Project1: SKATOCROSS - Indias's first Skatebike in collaboration with VIVRT Motors

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Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas 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 misrepresented 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 of from whom proper permission has not been taken when needed.

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Acknowledgement

I would like to sincerely thank Mr. Rathees M.Y. co founder of VIVRT Motors, Mr. Anshad mentor and Mr. Prabhat tiwari, design lead (Krypton Design Studio) for their valuable guidance and creative input throughout the projects.

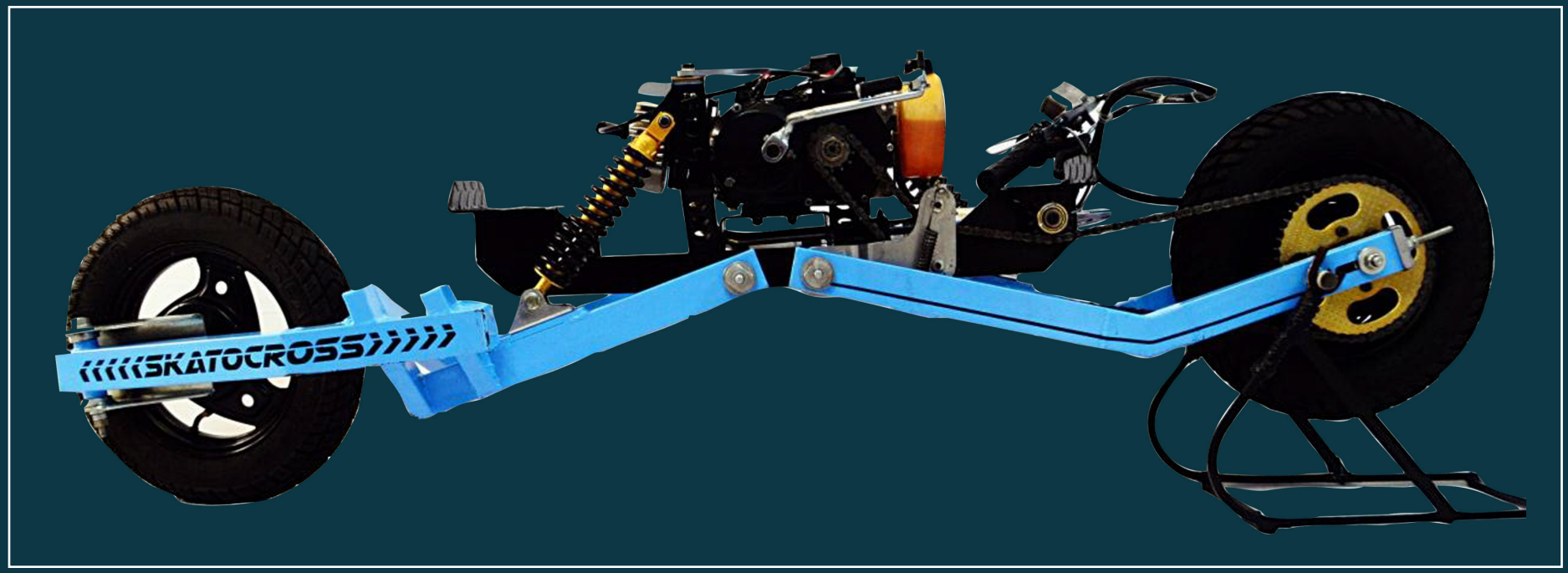
I would also like to thank them for giving me this opportunity to work for their firm and gain a better understanding about a totally new segment of vehicle (both aesthetically and technically). Thanks to all the design team members including intern. it was a great experience to work as a team which help me to learn a lot from everyone.

Contents

Project Brief

Skatocross: India's first skatebike

Skatocross concept emerged from the thought of having both Skateboard and a Motorcycle. SKATOCROSS will be designed to be a new kind of integrated vehicle. Idea is to provide personal mobility for an individual and to establish new kind of sport. For steering, users must rely on their own skill and the ability to lean for maneuvering from one place to another, by implementing Gyro the skill needed to steer can be eliminated.



About the Design Studio

KRYPTON
designworks

Krypton Designworks is a Delhi based integrated design studio. co founder of krypton designworks is Prabhat Tiwari. We are a team of passionate people from different backgrounds came together with a goal to make the world better through design.

We believe in innovation & building things that provides the best user experience. krypton studio this time collaborated with VIVRT motors and got opportunity to work with VIVRT Motors for the Project of Skatocross: India's first Skatebike which is totally new segment of vehicle.

About the Company

To create innovative automotive products built for performance which not only delights our customers but also motivates them to challenge the status quo and discover themselves. VIVRT is a promise to all its customers to unleash an adventure within them; be a regular joe or a pro rider, discover the passion and thrill of journeying the untraded paths.

VIVRT's Core Values

-
- Take complete ownership and pride of every single unit built in all aspects.
- Build products with utmost priority for the thrive and zeal of its customer.
- Build Innovative and Technologically Advanced products for Recreational and Motorsports markets.
- To be the best in everything we do.

Objective

- The concept had to be clean and lean all-terrain vehicle.
- Traveling off road terrains require vehicles having capabilities such as Ground clearance, off road tires and Drive train.
- One of the kinds of recreational vehicle.
- Concept had to be of light weight in design.
- The concept had to provide personal mobility for an individual and to establish new kind of sport.
- With this concept, a lot of everyday traffic issues, parking issues & public transit issues are solved.

- *all terrain vehicle*
- *shared mobility*
- *light weight vehicle*
- *parking issue solution*
- *traffic jam issue solution*
- *green energy*

Design and optimise the Skatocross using various engineering techniques like

Scope

The scope of the concept falls under the area of sports, recreation and personal mobility with its light weight and other technical features.

Market competitors and what they currently offer

1. Wheelmen

The Wheelman is a hub less electric Skateboard, but with 2 separate pads and orbit Wheels. It is one of the latest versions of motorized skateboards these days. The learning curve of the Wheelman Skateboard is still the same to the other board activity such as skateboarding and snowboarding

2. Dirt Surfer

Dirt surfer is a downhill vehicle which is not equipped with any propulsion system. It is only used to travel with gravity (Downhill). It is not an all-terrain vehicle and it doesn't have suspension system to cushion the ride.

3. Segway

The Segway is a two-wheeled electric vehicle used as a convenient way to travel around towns and cities. It is a self-balancing device and its name is derived from the word "segue" which literally means "follows". The motorised scooter uses gyroscopes to remain upright and is controlled by the direction in which the rider leans.

Hoverboard

Hoverboards are two-wheeled, electric, portable devices that are also commonly known as self-balancing scooters. Typically, these devices function like powered skateboards and consist of a platform for the rider, situated between two wheels and powered by large lithium-ion batteries.

