

A futuristic motorcycle with a rider in a sleek, metallic suit, set against a background of motion-blurred lines. The motorcycle is dark with green accents. The rider is wearing a helmet and gloves. The background consists of horizontal lines that are blurred to suggest speed.

The Future of Motorcycles

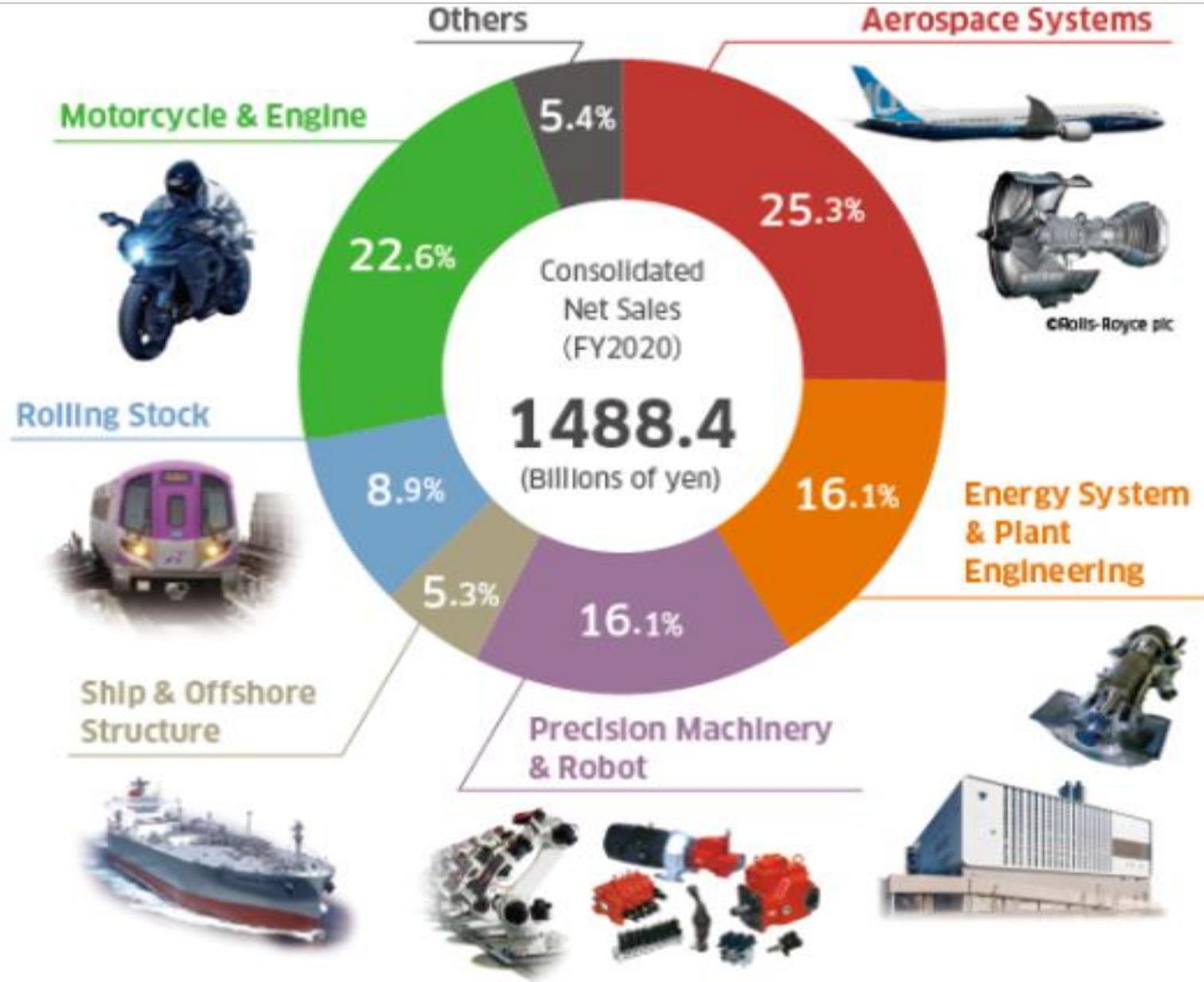
Yoshimoto Matsuda / Kawasaki Motors, Ltd.

This presentation represents the views and opinions of the speaker, and it may not necessarily reflect official Kawasaki strategy.

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Overview of Kawasaki Heavy Industries



Kawasaki Motors, Ltd.

