://lib.store.yahoo.net/lib/yhst-139249549160997/Razor-Chargers-6-15.jpg

1.2.3 Motorcycle segmentation in India

Entry level

These are motorcycles provide just the essential features for day to day commuting. They comes at an entry level price tag too. These motorcycles provide upright and comfortable riding position . Engine size vary from 100 to 125 cc.
E.g. : hero CD Dawn, Honda Dream Neo

Deluxe

These are essentially cosmetically upgraded entry level motorcycles. It is done to make these vehicle appeal for a wider demographic. It is the largest selling segment in India, accounting for 50% of all the sales.

E.g. : Honda Dream Yuga
Honda Shine

Sporty

Sporty commuter motorcycles provide good performance and a sporty yet comfortable riding position for a relatively affordable price. These are aggressively styled to make them appealing for young customers. Engine sizes vary from 125 to 220 cc.

E.g. : Suzuki Gixxer
Yamaha FZ

Premium

For these motorcycles, being a purpose made performance motorcycle is as important as being a commuter. They often come at a high price range and offer premium components to provide great riding experience. Their engine size varies from 200 to 400 cc.
E.g. : Yamaha YZF R15
Honda CBR 250 R

1.3 International Scene (Commuters)

Suzuki Xtrigger

The Extrigger concept has battery/motor combo is good for 20 miles of range and a maximum speed of 20 mph.. It has premium components like inverted forks, a chunky aluminum swing arm, and wavy disc brakes and lithium-ion battery pack.

Caterham Classic

Caterham's Classic e-bike draws design inspiration from the track-board racers of the 1920s. The e-bike is powered by a 36 V, 250 W, brushless motor mounted in the center with a torque sensor to manage power. A 36 V, 12 Ah lithium battery provides the power.

Husqvarna E go

The Husqvarna Concept E-go is a lightweight electric motorcycle. It weighs only 80 kg. Styled to resemble Husqvarna's dirt bike heritage. It is aimed at those who do not want to ride scooters as a commuting vehicles.

Yamaha PES

This electric motorcycle is powered by their Yamaha Smart Power Module, a brushless DC motor with an lithium-ion battery pack. this street sport bike features a monocoque structure, manually-shiftable automatic transmission

Brammo Enertia

Enertia Plus has a 6.0 kWh Brammo Power Lithium Ion battery pack. will travel 80 miles on one charge, over 60 miles per hour, and should take about 6 hours to fully power up

Johammer j1

With its unconventional shape, J1 manages to stand out of the crowd. The J1 has a 11 kW motor.
It has a top speed of 120 km/h. The range of the batteries, between 150 to 200 kmThe charging time for 80 per cent is 2.5 hours.

Zero S

The Zero S have an 81 kilometre (50 mi) range on a full charge, with a top speed of 112 km/h . The motor is rated at 22 kilowatts (30 hp).

Terra Kiwami

It rates the motor at 10 kilowatts(13.4 horsepower). Though the company claims the performance of a 1000cc motorcycle, realistically it will have a top speed of 120 kmph.

Electric Motorsport GPR-S

The GPR-S for light commuters and motorcycle enthusiasts alike. It has a 14.2 kilowatt electric drive system and hi-power lithium and reaches highway speeds.It can travel for 35-60 miles per charge and reach a top speed of 60-70 MPH.

1.3 International Scene (Commuters): Inferences

In the international market, a large variety of electric commuter motorcycles are available. The manufacturers are trying to invade every segment with motorcycles with different sizes and shapes. The huge battery pack is one of the factor which limits the makers to stick to the conventional motorcycle form. But there are ways around this problem. The Johammer J1 for example, is a complete departure from conventional motorcycle form and intelligently utilizes the extra space gained for large battery pack.. Unless if the manufacturer wants to keep its heritage or revive an old style, sticking with traditional motorcycle form is not necessary.

1.4 Electric Two Wheelers in India

Motor and Pedal powered (Mo-Ped)

Motor driven cycles

Push scooter

Razer E32S

Powered bicycle

BSA CMX Electra

Moped

Avon E-bike

Scooter

My E bike Sporty

Motorcycle

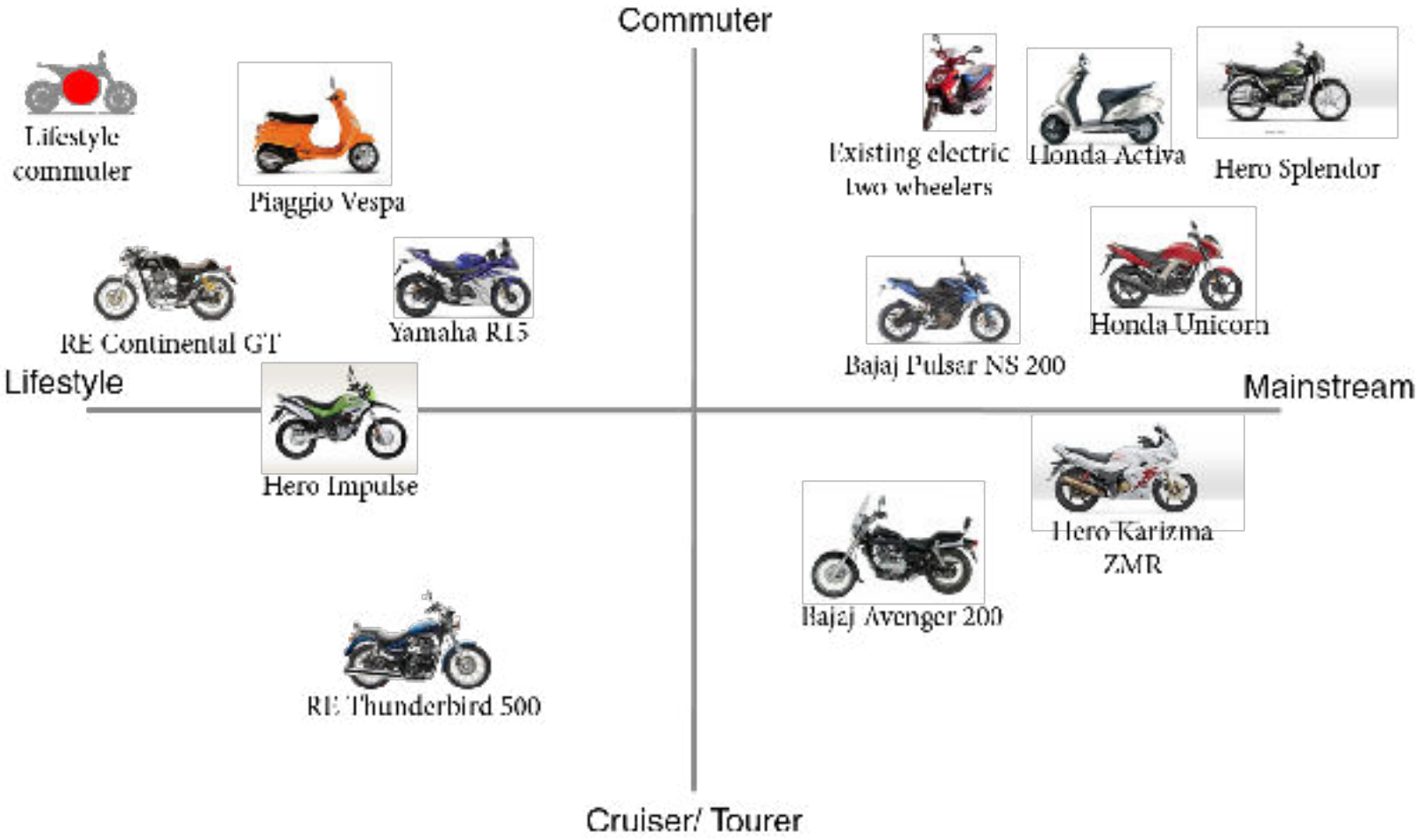
GENXT Evera

Electric two wheelers in India are either modified bicycles or styled similar to their fossil fuel counterparts. They lack identity. As these vehicles are made in low volumes and low cost, they are aesthetically less pleasing and lack in build quality.

1.5 Product Positioning

As of now, the range of electric motorcycles are less than that of a similarly priced petrol powered motorcycle. The main limitting factor of range is the size of the battery pack. Even if there are smaller batteries, they tend to be on the very expensive side, which the customers cannot afford. So the motorcycle is positioned in the commuter segment, as their daily travel is limited and can be well within a normal battery pack's range.

The mainstream commuter segment is very crowded very competitive. Due to the price and practicality factors, petrol powered motorcycles have the advantage in that segment. The success /failure of a radically different product in such a segment can be unpredictable. So the positioning is done in the lifestyle segment as there is space for experimentation.


Commuter
Lifestyle commuler
Piaggio Vespa
Existing electric two wheelers
Honda Activa
Hero Splendor
RE Continental GT
Yamaha R15
Bajaj Pulsar NS 200
Honda Unicorn
Lifestyle
Mainstream
Hero Impulse
Hero Karizma ZMR
Bajaj Avenger 200
RE Thunderbird 500
Cruiser/ Tourer

1.6 Product Study

To arrive at a motorcycle architecture which will provide the required essential segment defining characteristics , some motorcycles of particular segments needs to be studied. In this case, the segments are commuter and lifestyle.

Motorcycle 1: Royal Enfield Continental GT. It was selected because it is one of the more 'lifestylish' vehicle available in India.

Motorcycle 2: Hero Splendor. It is one of the most sold motorcycle in India. It can be said that the original Splendor started and defines the deluxe segment.

Motorcycle 3: Hero Impulse. It would be interesting to know what happened when a lifestyle motorcycle became commuter friendly.

Royal Enfield Continental GT

The new Continental GT was the result when Royal Enfield decided to reinvent itself to a big player in lifestyle motorcycle segment. The original GT when launched back in 1965 was the fastest 250cc motorcycle of Britain. The new GT is a contemporary take on it[1]. Royal Enfield has succeeded to make the new one a very beautiful looking machine. Even though a bit tamed, it manages to look a very well proportioned cafe racer with retro styling clues.

The mainimal bodywork has only 4 panels. The knee pocket on the fuel tank is such sculpted that it combined with the bodylines gives the whole motorcycle a slightly lean forward stance. The wheels are so placed that it makes the GT a well balanced stance.

Enfield has given the GT a lot of premium components like gas charged rear suspension, clip on handlebars etc, which makes it desirable.

http://ridermagazine.com/wp-content/uploads/2013/10/Royal-Enfield-action1.jpg

[1] http://www.autox.in/reviews/bike-reviews/royal-enfield-continental-gt-review/

Hero Splendor

When launched in 1994, the original Splendor was the deluxe replacement of then popular CD 100. It instantly became one of the most popular motorcycles of India of all time, and the largest selling too. The NXG is the latest version of the old trusted formula of cosmetic makeover a very good basic motorcycle. Which made it a desirable motorcycle for the average Indian familyman.

It is designed around the upright riding position of rider. It gives more importance to practicality than aesthetics. Still Hero tried to make it look modern. It has blacked out everything with tone colour schemes to reduce the visual clutter.

http://www.topgear.com/india/images/stories/articles/512x288/2014Jun04113721.jpg

Hero Impulse

Hero Impulse cracked open a new segment of Adventure commuter in Indian motorcycle scene when launced in 2011 and it remains the only one in that segment till now. Hero offers a offroadable motorcycle in the sporty commuter segment in a relatively affordable price point.