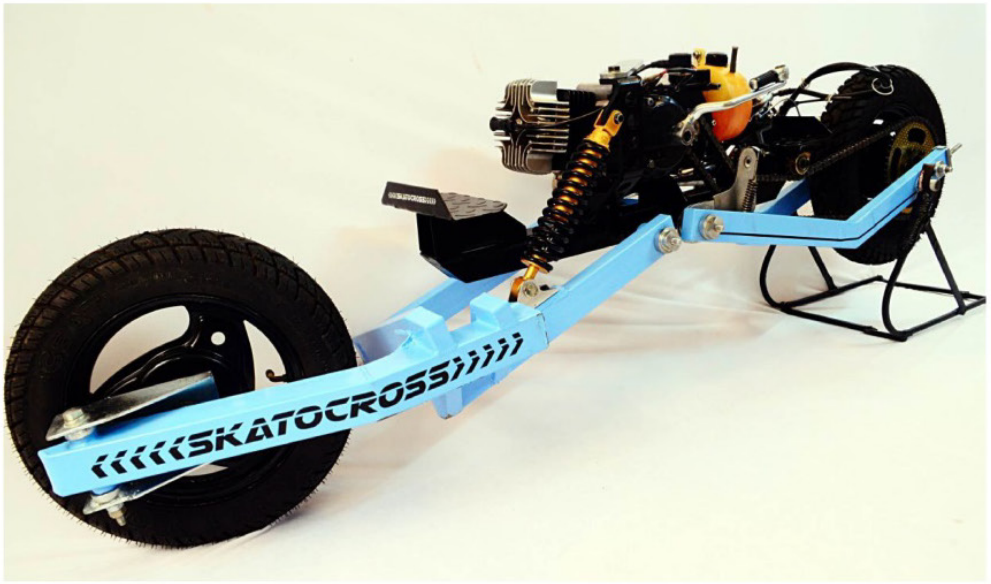
Boosted board

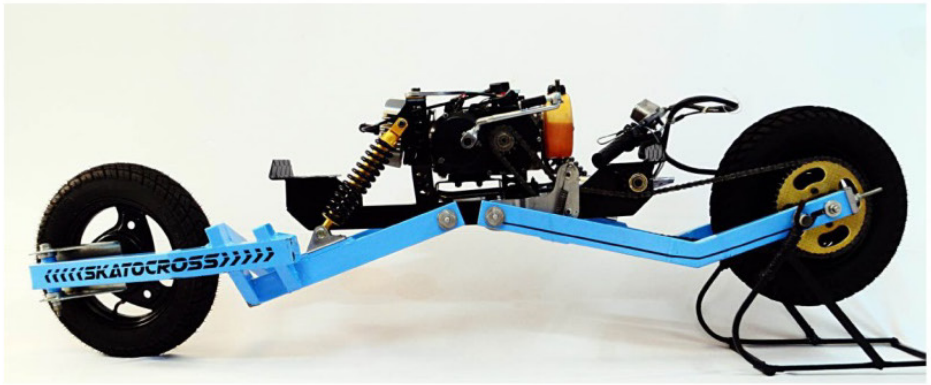
Boosted is an American manufacturer based in Mountain View, California. They are widely known for their electric skateboards, and for their coverage by American personality Casey Neistat. boards are designed and built to handle the rigors of daily use while offering an exhilarating ride with unparalleled power and control.

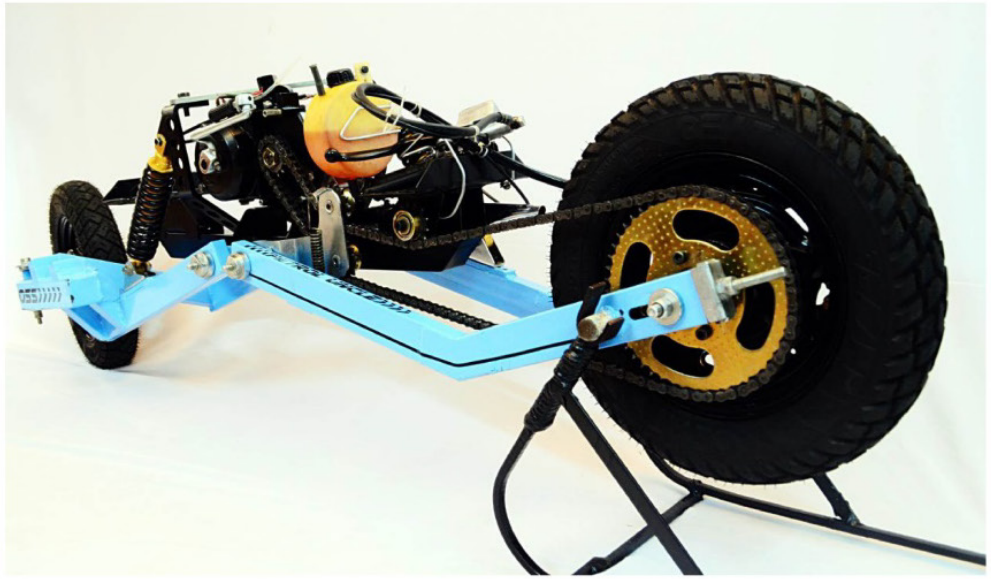
Bajaboard

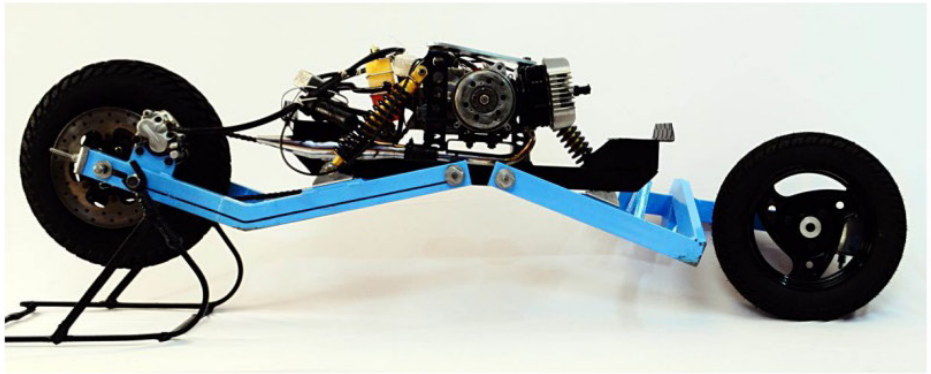
Baja Board is a four wheel mechanism which is driven by electric means. It is an all-terrain vehicle, capable of reach speeds up-to 30kmph. The BajaBoard is powered by four 3kW brushless motors (one motor per wheel), giving the board a combined motor rating of 12kW.