MOTORCYCLE



Off road 4 wheel vehicle: SIDE X SIDE



PERSONAL WATERCRAFT



GENERAL PURPOSE ENGINE



History of Kawasaki MC



1953



1963

1969



1980



The first Kawasaki MC in the US

Our Goal : Enabling riders to more completely control high-performance machines and enjoy the pleasure of riding.

<1> I love Motorcycle



① The Fun : More speed, More power and control !



MC is an extension-ability of the human body and ability

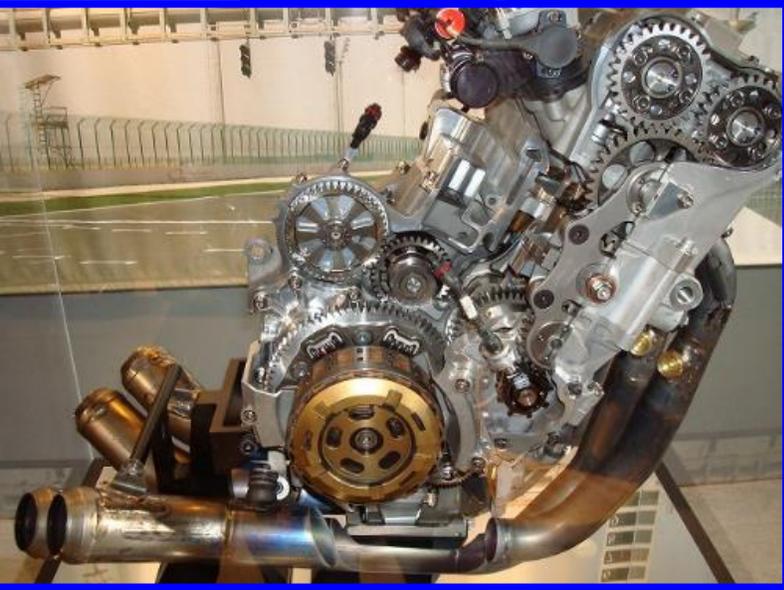
② The Attractiveness: Direct feeling when move.



Direct Feeling ··· Different from Automobile.



And I am happy to create new technologies.



<2> Pros. and Cons. of MC

Pros.

Energy efficiency

Personal move : driving

-2000kg vehicle for 1 passenger @automobile

-200kg vehicle for 1passenger @motorcycle

Production and supply chain

-30,000 parts for 1 passenger @automobile

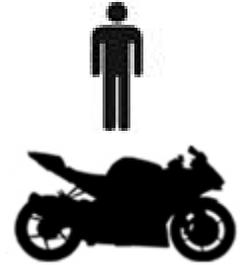
- 4,000 parts for 1 passenger @motorcycle

Automobile



2,000kg

Motorcycle



200kg

30,000parts

4,000parts



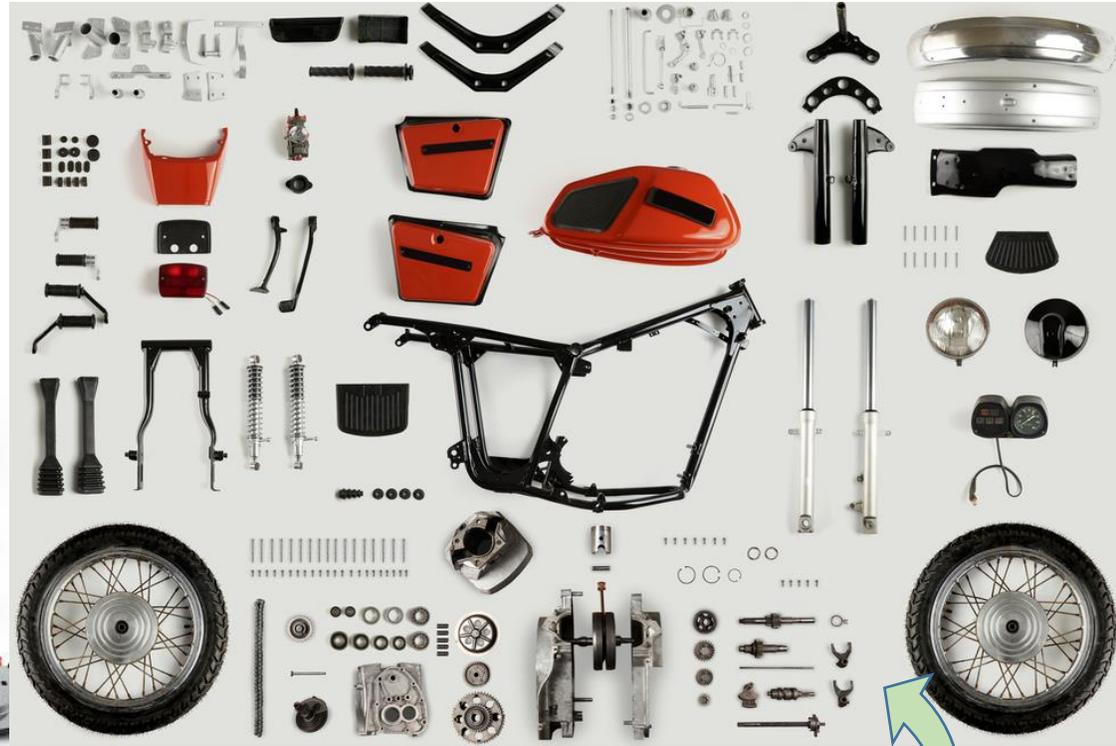
Pros.