It has an upright, relaxed seating position with wide set handlebars and forward set footpegs. Seat height is relatively high which is a result of high ground clearance. With its large rake angle, front wheel sits way forward of the rider making a surefooted stance. The high up headlight position and lighter colour tones combined with narrow tyres and black rims makes the whole motorcycle look top heavy and somewhat unbalanced.

Though being spartan, it manages to look like it can do what it is made for because of its exposed and purpose built components, like coverless chain, long suspension

http://bikeadvice.in/wp-content/uploads/2012/03/Hero-Impulse-7.jpg

1.7 Product Study : Inferences

Even though the models studied differ in many aspects like their respective segments, price range, riding position, styling etc, they have something in common. These models brought some features which are new in the segment and differentiated themselves from the rest. The Continental GT brought cafe racer style to Indian motorcycle scene. It instantly became a style icon and other manufacturers were inspired from it. The GT redefined what a modern retro cafe racer should look like. Hero Impulse is the first adventure tourer/commuter styled motorcycle to come from any Indian manufacturer. It enabled Indian offroad enthusiasts to enjoy their commuter motorcycles. The Hero Splendor Ismart brought start-stop technology to a fuel efficiency consious market and made itself stand out.

1.8 Dimensions Benchmarking

To proceed with the design process, a motorcycle architecture which will fulfil the riding requirements of the target customers is required. From the commuter motorcycle segments, such a platform is selected based on popular magazine reviews.

Among the commuter motorcycles, The dimensions and geometry of Honda Unicorn are taken as a reference as the Unicorn has got the right mix of fun of riding, riding comfort and ergonomics[1].

Dimensions[2]:

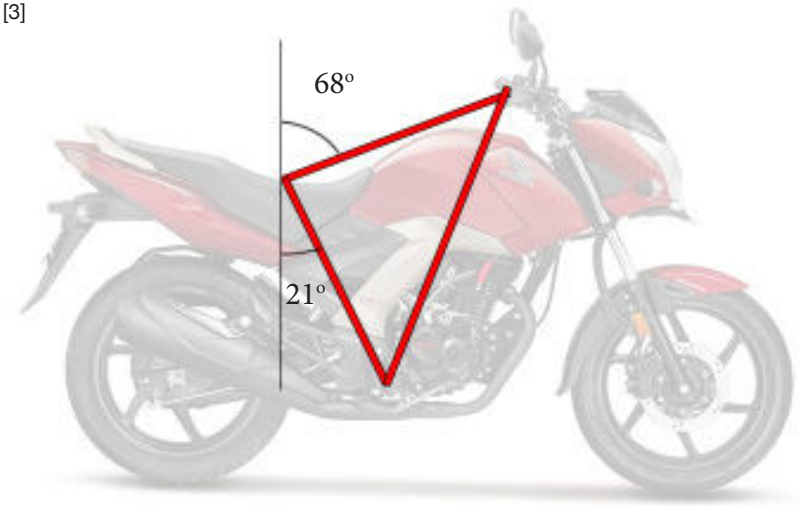
Wheel base : 1340 mm

Seat height : 790 mm

Geometry:

Rake angle : 23^0

[3]



[1] http://www.mouthshut.com/review/Honda-Unicorn-150-cc-review-mqoqsqmmlm
http://www.topgear.com/india/our-bike-reviews/cb-unicorn/itemid-52?id=3645
http://www.team-bhp.com/forum/motorbikes/157861-honda-cb-unicorn-160-a.html

[2] http://www.honda2wheelersindia.com/CBUnicorn160/specifications/
[3] http://cdn.zeegnition.com/sites/default/files/Honda%20Unicorn%20160%20cover.jpg

2 Research

2.1 User Research

The user research is done in order to collect more information about the prospective user in order to come up with a product that fulfils their needs. This information includes age, sex, profession, personality, values, opinion,attitudes, interests etc.
Understanding the point in time where the product is being used by the user, and their emotional and rational reasons behind choosing a particular product are also important. Getting an idea about their common preferences in types of forms, colours and textures will also be helpful.

The method used for data collection is by a survey. A questionnaire for the survey is prepared , which includes questions regarding the user's interests, hobbies, etc. A few prospective users were approached with the questionnaire. Users were selected on the basis of their age, sex, profession and their attitude towards motorcycles. The collected information wa s analyzed to find out the common requirements and keywords based on which the design process can be proceeded.

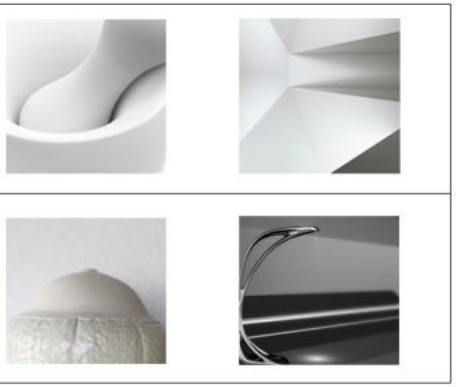
2.1.1 User Research : Questionnaire

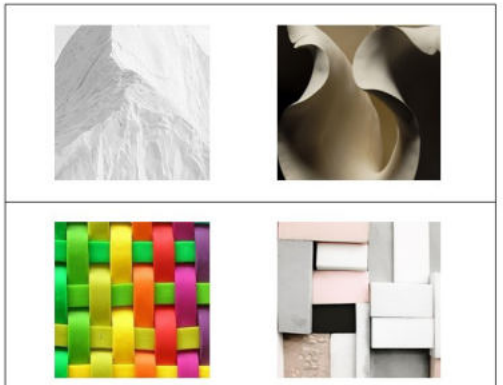
Vehicle styling questionnaire

Name -
Age -
Occupation -

1. What do you look for when you buy a new bike?
2. Which is your favorite bike model and why?
3. Name two of your interests

Pick the one you like from each pair

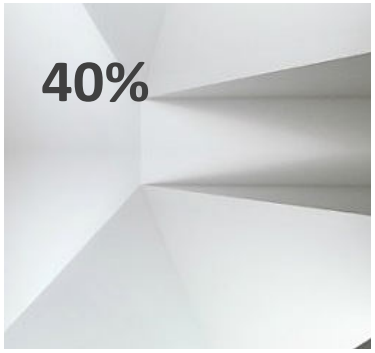




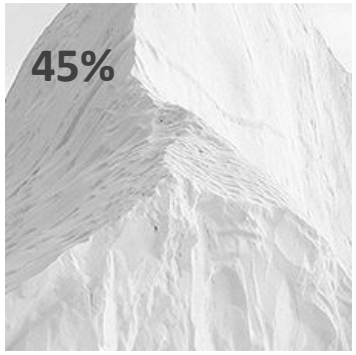
2.2 User Research : Analysis

Form and colour preferences

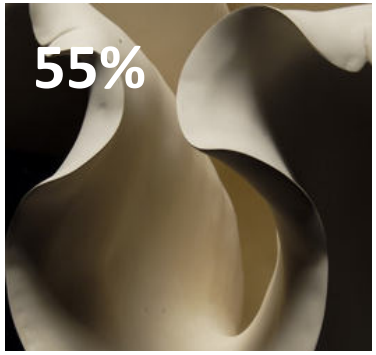
Organic



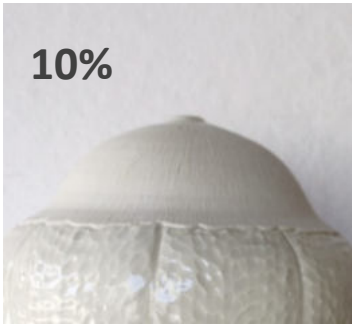
Geometric



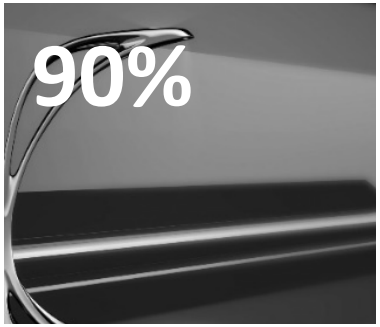
Rugged



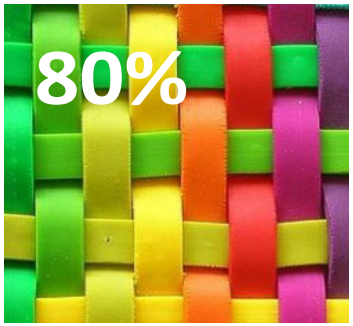
Soft



Static



Dynamic



Sporty

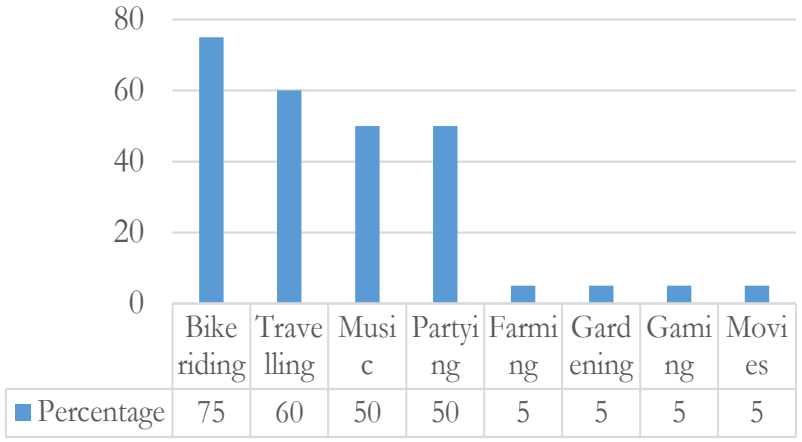
Sedate

What the users look for in a motorcycle?

Looks and performance are the main factors that can affect the buying decision. Price, new features and comfort are also worth mentioning. From the styling point of view, the sense of performance may be integrated to the looks of the motorcycle.

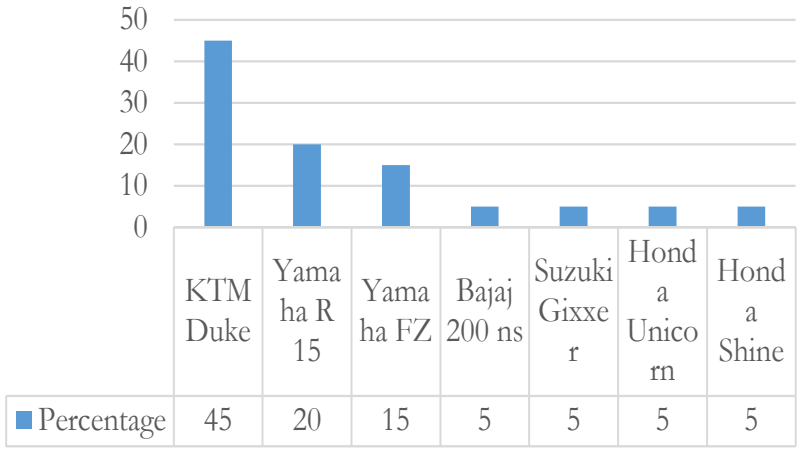
Hobbies/ Interests

The majority is interested in bike riding and travelling. The youth are into partying and music as well. It is evident that the prospective users like to have fun and enjoy freedom.