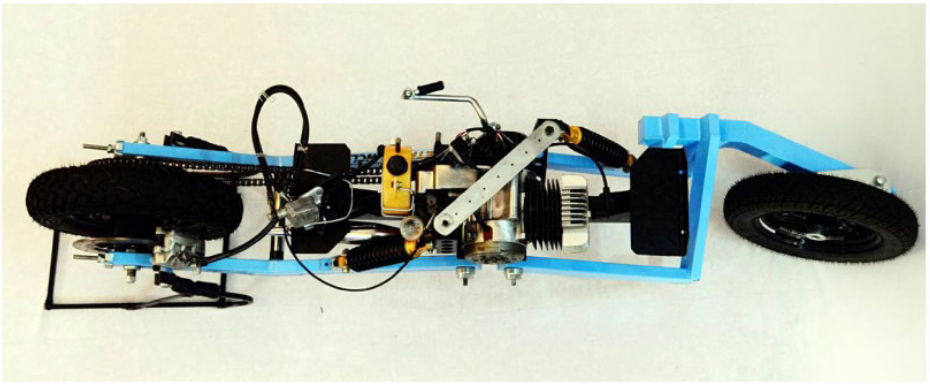
Prototype1: Skatocross



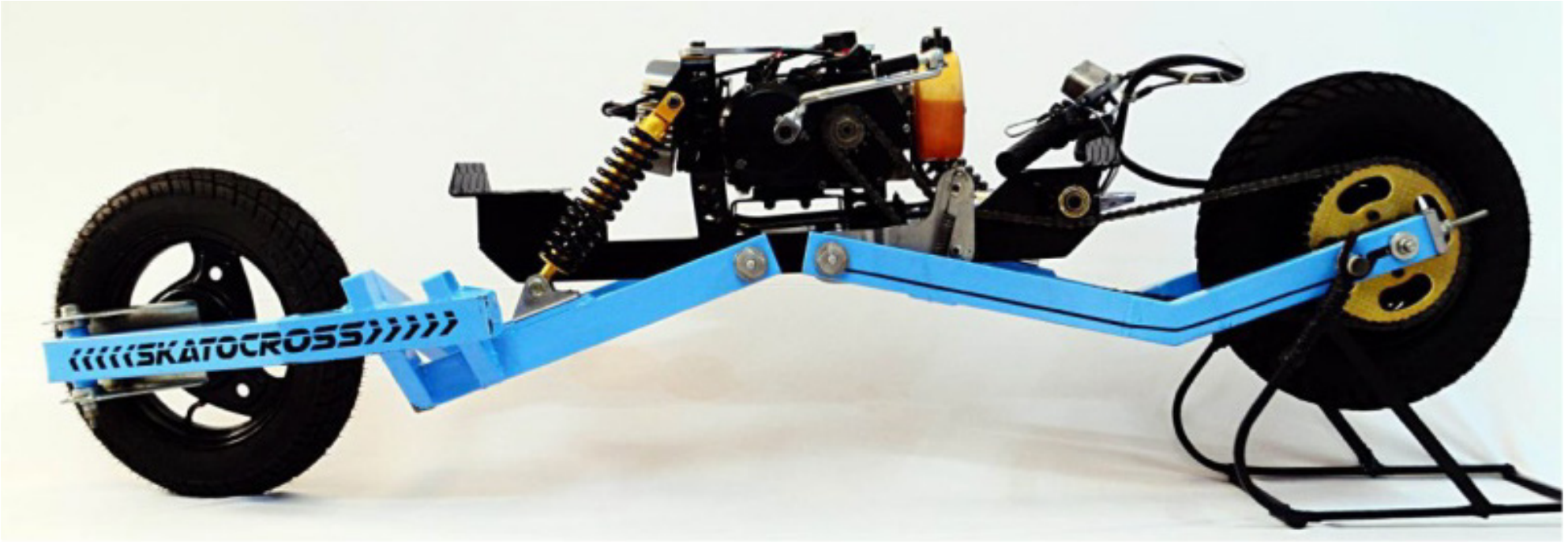








A Two wheels skatebike first working prototype with I.C. Engine



Specifications

- Engine - 80 cc
- Power - 8.85hp
- Top speed - 60kmph
- Kerb weight - 30kg
- Chassis - Self balancing

Drawbacks

- Difficulty in self balancing
- Less leg room
- Difficulty to ride at wet road
- No resistance to impact
- No vehicle locking system
- Engine vibration and noise

Prototype 2: Skatocross

Front quarter view

Rear wheel drive

Manual control system

Rear quarter view

HONDA GC 190 engine

Front Swing Arm

Steering system

right turn taken by leaning right side

left turn taken by leaning left side

keep straight by standing straight

Opportunity Identification:

This is where new product opportunities are identified or new product ideas are generated based on unmet customer needs. While customers are the most obvious sources of unmet needs, firms cannot afford to ignore its key suppliers and its own employees as valuable sources of opportunities and ideas. Marketing's role at this stage of the process is to reduce uncertainty during the NPD team's search for winning product concepts by accurately capturing customers', suppliers', and employees' points of view about customers' needs and communicating them to the team.

1. Identification 1: Electric Powered Product

- Good for environment
- Cost less to drive
- Investment into clean energy
- Reduced noise and heat

2. Identification 2: Off Road Vehicles

- effective on dirt and muddy road
- sporty feel to rider
- easy handling and more balance to vehicle

Idea Generation

The above identifications lead us to the answers of WHY the SKATOCROSS should be our new product as
it satisfies all the above identifications.

WHAT –

- The product is an electric vehicle which is a combination of a motorbike and a skateboard which would have a speed roughly around 50kmph including all safety systems to prevent the rider from any injury.
- The product should be able to off road and hence should involve a good shock absorbing system. It should weigh as light as possible to increase portability.
- It should include an interface to tell the rider his speed, distance travelled and all other relevant information.
- It should include accessories to attract customers and provide further advantage over our competitors (myo band).
- The product should be easy looking with good aesthetics to attract the eye of the customer.

Concept Development

Combining the Best of each.....

Skateboard: Being a skilled based and a responsive device, it wouldn't work with a push feed by the operator, we wanted that responsiveness for our concept.

Motorcycle: Having a good propulsion system and suspension system, we wanted both into our concept. This makes our concept self-propelled and a good off roader from the suspension systems.

Design Process

Feasibility Study:

A feasibility study provides an Investigating function that helps answer —Should we proceed with the proposed project idea? Is it a viable business venture?—

Preliminary Design:

Here we will iterate the alternative concepts of building the SKA-TOCROSS and based on the feasibility study we will select one concept.

The concept should consider the following details:

– Design for maintenance

– Design for reliability

– Design for safety

– Design for convenience for the user

– Design for aesthetic features

– Design for operational economics

– Design for adequate duration of services

—

Detailed Design:

– Preparation for design

– Overall design of subsystem

– Overall design of components

– Preparation of Assembly drawings

– Prototype

– Testing

– Analysis and prediction

– Redesign

Design Contribution

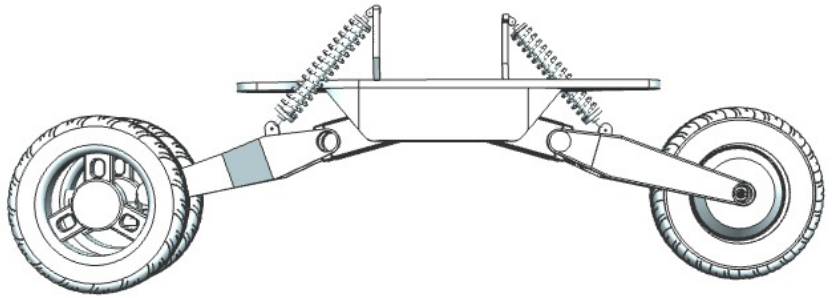
- Assist the exterior styling part of new design in team.
- Assist the Lead Vehicle Dynamics Engineer as assigned, with the research, development, testing, and proper design maintenance of all Parma products.
- Assures the accuracy and completeness of all drawings, files, engineering records, and tasks of assigned projects.
- May assist in inventing/creating concepts and designs/ approaches for project/process methods.

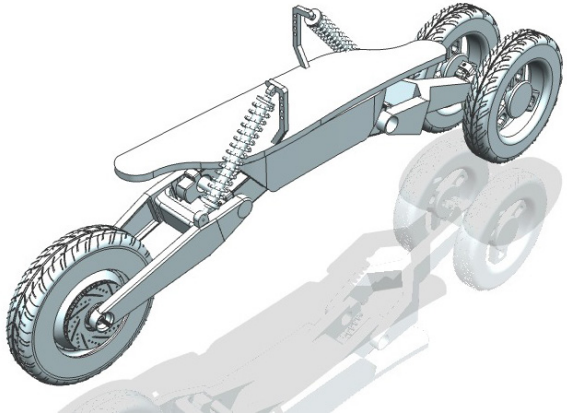
Final design

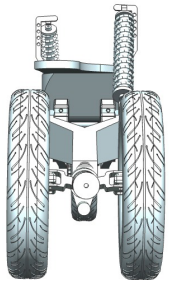
Platform for Electric concept Skatocross

after the prototype VIVRT Motors decided to go for electric version of skatocross. for that they have kept the same platform and chassis which is three wheeled and rear wheel drive. rear wheel will be hub motor.

team was given this CAD refrence for new design for this segment. considering the same swing arm and its dimensions team has to design a complete package of elctric skatocross.