Automobile

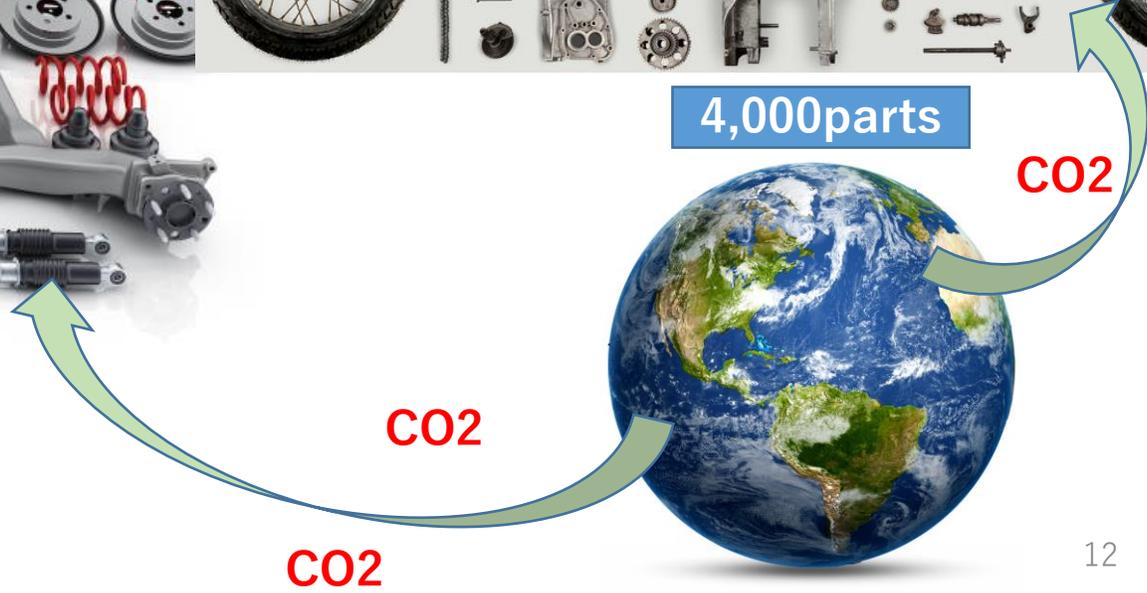


30,000parts

Motorcycle



4,000parts





Pros.

- **Less Traffic Jam** : space efficiency in the traffic
- **More parking** : space efficiency in the town





Cons.

Safety Issue: Motorcycle is dangerous.





<3> My 2 thoughts on the future of motorcycles.

- 1) Improvements for rider ability extension**
- 2) Carbon neutral impact to the MC design**

1) Improvements for rider ability extension

Up to now, those were 'Performance orientated'



The Actual technologies Introduction into the market.

'96:Anti-lock Brake control



Advanced Rider Assist System,
apps, connected service

Safety & Comfort related

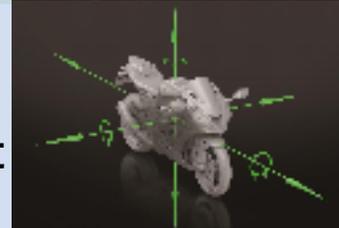
'16:Electric Suspension control

'11:Traction control, launch control,

'98:ECU:Electric Control Unit for Engine(FI),
Electric Throttle (Ride by Wire),

Controlling technology

'11 : Inertial Measurement Unit
Auto shifter,



Electric propulsion: EV, HEV

Propulsion power&Speed related

2cycle , 2cycle-EFI, 2cycle-DI, 4cycle-EFI,



' 15:4cycle Carbon Fairing
-Super Charger



1990

1994

2000

2010

2020



All my career is for R&D to realize the new technology.
So I have been involved and familiarized to the above technologies.