Most favored motorcycles

The most favored motorcycles are KTM Duke, Yamaha R15, and Yamaha FZ. Even though these models differ in their design languages, they retain some common characteristics.



2.3 User research : Inferences

Inferences:

A commuter motorcycle for this particular customers requires
Dynamic visual characteristics
Fun to ride nature
Comfortable yet sporty riding posture
Storage for essentials

The motorcycle must be styled in a way that the form expresses dynamism in contemporary fashion and enhances the experience of riding. New features and technologies may be used to improve the premiumness.

2.4 Keywords

Keywords from user study

Dynamic

90% chose dynamic forms.
70% likes dynamic looking motorcycles.
80% likes sporty colors.

Contemporary

Product study suggests that motocycles in this particular category should have contemporary design cues and modern features.

Fun

The user's hobbies include leisure rides and partying, also they like their motorcycles to be fun to ride.

3 Design brief

Design a electrically powered single seated commuter motorcycle for the urban youth

Audience

The motorcycle is for the urban youth (men). Age group is 20 to 25

Aesthetic Intent

The vehicle should be styled with contemporary design cues, dynamic proportions and commuter friendly yet fun to ride seating position. It should also have a distinct identity.

Packaging

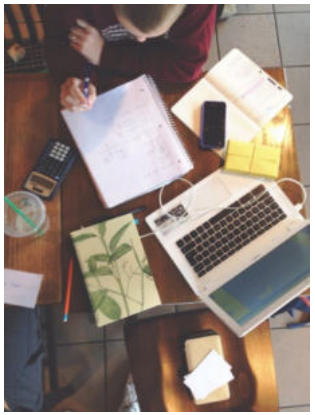
The motorcycle is to be designed around a set wheelbase, rake angle and seat height as follows

Wheel base	: 1340 mm
Seat height	: 790 mm
Rake angle	: 23^0

4 Persona

Name : Rohit Raj
Age : 24
Male
Student at Mumbai University

[1]



[2]

Behaviors

Maintains his bike in impeccable condition
Buys accessories for his ride
Goes on occasional trips with friends
Updated about latest technologies
Always well dressed

Needs/ Goals

Wants to stand out of the crowd, look his best all the time.
Aspiring motorcycle rider
Wishes to become a successful entrepreneur

[1] http://previews.123rf.com/images/ximagination/ximagination1408/ximagination140800677/31163381-High-angle-view-table-of-student-doing-homework-with-laptop-computer-Stock-Photo.jpg
[2] http://www.goodlivingtips.co.uk/wp-content/uploads/2015/07/Evening-ride.jpg
[3] https://c2.staticflickr.com/6/5188/5560242893_a049476b7e.jpg

5 Concept Generation

Concept generation stage starts with creating moodboards appropriate for the keywords obtained from the research done. Moodboards help in creating the suitable ambience to generate forms and in translating the emotion which is expressed through the design.

5.1 Moodboard

Contemporary

Contemporary design refers to what is popular or used right now. So the moodboard is made by including images of some products which represents latest design trends.

[1]

[2]

[3]

[4]

[1]http://core0.staticworld.net/images/article/2015/09/iphone-6s-6splus-100617434-orig.jpg
[2]http://www.prodirectsoccer.com/productimages/V3_1_Main/107686.jpg
[3]http://image.architonic.com/img_pro2-1/130/2516/asia-soft-pol-a-6540736-b.jpg
[4]https://s-media-cache-ak0.pinimg.com/736x/6f/d1/62/6fd162760ebf7316382881fac40a0c74.jpg

Dynamic

Dynamic means energetic, capable of action and/or change, or forceful. Volumes and lines which are continuously changing depicting motion or direction are suitable for expressing the sense of dynamism.

[1]

[2]

[3]

[4]

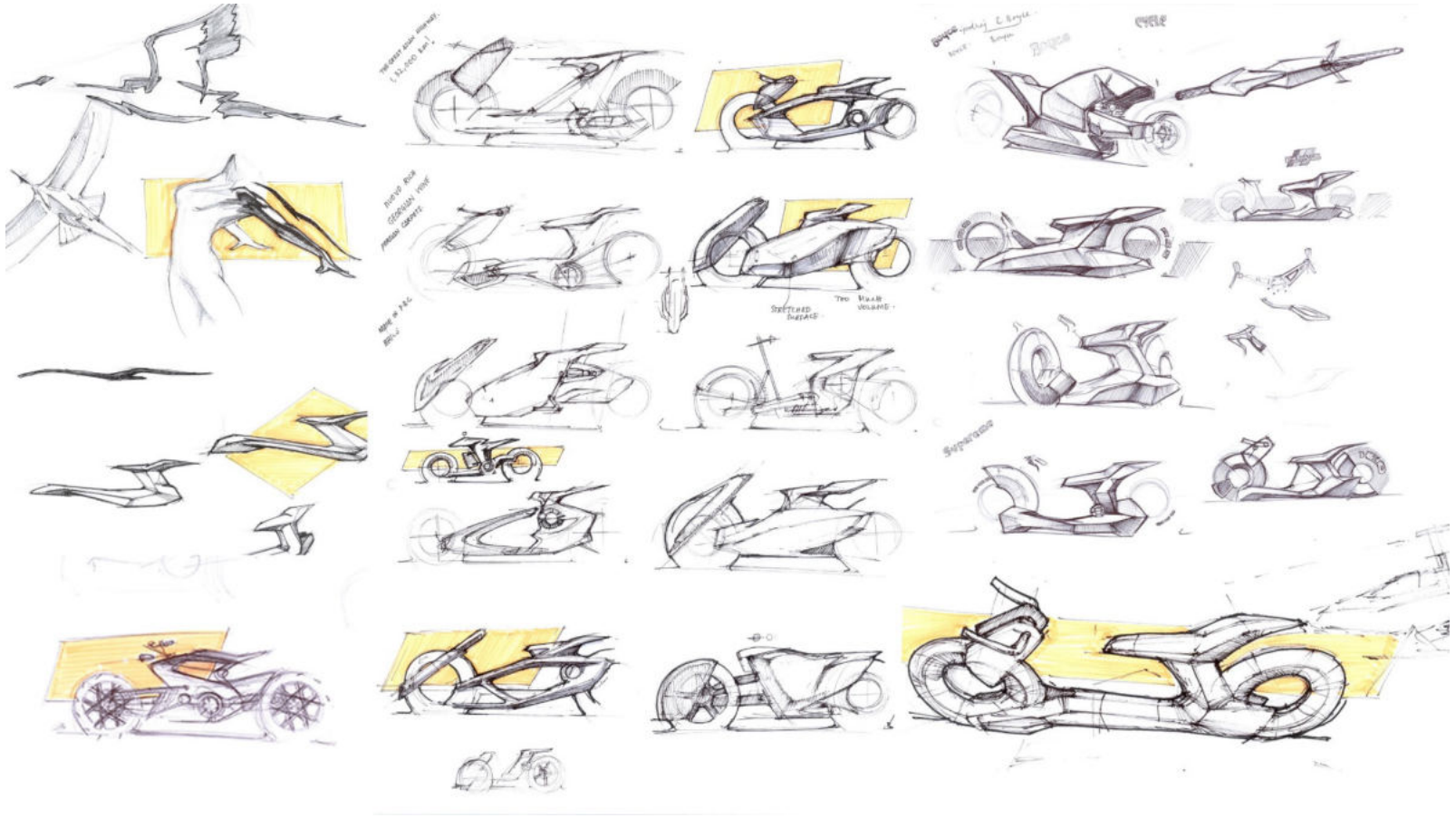
[1] http://images.worldarchitecture.org/2-17-.jpg
[2] http://cdn.homedit.com/wp-content/uploads/2012/04/07_rg1_sidchr-rd_r_760x1150_1.jpg
[3] http://www.zuup.com/Upload/dmadray_20101013025750.jpeg
[4] http://objects.designapplause.com/wp-content/xxG58hlz9/2011/02/bertoia-chaise-1.png