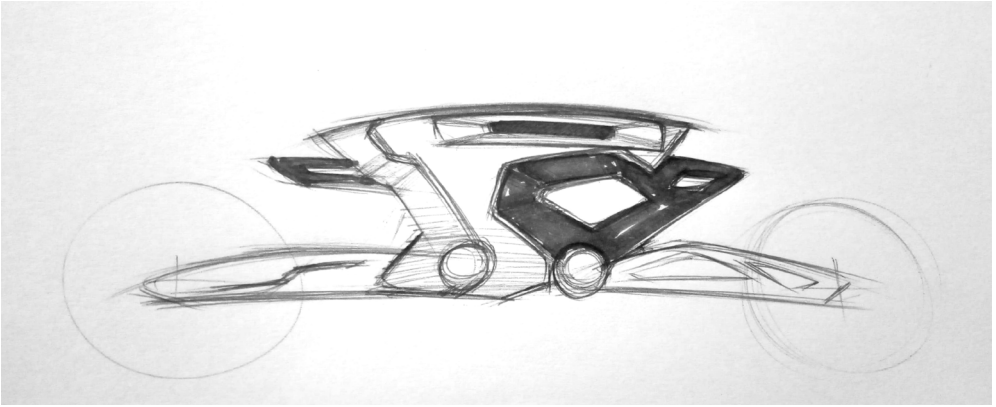


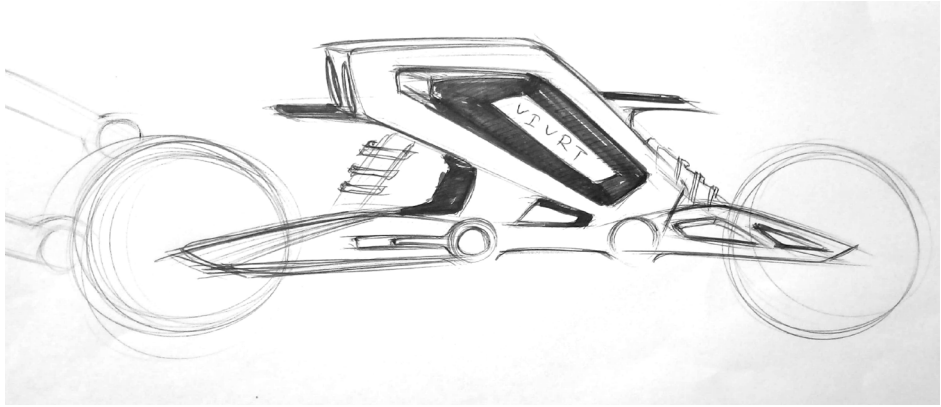


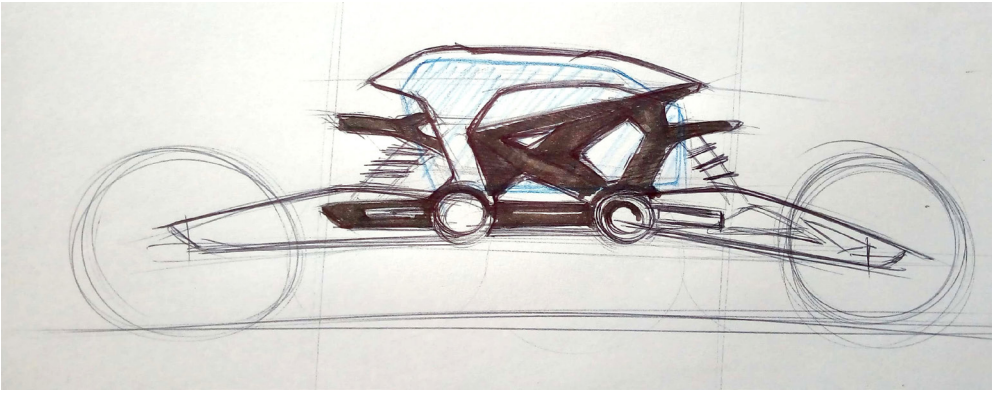


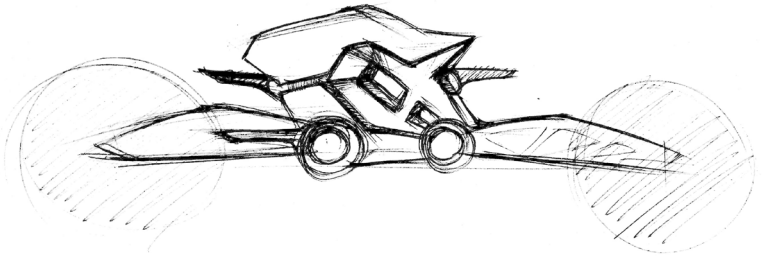
CAD design platform

Concept Ideations



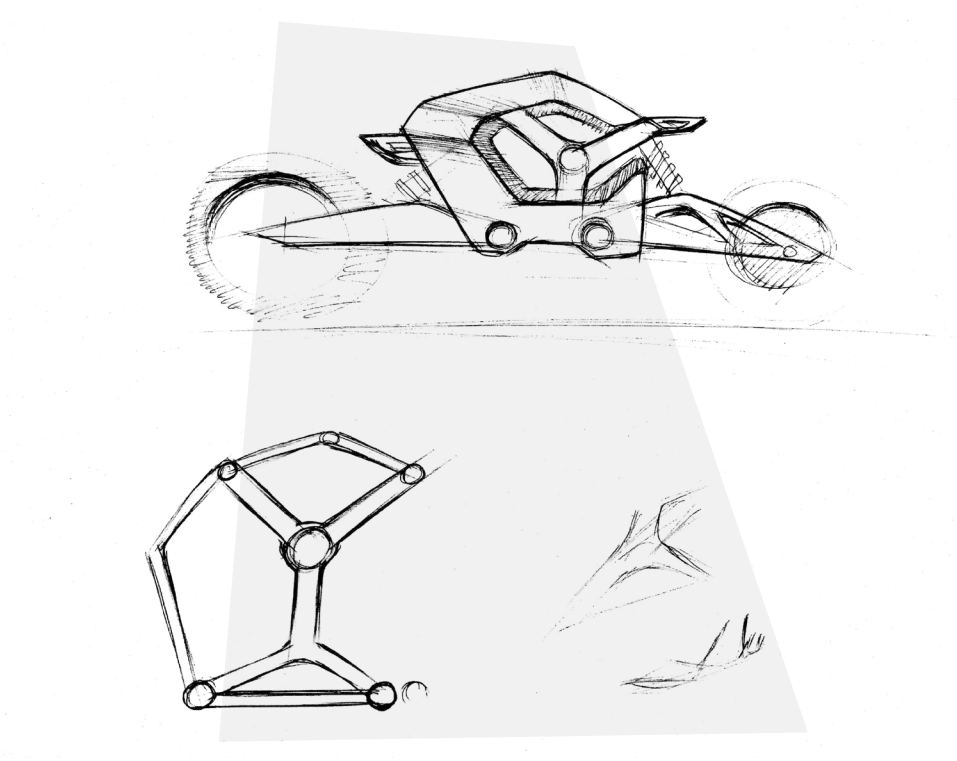


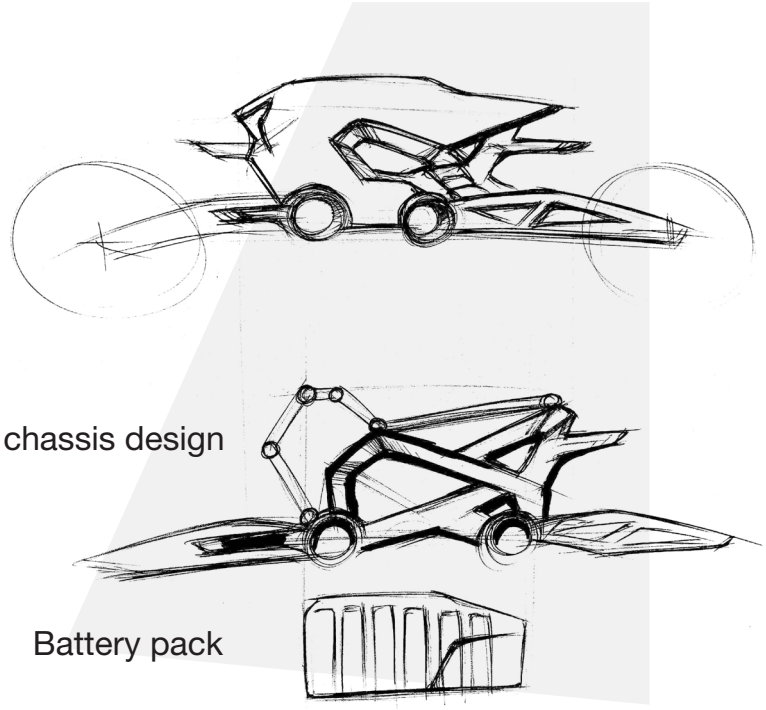




Ideation sketches for sporty skatocross considering the same swing arm for the design