Remaining challenges: new technologies for the extension-ability of the rider



Power & Speed , handling

- Physics & Body performance

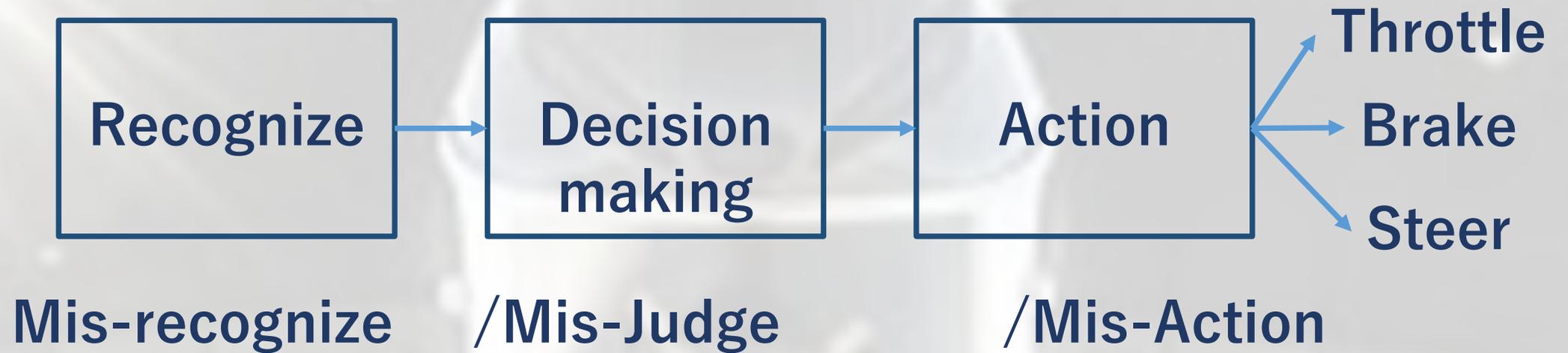
- Sensing(eye & ear),
- recognizing(brain: judge),
- connecting(mouth: speak & ear: listen),

ABS, Helmet , rider suits

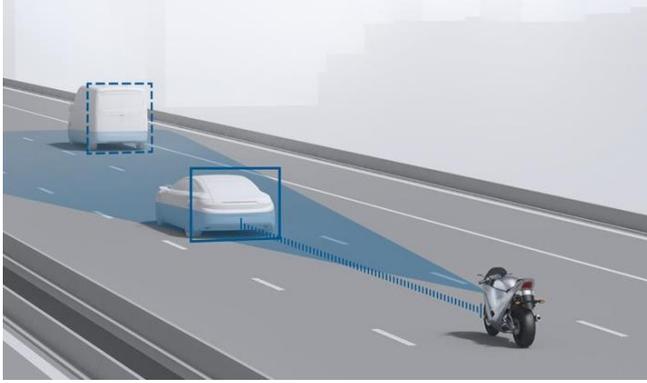
- Safety(or body protection)

These can allow more diverse people to ride.