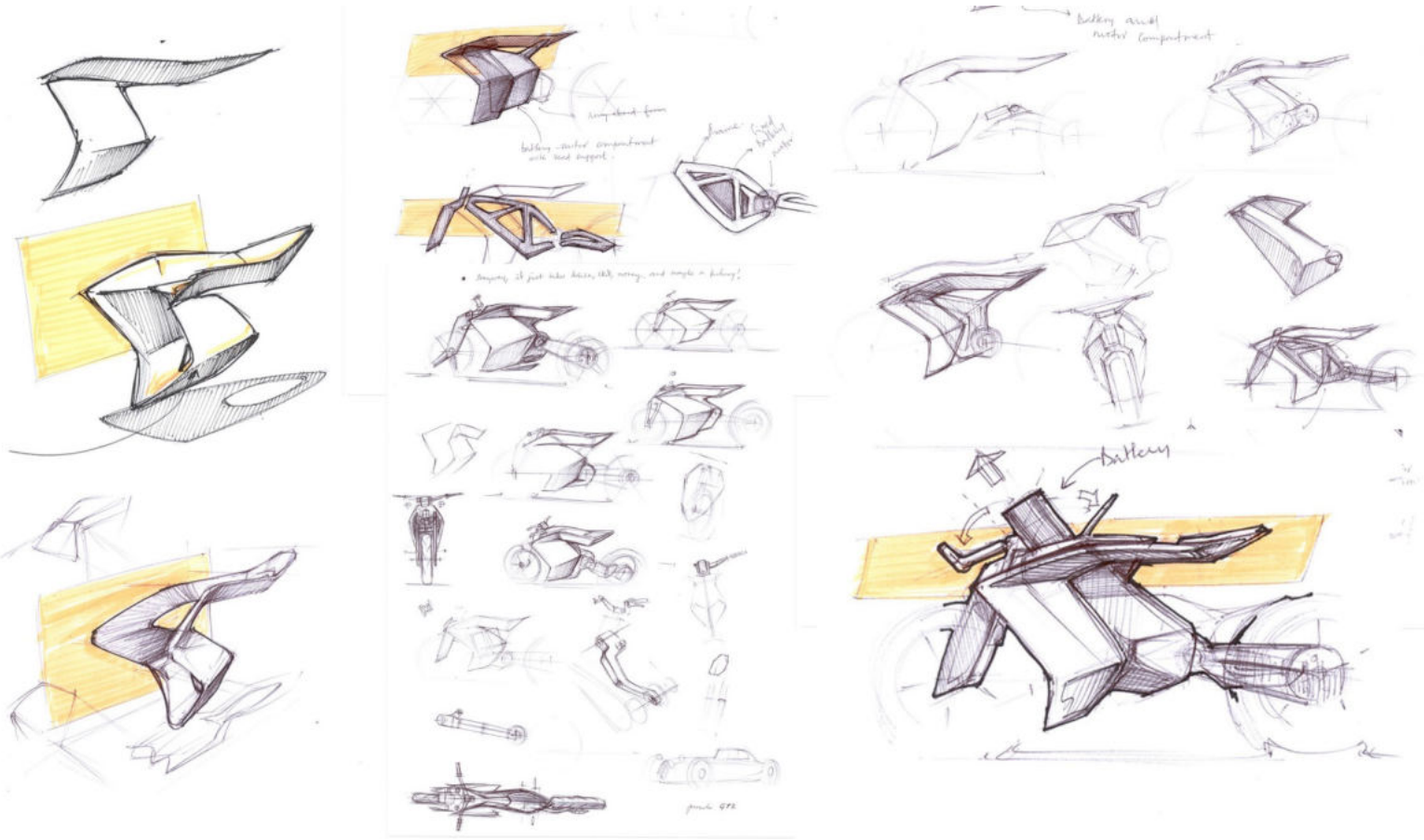
Fun

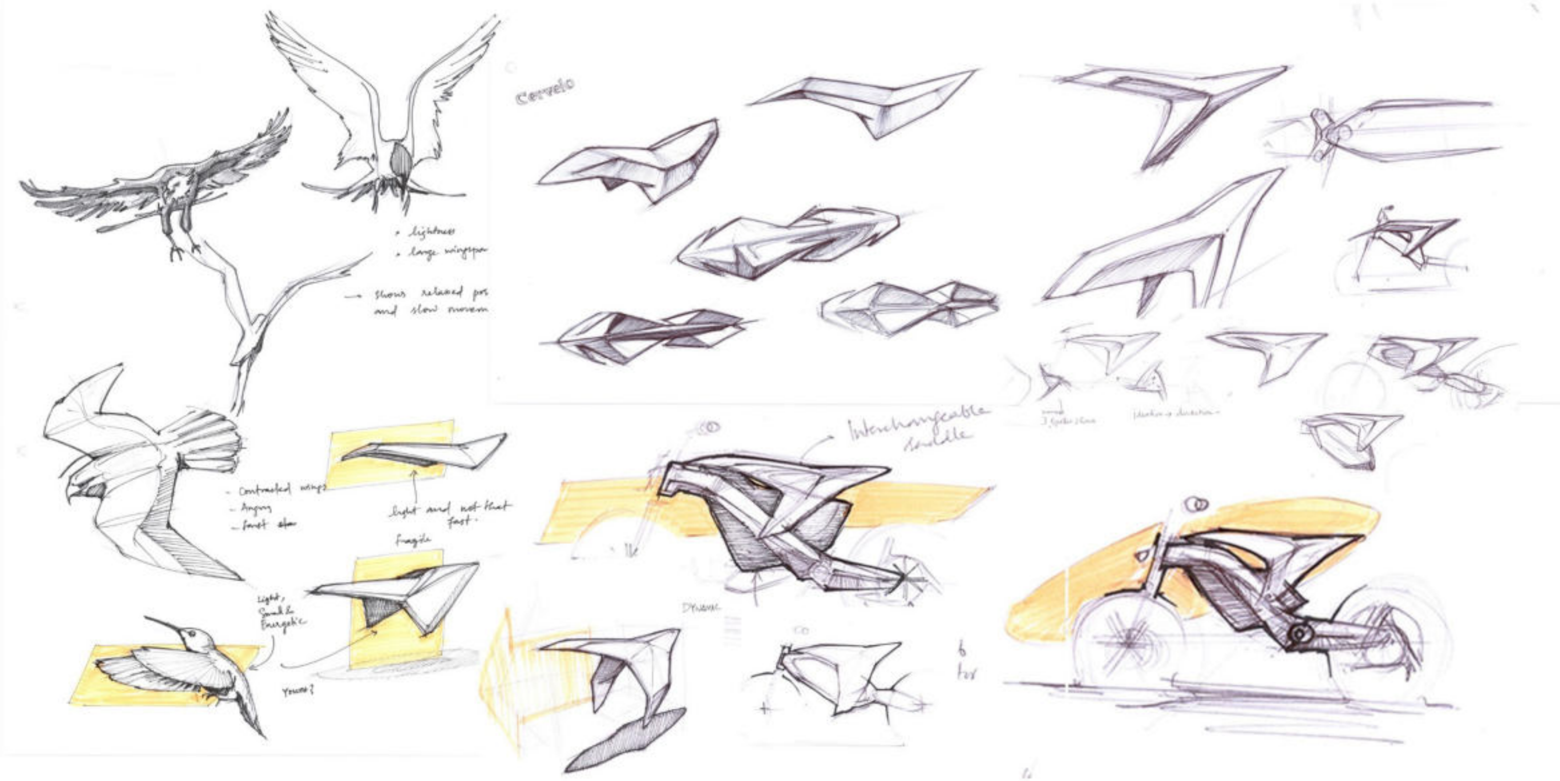
Having fun means to enjoy one's self while involving in some activity. In this context, the sense of fun to ride quality of motorcycle is represented through images.

[1] https://i.ytimg.com/vi/YUeskpQOBj4/hqdefault.jpg
[2] http://www.immediateentourage.com/ie/wp-content/uploads/2013/10/Orange-Pants-BMX-copy.png
[3] http://cache3.asset-cache.net/gc/465911341-guy-having-fun-with-a-skateboard-at-sunset-gettyimages.jpg?v=1&c=IWSAset&k=2&d=NDhaIDKUGgjTdRYVSThnLa6T4zpfQ43QP0i556MXXTjchZNNb7jBgHofAGamyJGM

5.2 Exploration sketches

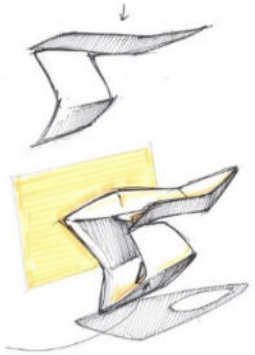



battery
battery axial
motor compartment

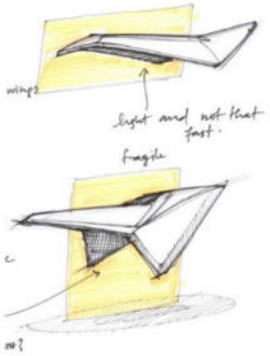

Cervelo
- lightness
- large wingspan
→ shows relaxed pos and slow movem
- Contracted wings
- Angry
light and not that fast.
Fragile
Light, Small & Energetic
Interchangeable saddle
Dynamic

5.3 Directional sketches

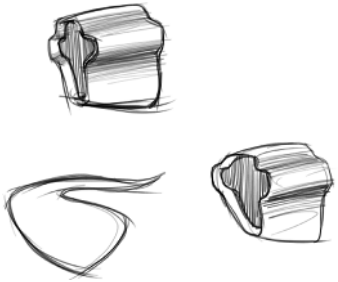
Contemporariness in different dynamic forms



Aggressive speed

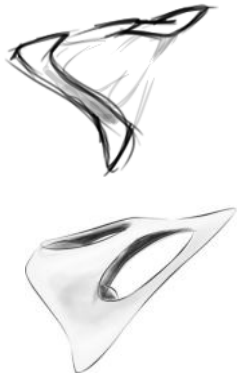


Light and sharp



Modern muscle

Quick and floating

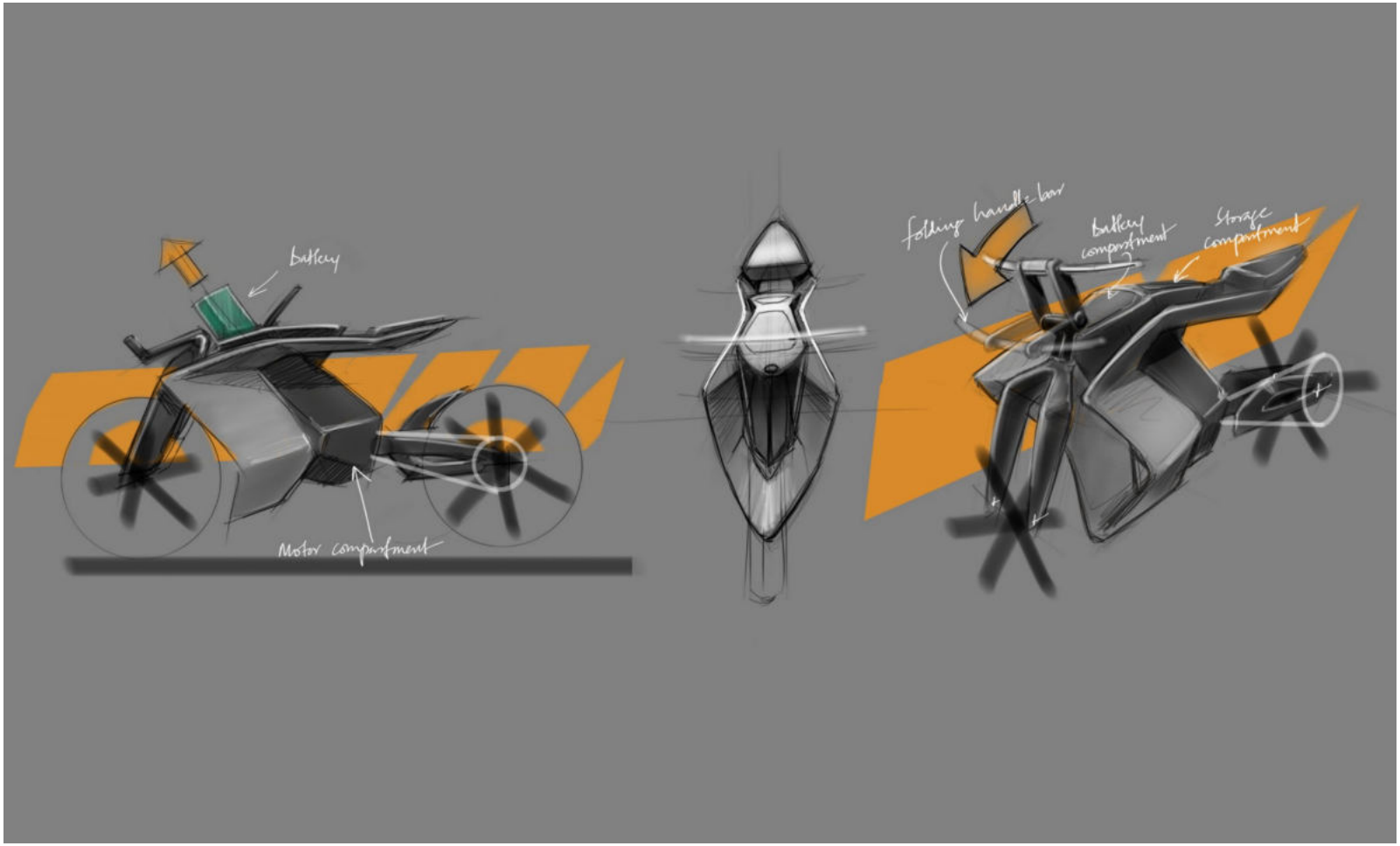


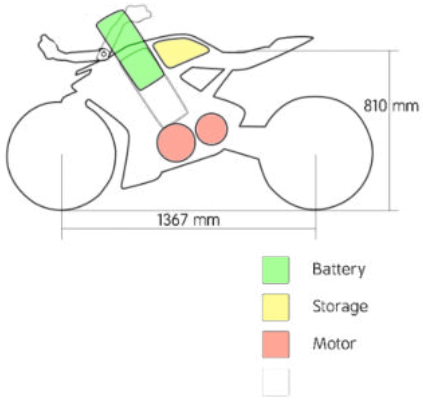
Forceful and minimal

5.4 Concept 1

Aggressive speed

This concept form consists of mainly two volumes. The sharp, continuous outer shell is the result of combining a sharp, triangular shape with a dynamically continuous loop. The inner form is made by the intersection between the shell and its interior space, which is the battery pack. The overall form is given a leaning forward stance to express speed and aggression.