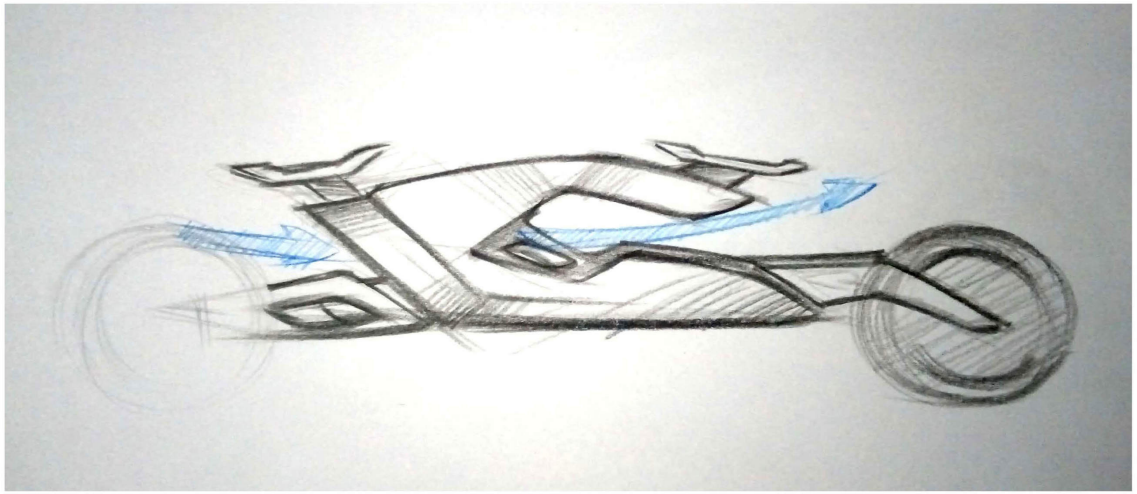
Semi Naked concept ideation

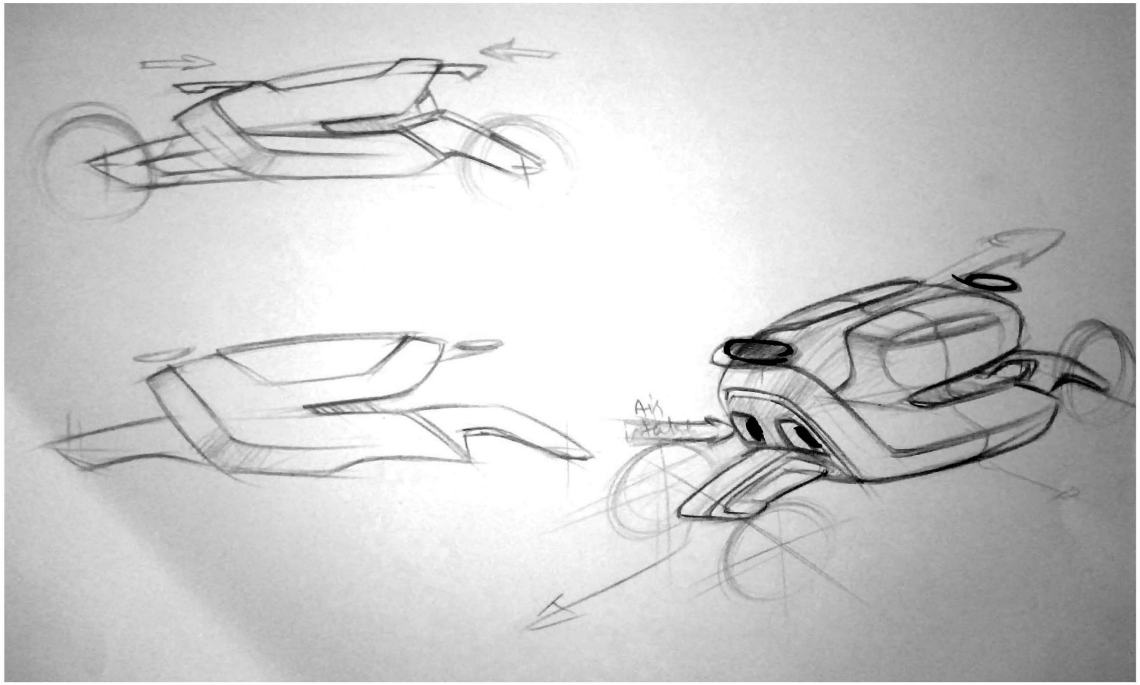




some semi naked concept ideation in which battery pack will be half uncovered. since a new battery pack with its own cover is designed. some part of chassis is also designed for new kind of form.