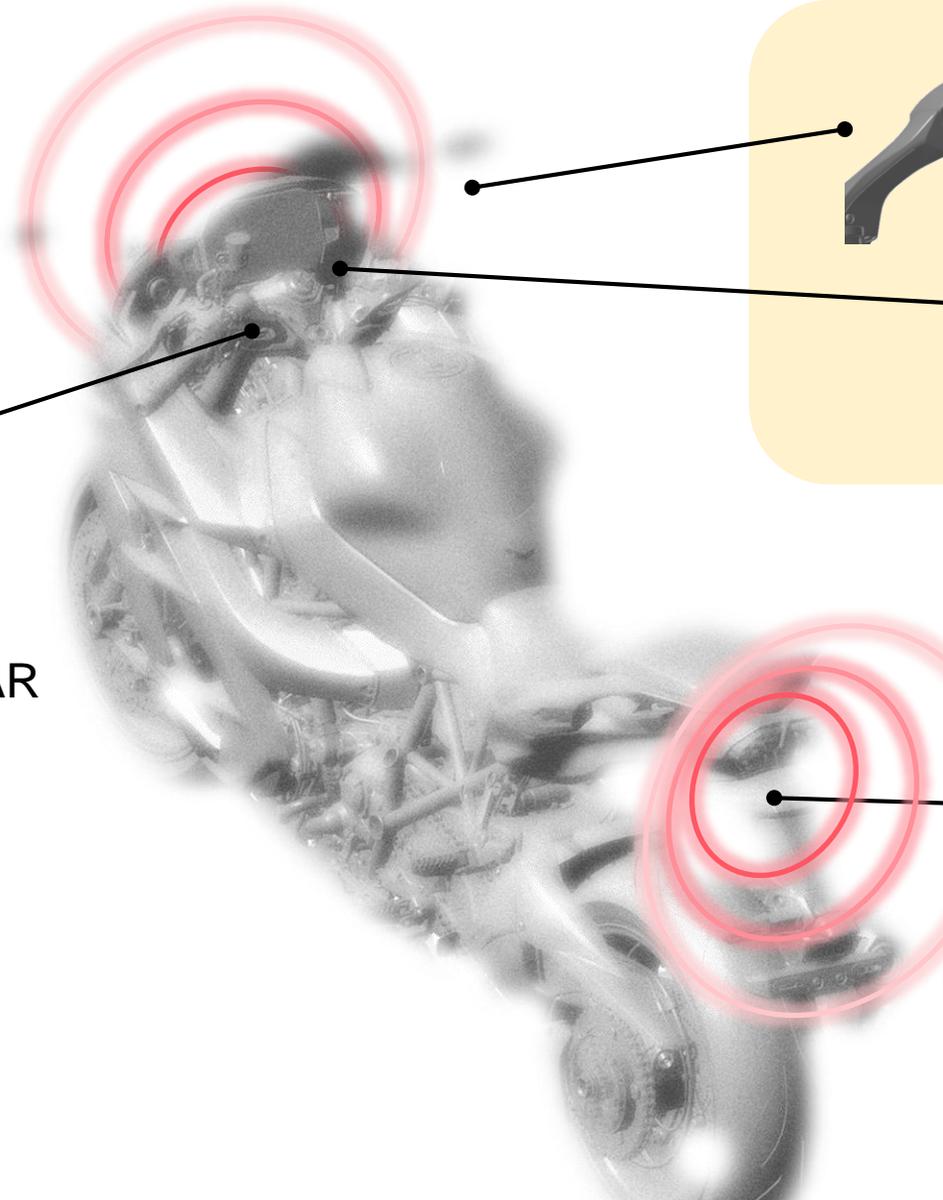
Safety Issue : Rider Action



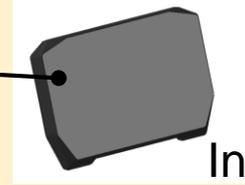
① Advanced Rider Assist System



Front RADAR



LED for Rider



Indicator for Rider



Rear RADAR

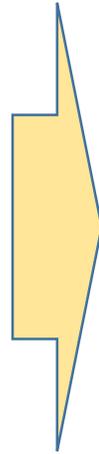




②Smart helmet : Just concept



② Smart helmet





Turn right after 700m.
Be careful of changing lanes.