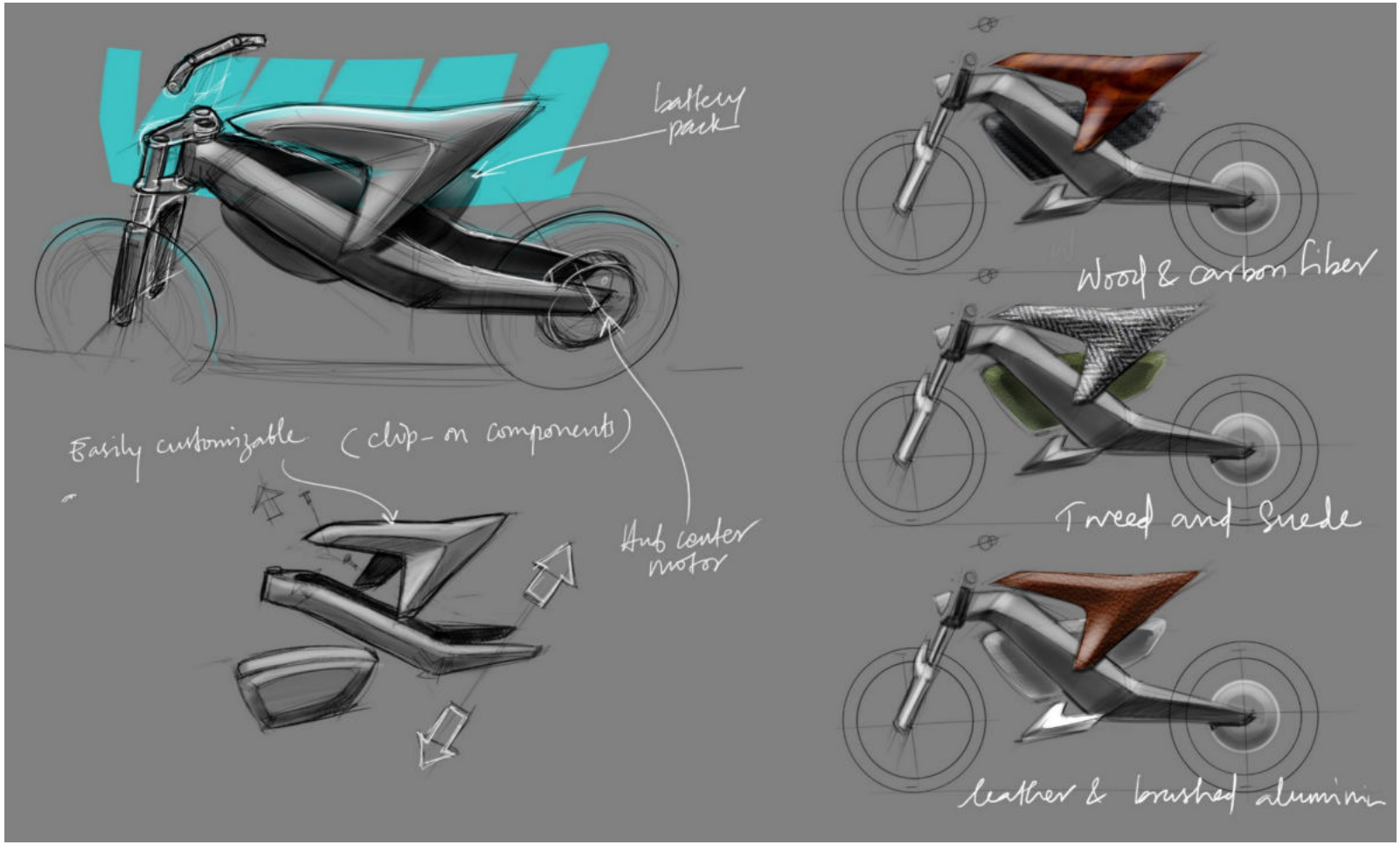

battery
Motor compartment
folding handle bar
battery compartment
Storage compartment

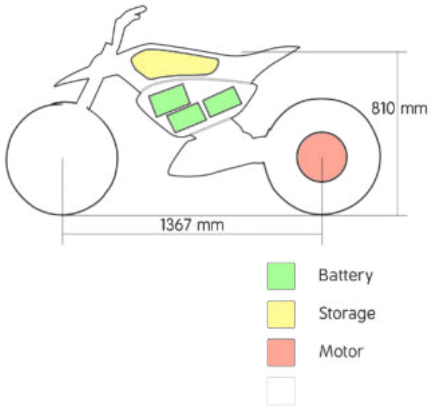

810 mm
1367 mm
Battery
Storage
Motor

5.5 Concept 2

Light and sharp

To express dynamism through lightness, the top part(the seat) is inspired from the wings of a humming bird while it is in motion. The sharp lines and flat surface treatment gives a strong sense of preciseness. The frame came into being as the result of trying to visually balance the seat. It also made the vehicle look minimal. The battery pack in the centre is shaped in such a way that it enhances the total stance. It disturbed the overall balance of the combined form. To avoid that, an underbody cowl is added and let it follow a line from the seat. It made the form look more integrated.


battery pack
Easily customizable (clip-on components)
Hub center motor
Wood & carbon fiber
Tweed and Suede
leather & brushed aluminum

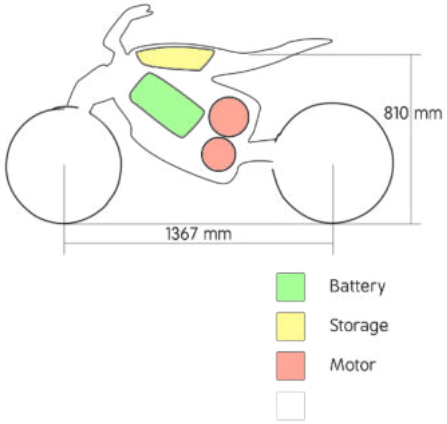

810 mm
1367 mm
Battery
Storage
Motor

5.6 Concept 3

Modern muscle

The theme for this concept was to subtly integrate some amount of muscle into a modern looking form. Since this being an electric motorcycle, a geometric form was selected which represents the power source, the battery. The edges were rounded of just the right amount so that it is nor too soft or very geometric. While trying to add volume to make the form more three dimensional, headlights side flare were added to it. Which resulted in a very distinctive but somewhat static form. To make it more dynamic, the tail piece was added. The idea of an integrated seat resulted in an interesting surface transition which captures light and highlights the muscle.

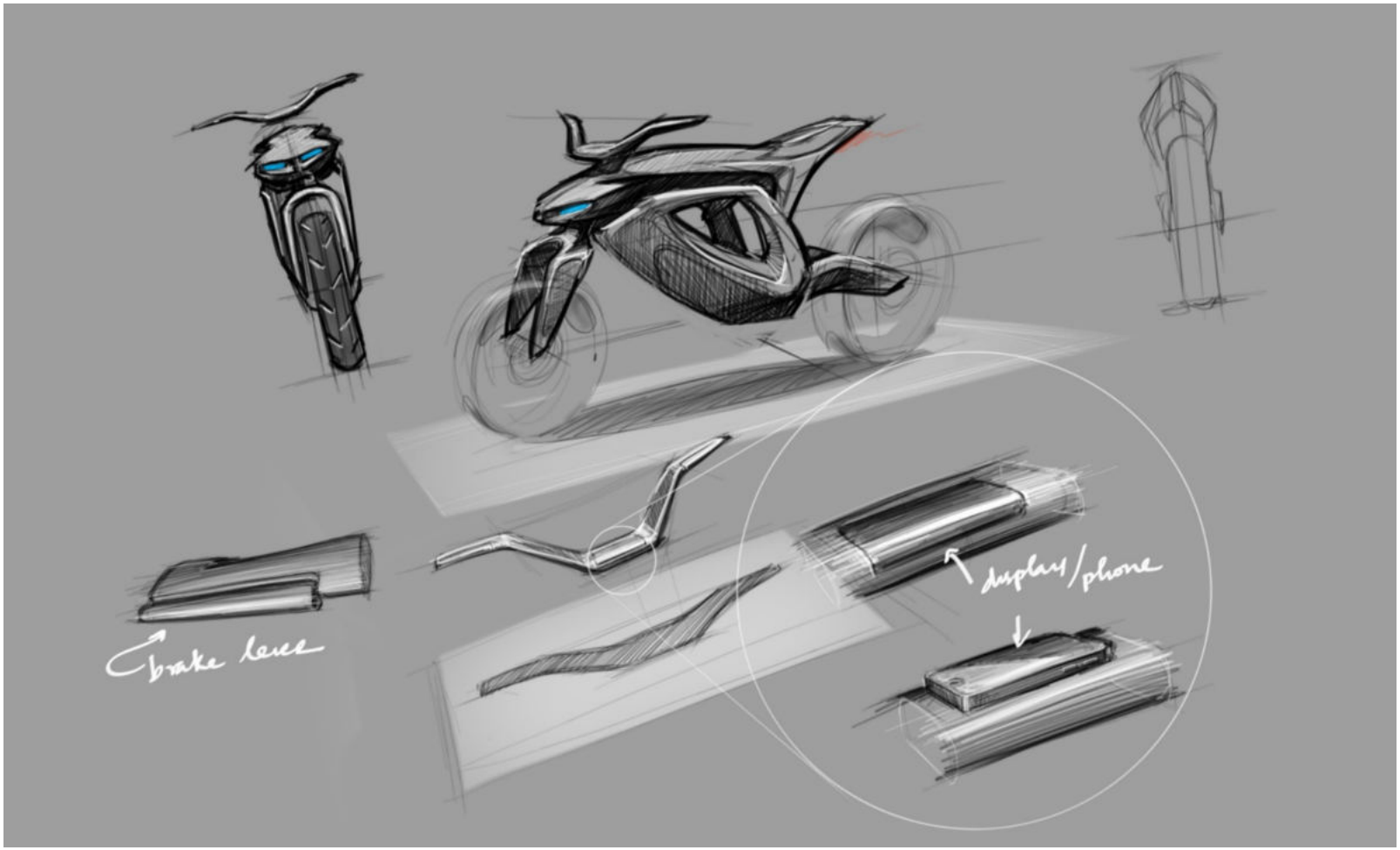

STORAGE
BATTERY & MOTOR

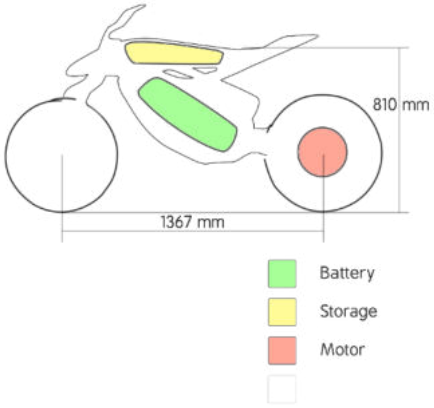

810 mm
1367 mm
Battery
Storage
Motor

5.7 Concept 4

Quick and floating

To express comfortable yet fun to ride nature in a dynamic form, a sleek, flowing form is selected. A detached volume is added below the first form to make it look floating and cushioned by air. Cutting out the central part of the top form made it look too weak and fragile. So a small projection is added along the top curve to make it look more substantial. The battery pack is given a cutout to reduce the visual mass. The cutout curve follows the line joining the head and rear wheel. This line adds a sense of urgency when combined with the top form's contour. Swingarm was added to complement the whole form and to visually balance .


brake lever
display/phone


810 mm
1367 mm
Battery
Storage
Motor


SS4
SHOCK

5.8 Concept 5

Forceful and minimal

The visual inspiration for this form was a tight skin stretched by a forcefully moving object. The curves and surfaces are dictated by the force acting through the skin. This allowed to integrate the seat with the rest of the body in a minimalistic manner. This form conveys the idea that the power source pushing the whole form ahead.