Idea exploration

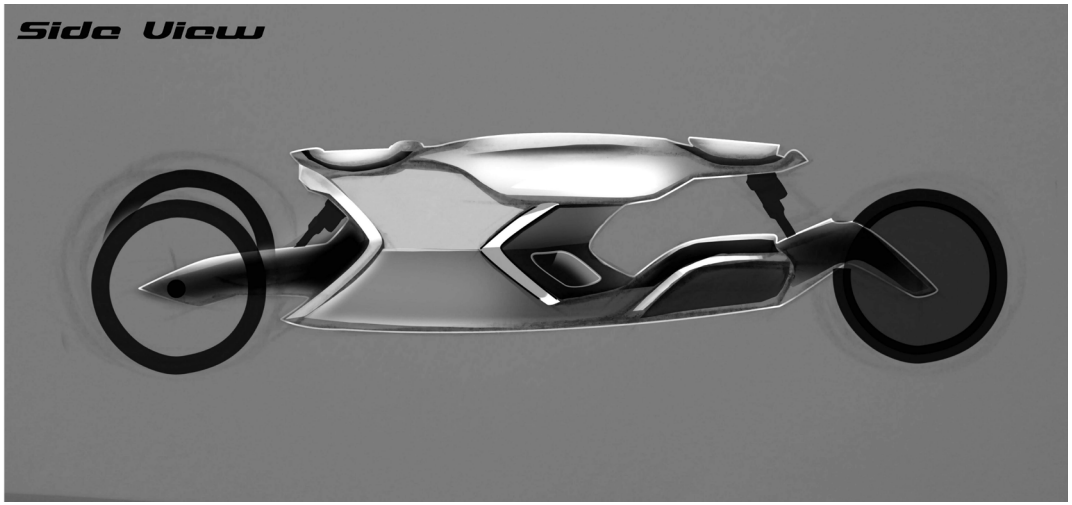


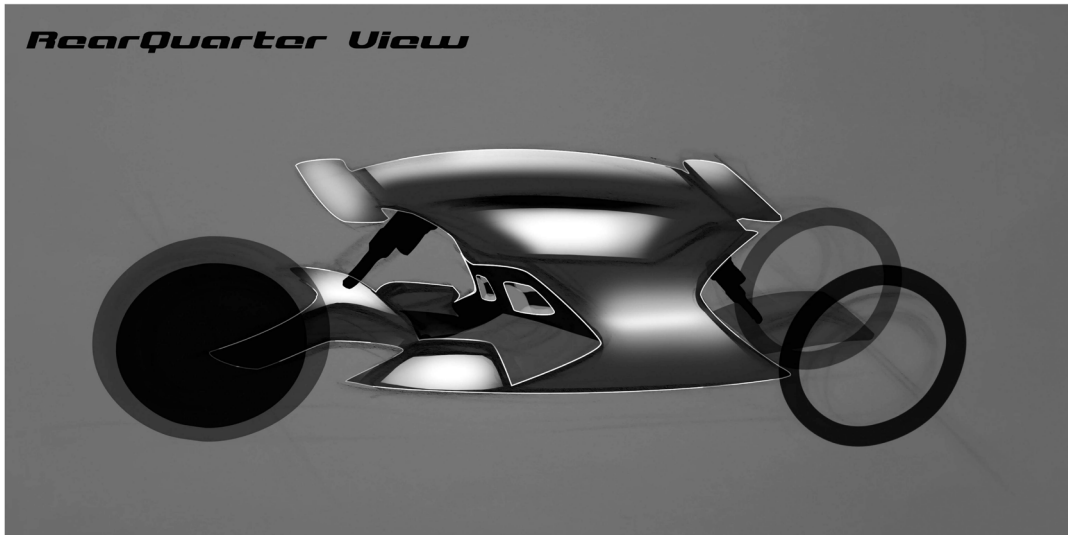


considering about same arm length a new form and volume is ideated having air vents in front for cooling system to battery set up and the air passes through the body and ventilated out.

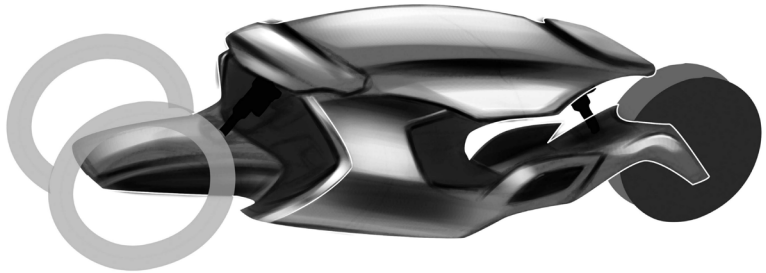
two shock absorber is considered one at front swing and another at rear swing arm