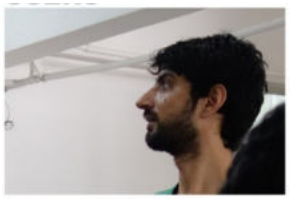

ZERO

6 User evaluation

User evaluation is done to get the feedback from the prospective users about the concepts. It also helps in finalizing on one concept and then proceed with it. The process followed was to show the 5 concepts to some of the prospective users and ask for what they like/dislike from each of the concepts. The likes and dislikes are represented by green and red stickers. Their ranking of these models from one to five will also be considered while finalizing on one concept.

The prospective users belongs to the particular age group, and have prior knowledge about motorcycles and riding, so that they can provide constructive feedback on the concepts.

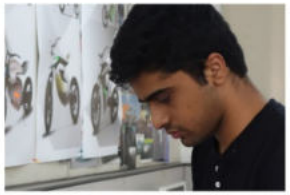
6.1 User evaluation : Prospective users



Sandeep
Age : 28
Engineer

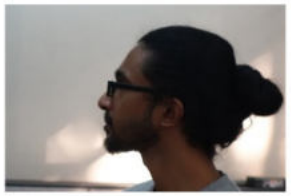
Aniket
Age : 23
Designer

Shyam Sundar
Age : 28
Research Assistant



Thejas
Age : 22
Engineer

Sarthak
Age : 22
Engineer



Prasanth
Age : 26
Research Assistant

Paul Anthony
Age : 27
Research Assistant

Ashwin
Age : 23
Student

Shubham
Age : 20
Student

Jishnu
Age : 23
Engineer

6.2 User evaluation
: The process

6.3 User evaluation Results

Feedback about concept 1

Feedback

Really aggressive
Looks intimidating
Has a big bike feel

Likes

Headlamp position and front mudguard
Wide handlebar
Frame and swingarm follows the same language
Front end looks familiar

Dislikes

The inner form looks crooked
The bottom part looks drooping down
Rear end looks too sharp

Feedback about concept 2

Feedback

Looks pointy and sharp
Has a dirtbike look to it
Looks hollow because of the frame shape

Likes

Headlamp position and front mudguard
Wide handlebar
Frame and swingarm follows the same language
Front end looks familiar

Dislikes

The bottom cowl looks disproportionate

Likes Dislikes

Feedback about concept 3

Feedback

Front forks suits the whole body, looks like it can do well what it is made for.

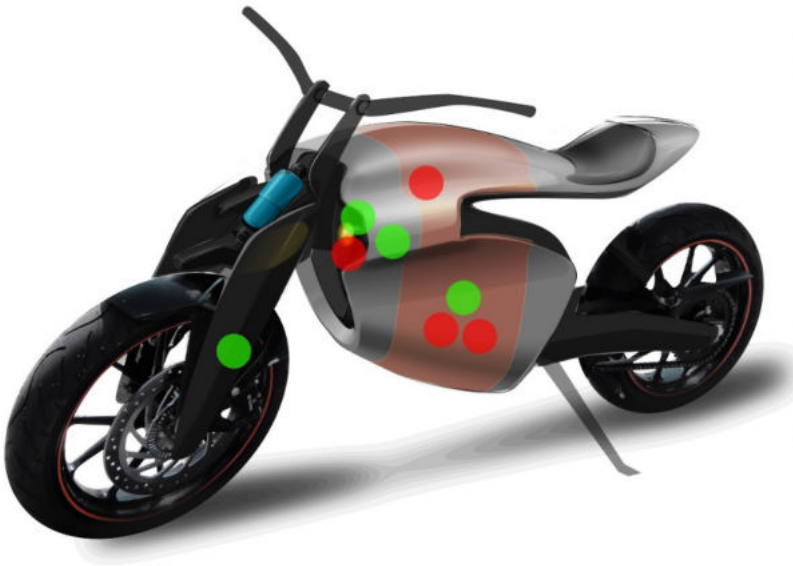
Has got nice presence due to long wheelbase and low body.

Likes

Headlight positioning is good
Side stripes are nice
Front end looks good

Dislikes

Front end looks incomplete
Curvatures are a bit too soft
Lower body seems bulky



Likes Dislikes

Feedback about concept 4

Feedback

Looks strange
Looks like the floating body is dragging the mass
Surface treatment makes it look like a fish

Likes

Headlight detailing
The blending and treatment of the upper body
The way the handle is integrated

Dislikes

Front forks look fake
The lower body looks like an animal's belly
Sharp cut on the body does not suit the whole design

Likes Dislikes

Feedback about concept 5

Feedback

Front end looks familiar, resembles existing motorcycles.
Handlebar position is good.

Likes

Headlight
Storage space looks like fuel tank
Looks well balanced

Dislikes

Seat support looks weak
Graphics looks odd

Likes Dislikes

6.4 User evaluation inferences

Concept 5 was rated highest because of its front end resembles existing motorcycles, which the users have already seen.

The least rated concept was no.4. the feedback was that concept 4 is too futuristic, and strange.

Concept 3 was ranked as 3rd , but it strikes the right balance between being distinctive and being too strange.

Concept 1 was considered too aggressive by the users.

Even though the users like concept 2, it was said to have resemblance with existing dirtbikes.

7 Rating and finalizing the concept

Finalizing is done based on the user rating, keywords and the intend of my project.

	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5
Overall user rating	33	29	32	24	40
Keywords By users	Aggressive Fast Sharp	Light Pointy Minimal	Different New Muscular	Light Futuristic Floating	Organic Clean Familiar

8 Packaging

Components

Chassis : Trellis frame

A trellis frame connects the steering head to the swingarm pivot as directly as possible using metal tube arranged in triangulated reinforcement. it is rigid, lightweight and suitable for small scale manufacturing like a lifestyle motorcycle.

[1]

Battery : Li-Ion

Smaller, lightweight , longer life and no leakage compared to conventional Lead Acid battery. It also has a larger lifespan compared to Lead Acid.

Dimensions (12 V, 55AH Li-Ion)
251*133*201 mm3
Weight : 8.2 kg

[2]

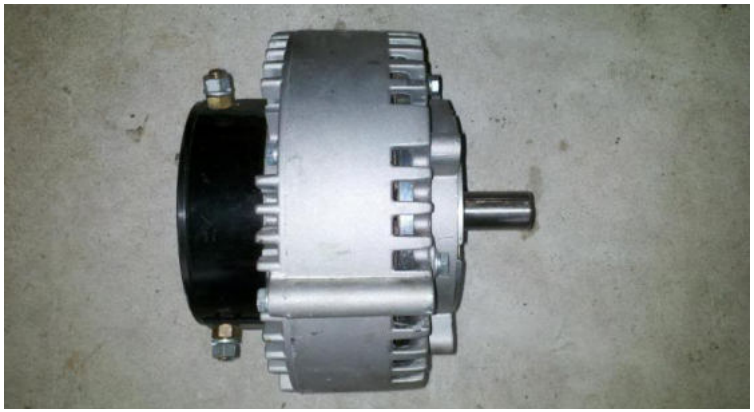
[1] https://lh5.googleusercontent.com/-LgEVofvKyNQ/T4UudT6K2NI/AAAAAAAABm8/WzS4mhTcGJo/s800/04%2520trellis%2520frame.jpg
[2] http://thumbs.ebaystatic.com/images/g/DT8AAOSwVupTourE/s-l225.jpg

Motor : 18 Horsepower 48 V 150 A DC, brusless motor

A Good balance between size, power and cost.

Dimensions Diameter :201 mm
Width :206 mm
Weight : 11 kg

[1]



Control unit : 300 A 24-48 V DC

Dimensions : 196*146*72 mm
Weight : 3.5 kg

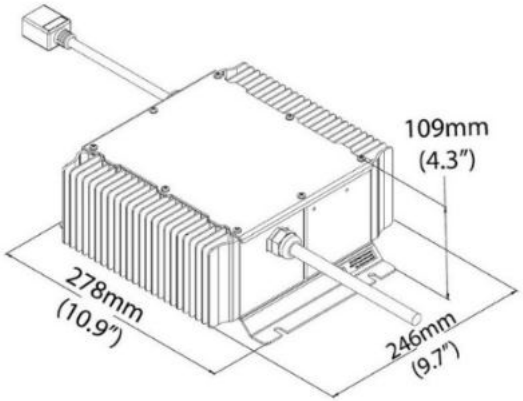
[2]

[1] http://www.eng.mu.edu/crovettj/ses/lib/motors/brigs/Etek_motor_pic.jpg
[2] http://sc02.alicdn.com/kf/HTB14H3FGVXXXXb8XFXXq6xXFXXXW.jpg

Charger : 48 V , 18A

Weight : 3 kg

[1]



Belt and sprocket (14 to 72 teeth)

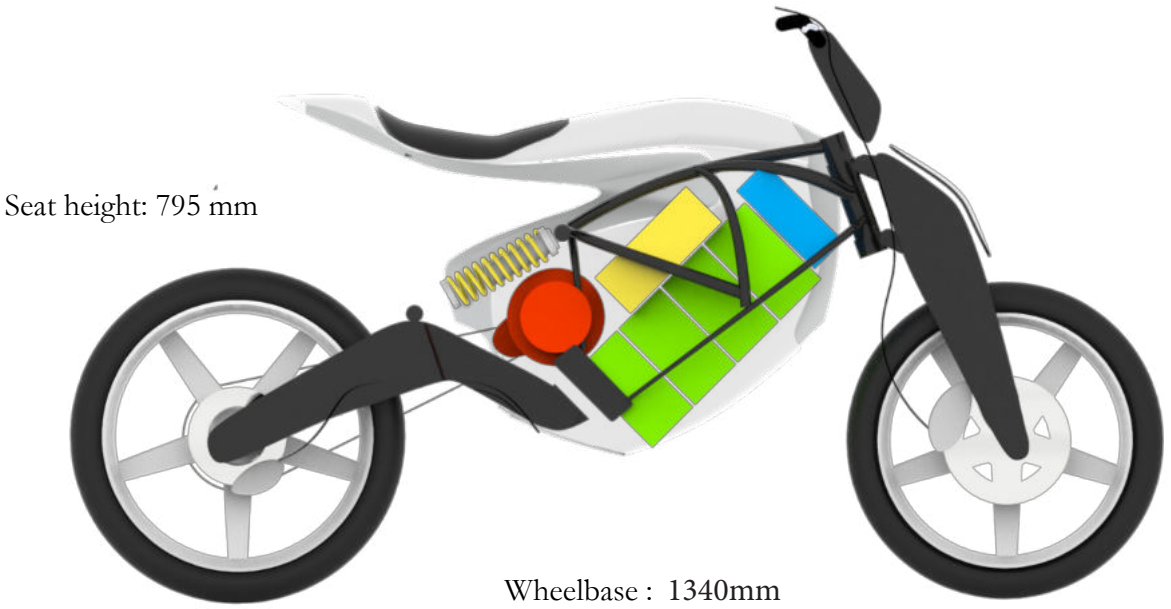
Silent, maintenance free and cleaner looking than chain drive.