Idea exploration

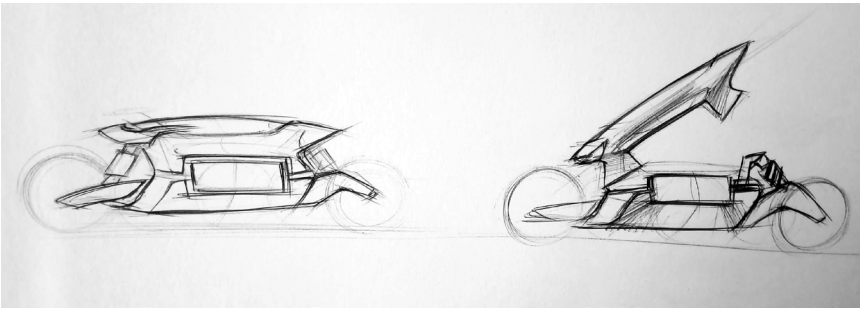


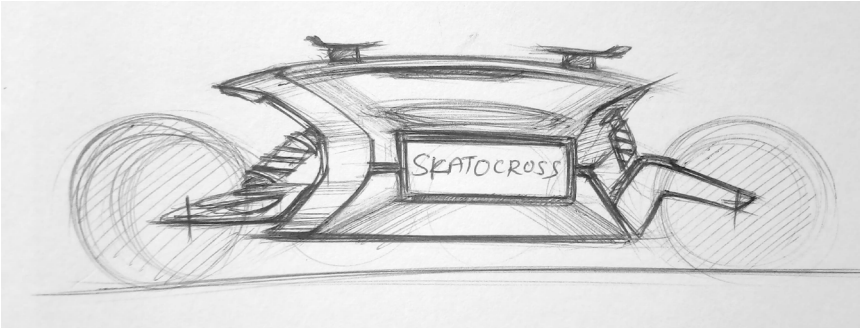


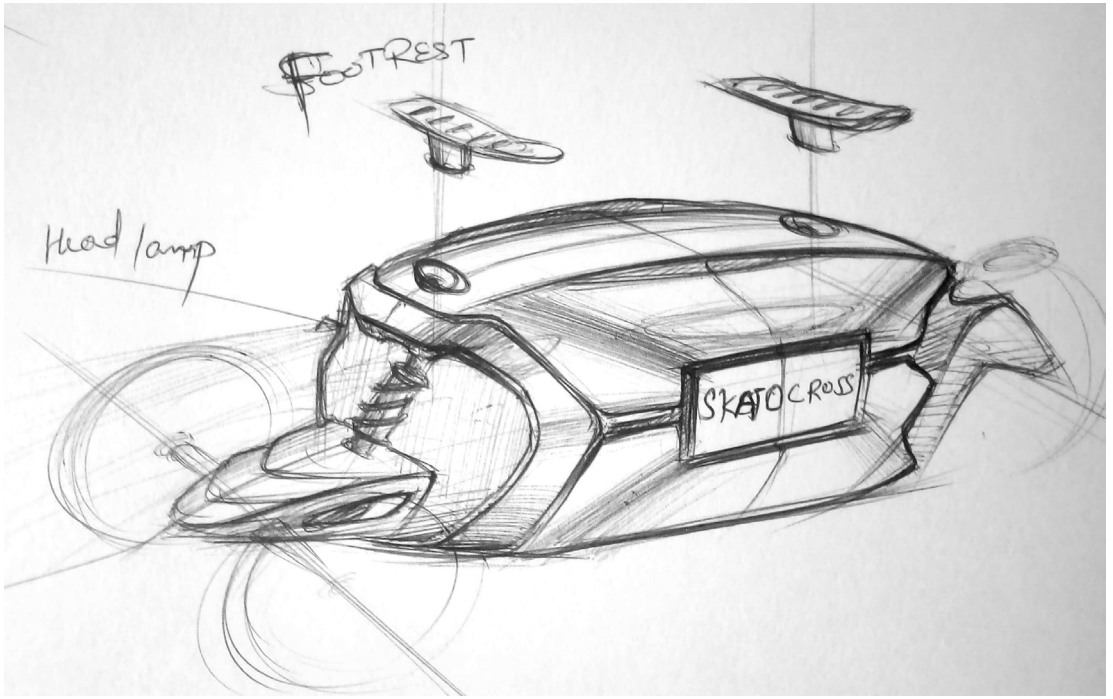
Front Quarter View



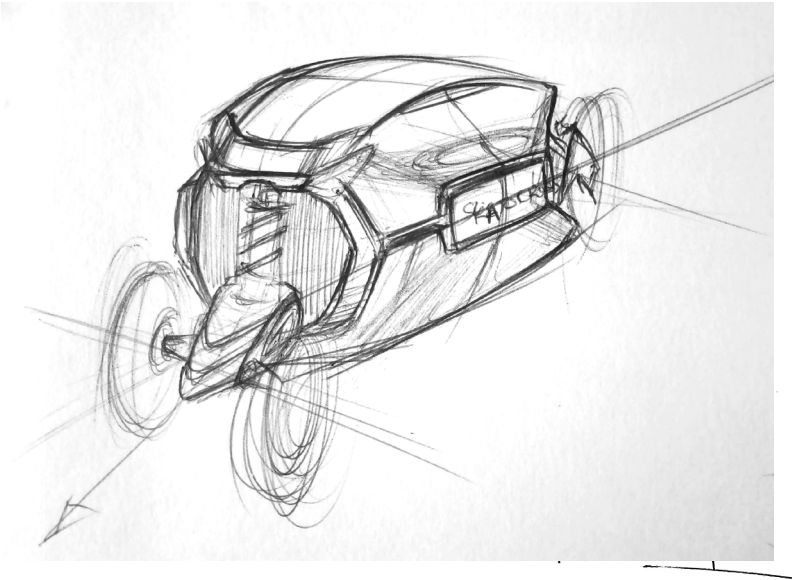
2nd concept generation

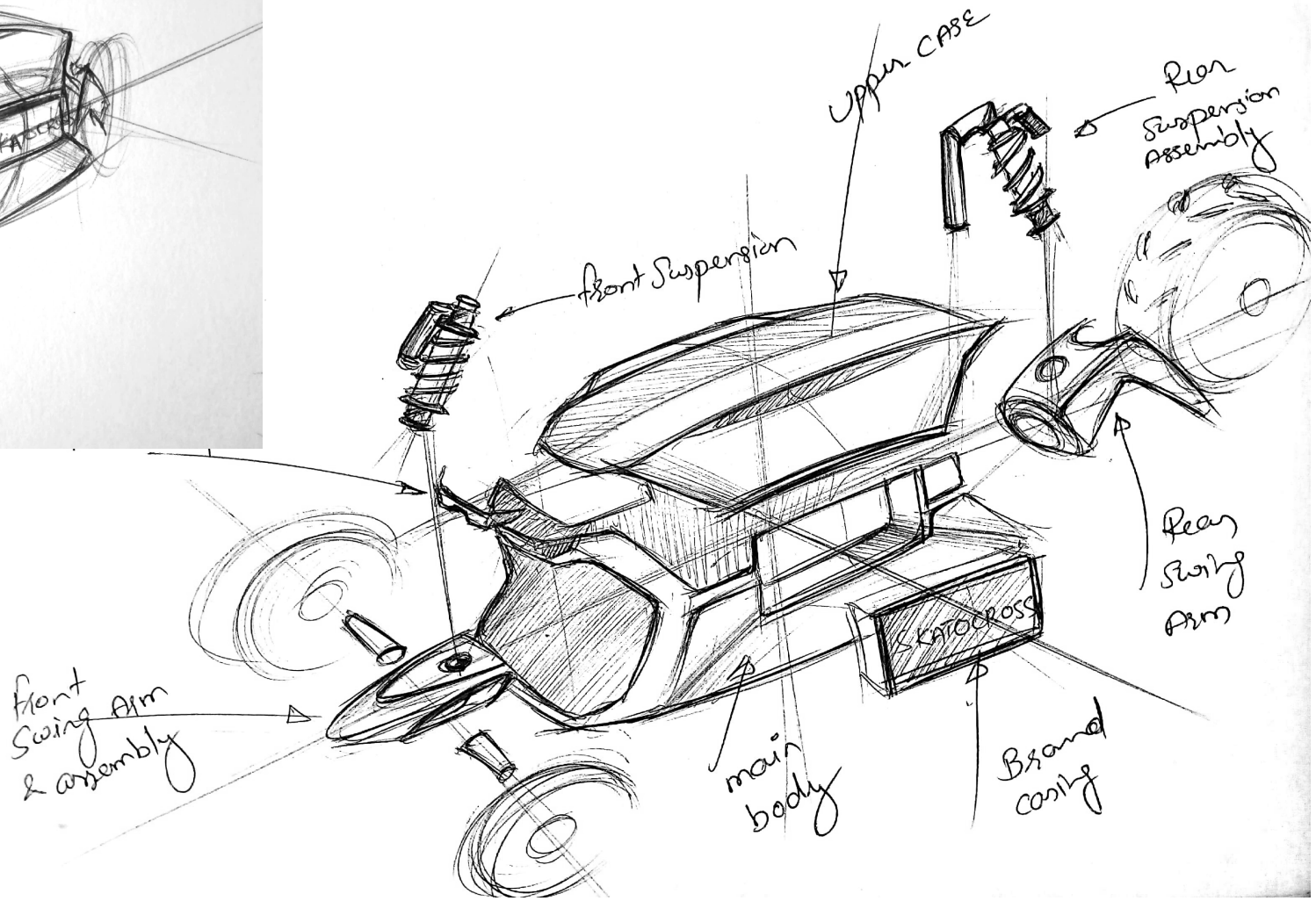




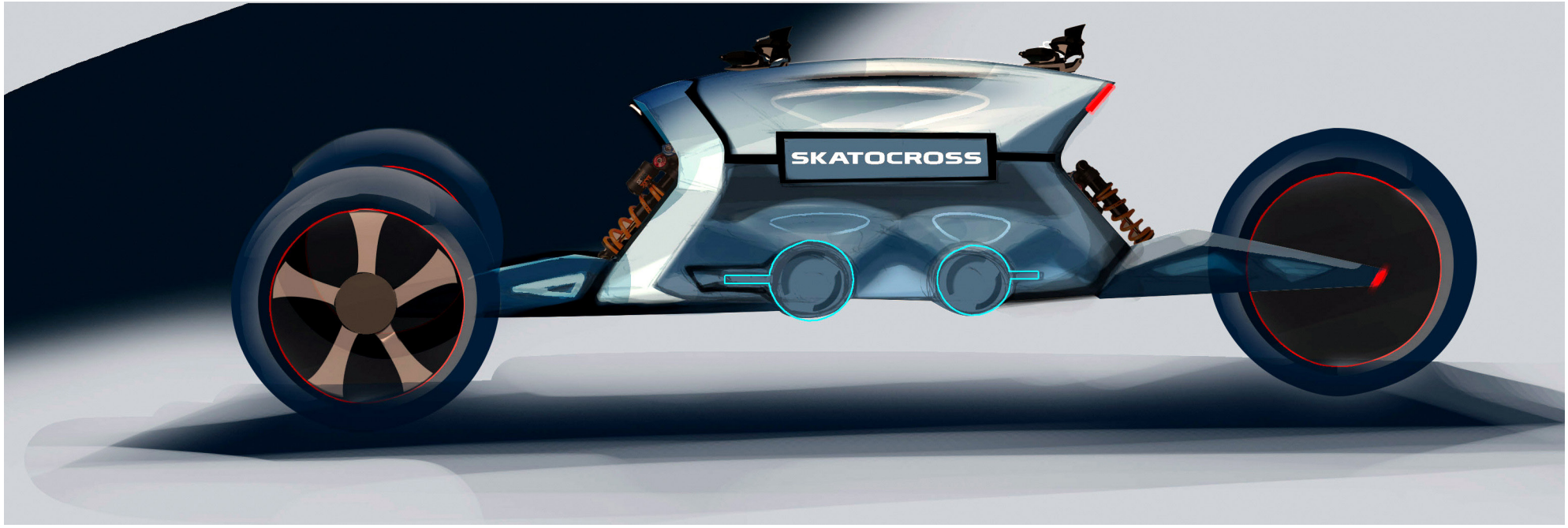


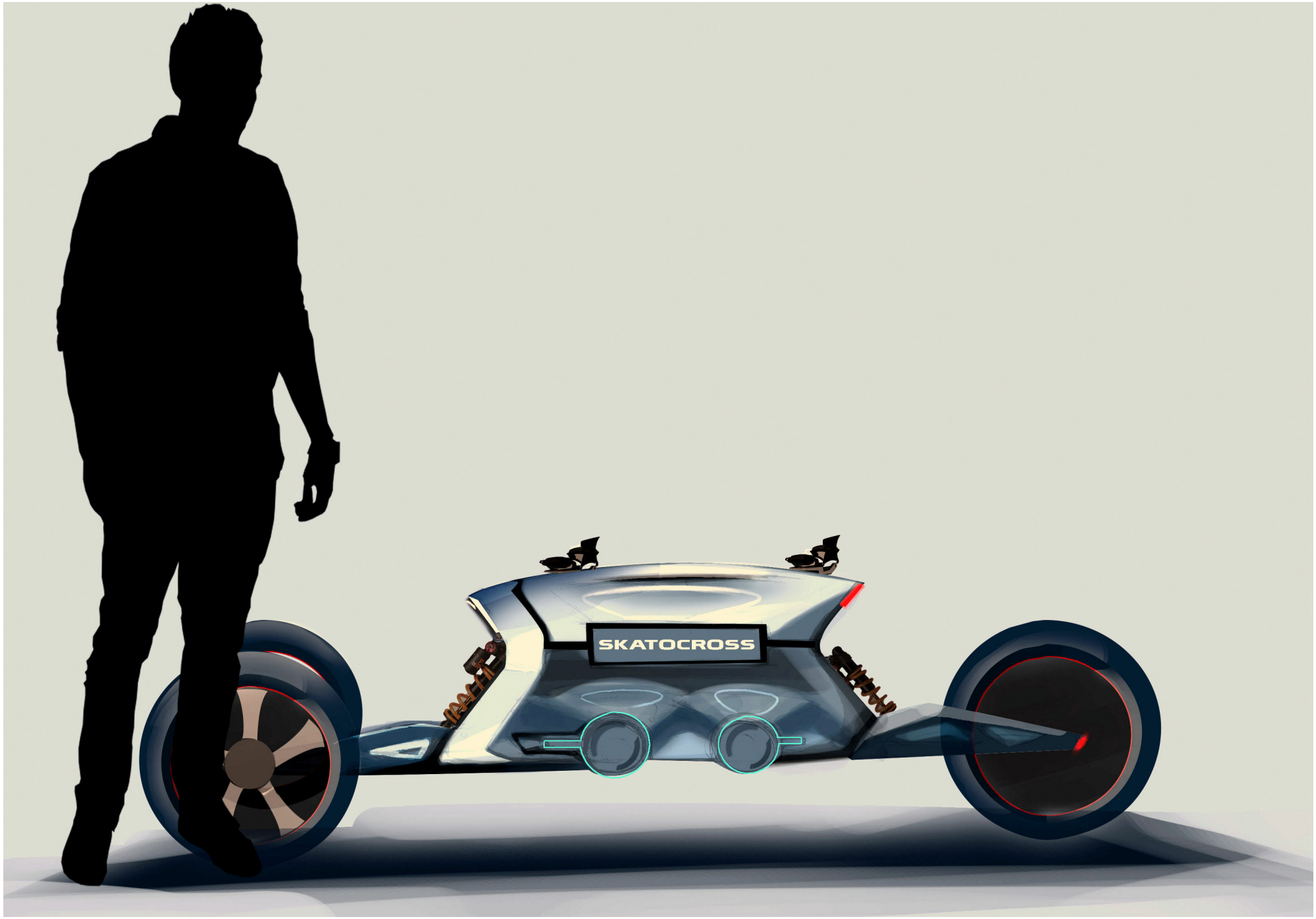
concept exploration





Final Concept: Skatocross




SKATOCROSS

Skatocross Technical Specifications

Skatocross is an Electric vehicle which is totally different segment than available in market in current scenario. It's a three wheel self-balancing vehicle which is ride by a person just standing over the pedals of vehicle and the steering system happens by just slightly leaning front or rear to the rider.

Factors	Specifications
Vehicle Chassis type & material	Circular tubes, Chrome Moly tube
Vehicle dimensions	190*30*62.5 (in cms)
Wheels	3 wheels- two in front and one in rear
Wheels type	Front- spokes wheels with tubeless tyre Rear- Motor hub wheel with tubeless tyre
Top speed	60 kmph (variable)
Drive train	Rear wheel drive
Suspensions	Torsion spring suspension with aluminum alloy damper
No. of suspensions	2 nos (one in front and one in rear)

Vehicle dimensions are measured by considering 2.75 wheels gap in between front and rear wheels. One wheel dia taken as 41.91cms.
since it's a electric vehicle so there maybe chance to top speed variation according to overall weight and various other factors.

Battery pack

The battery pack contains battery set up and motor controller. A casing can be done for these which has air ventilation system. It will protect damaging of battery pack and safety. The battery pack can directly be removed just opening the lid of casing. The dimensions are considered according to casing since the gap between front and rear wheels is 2.75 wheel so for main body the battery casing will cover about 0.75 of wheel area.

Factors	Specifications
Type	Li ion Battery pack
Capacity	48/60/72 V
Charging time	3 to 4 hours max
battery pack dimensions	31*15*18 (in cms)
Top speed	60 kmph (variable)
weight	<= 30 kg

Hub motor

Factors	Specifications
Type	BLDC hub motor with controller
Voltage	24/36/48V
Power output	480W-1000W (variable)
maximum power	3000 RPM
efficiency	85% (variable)
weight	8-10 kg (variable)

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