[2]

[1] http://www.electriccarpartscompany.com/assets/images/ChargerDimensions.jpg
[2] http://s1.cdn.autoevolution.com/images/news/gallery/triumph-bonneville-belt-conversion-kit-photo-gallery_9.jpgt

Packaging diagram

Packaging is done in such a way that it minimizes the space utilization and the combination of components result in a form which goes in alignment to the motorcycle's form. It makes sense as the particular motorcycle has a form inspired from its power source and components inside.

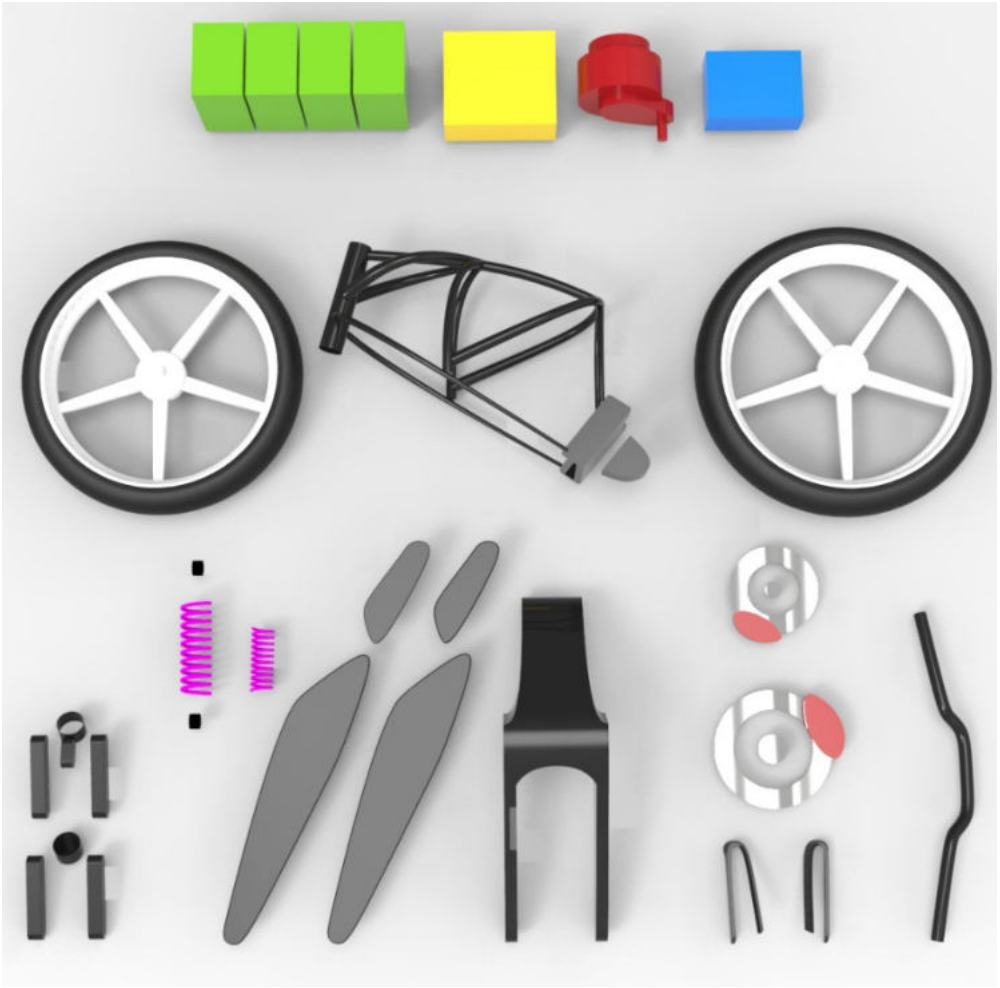


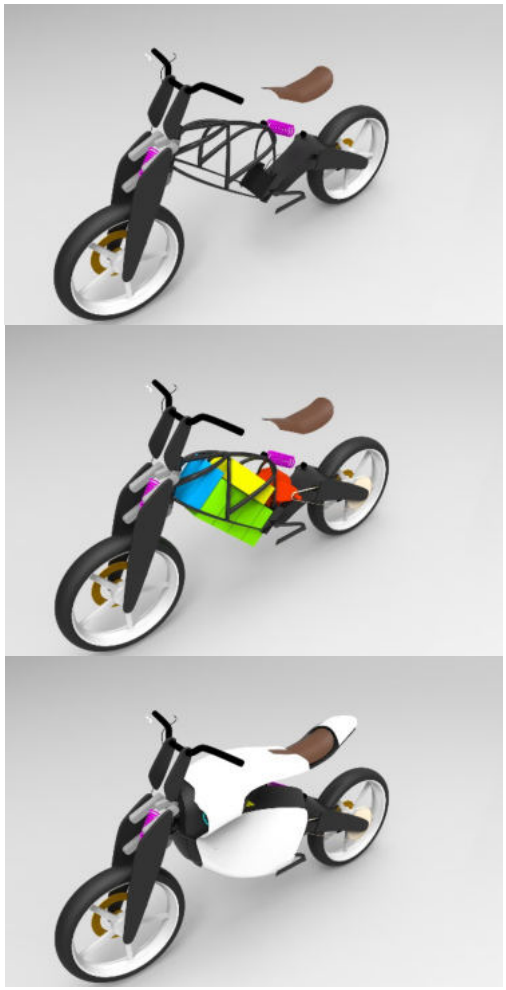
Charger

Battery

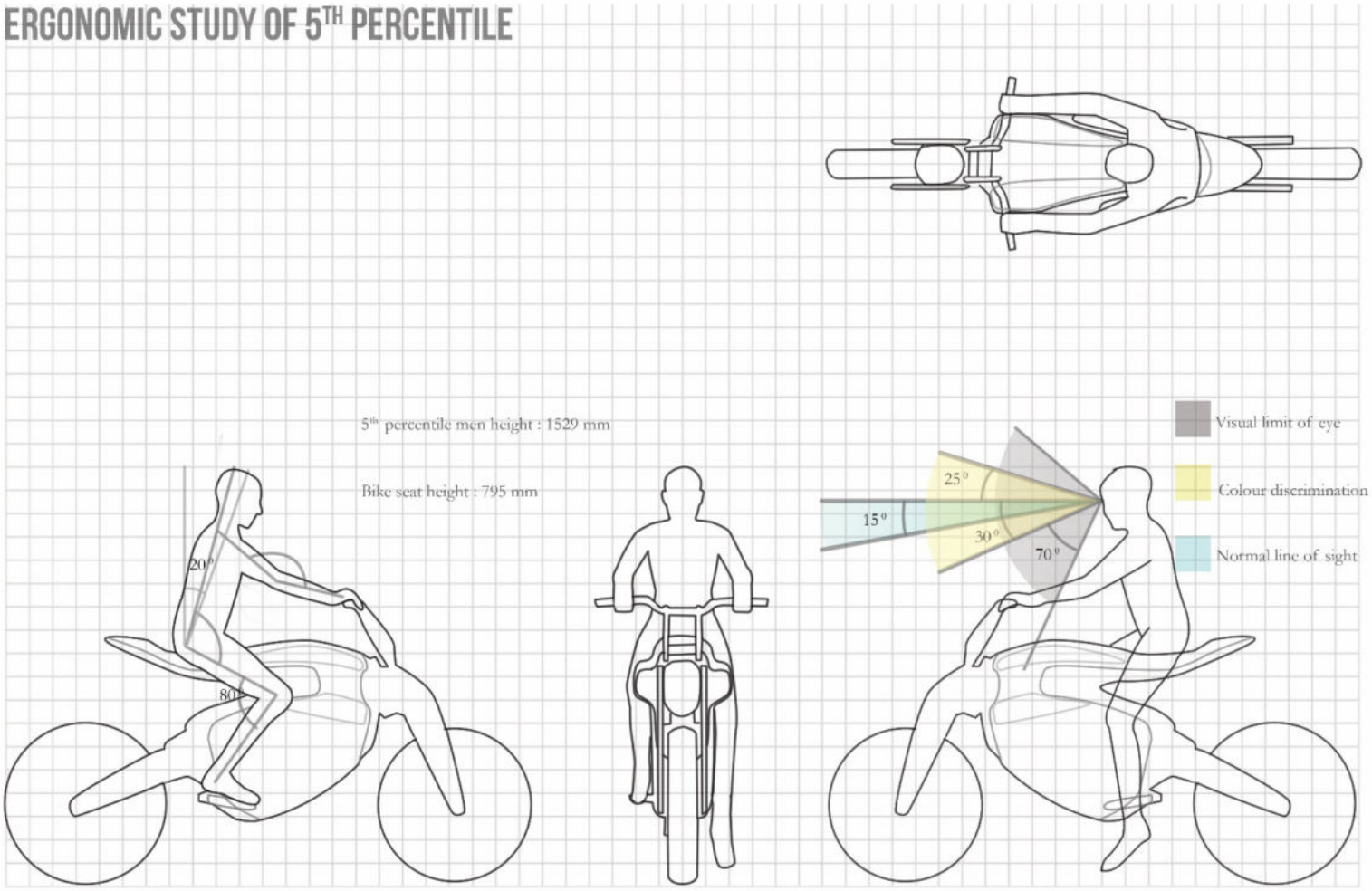
Motor

Control unit

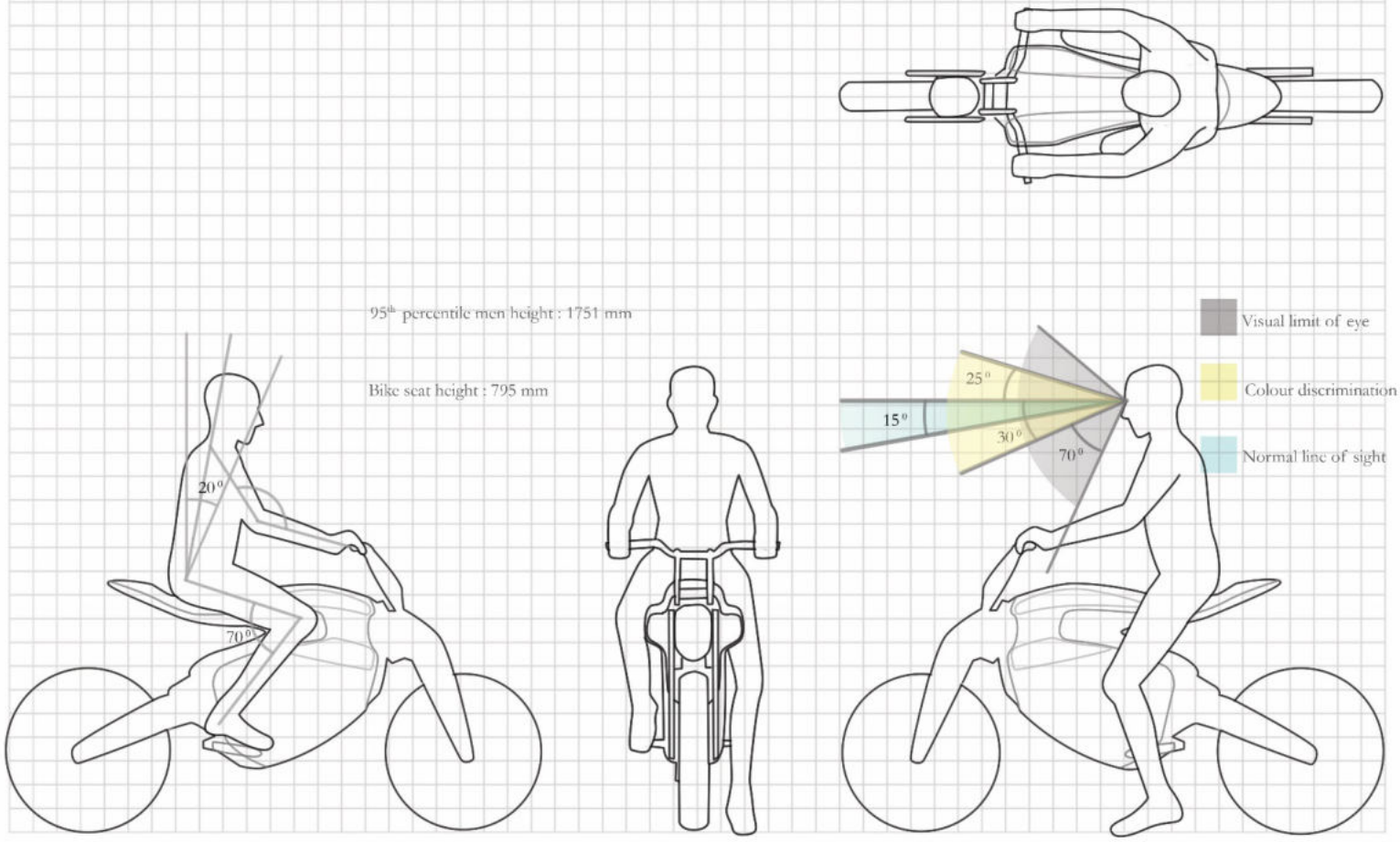




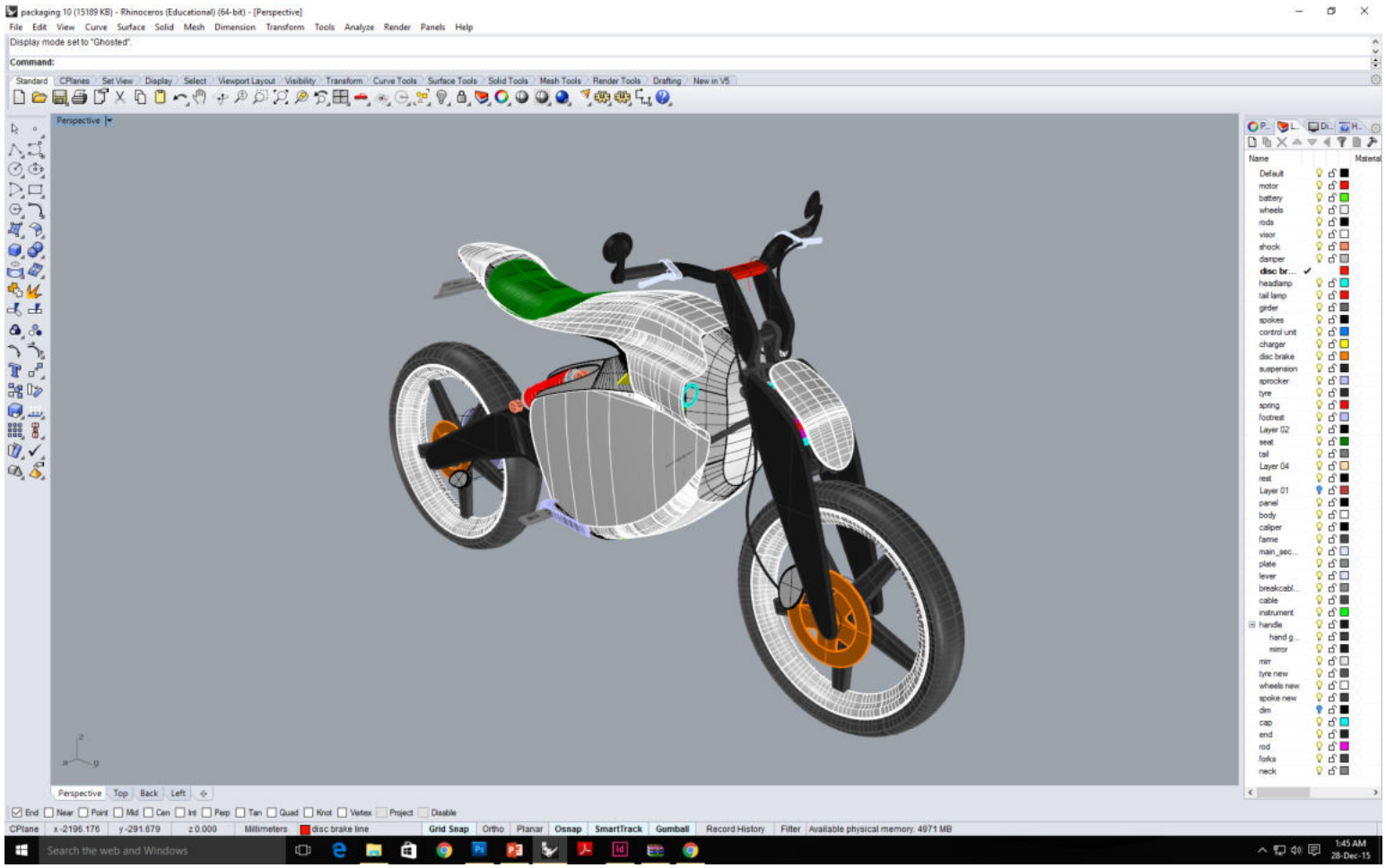
9 Ergonomic study



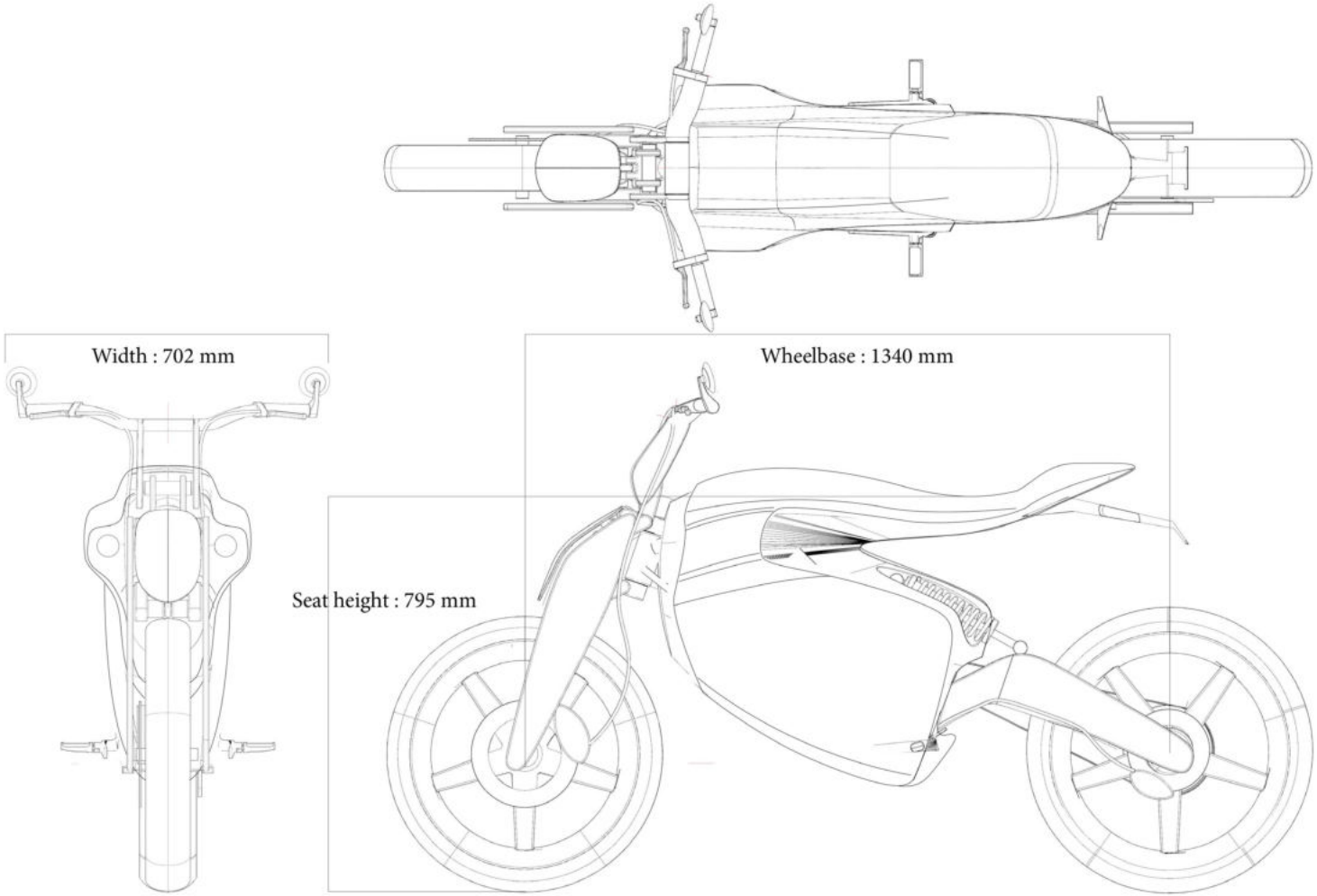
ERGONOMIC STUDY OF 95TH PERCENTILE



10 CAD Model


packaging 10 (15189 KB) - Rhinoceros (Educational) (64-bit) - [Perspective]
File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Panels Help
Display mode set to "Ghosted".
Command:
Perspective
Name
Default
motor
battery
wheels
rods
visor
shock
damper
headlamp
tail lamp
girder
spokes
control unit
charger
disc brake
suspension
sprocker
tyre
spring
footrest
seat
tail
rest
panel
body
caliper
frame
plate
lever
cable
instrument
handle
cap
end
rod
forks
neck
Perspective Top Back Left
Search the web and Windows

11 CAD Drawings



12 Final Renders

13 Physical model

Physical model : 1:5 Clay Model





14 Bibliography

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