PM 13:20

Turn Right
700m

Turn Left
400m

Turn Right
150m

car behind the right

Green

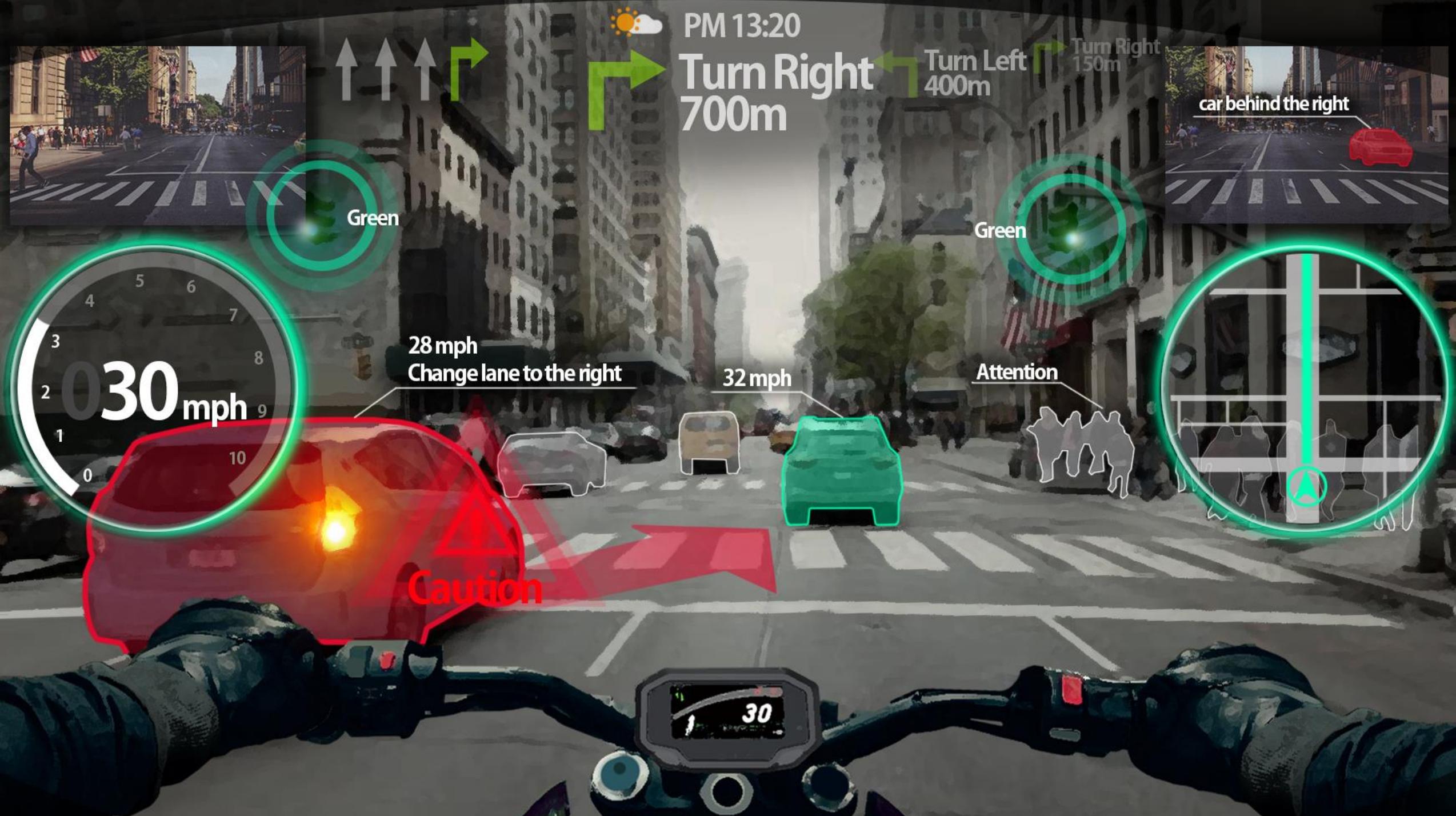
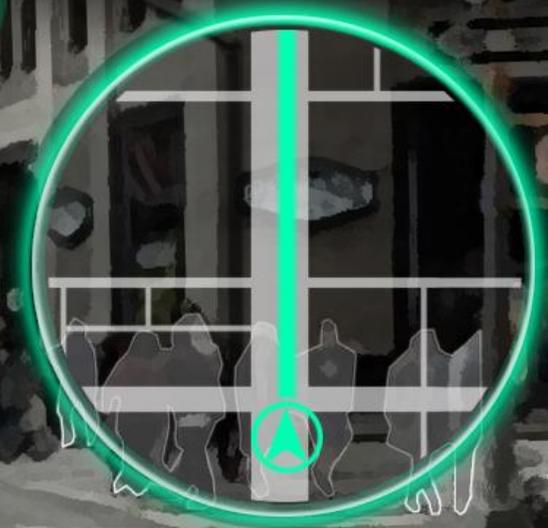
Green

28 mph
Change lane to the right

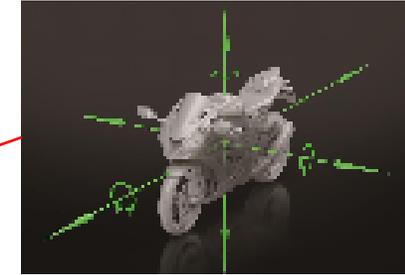
32 mph

Attention

Caution



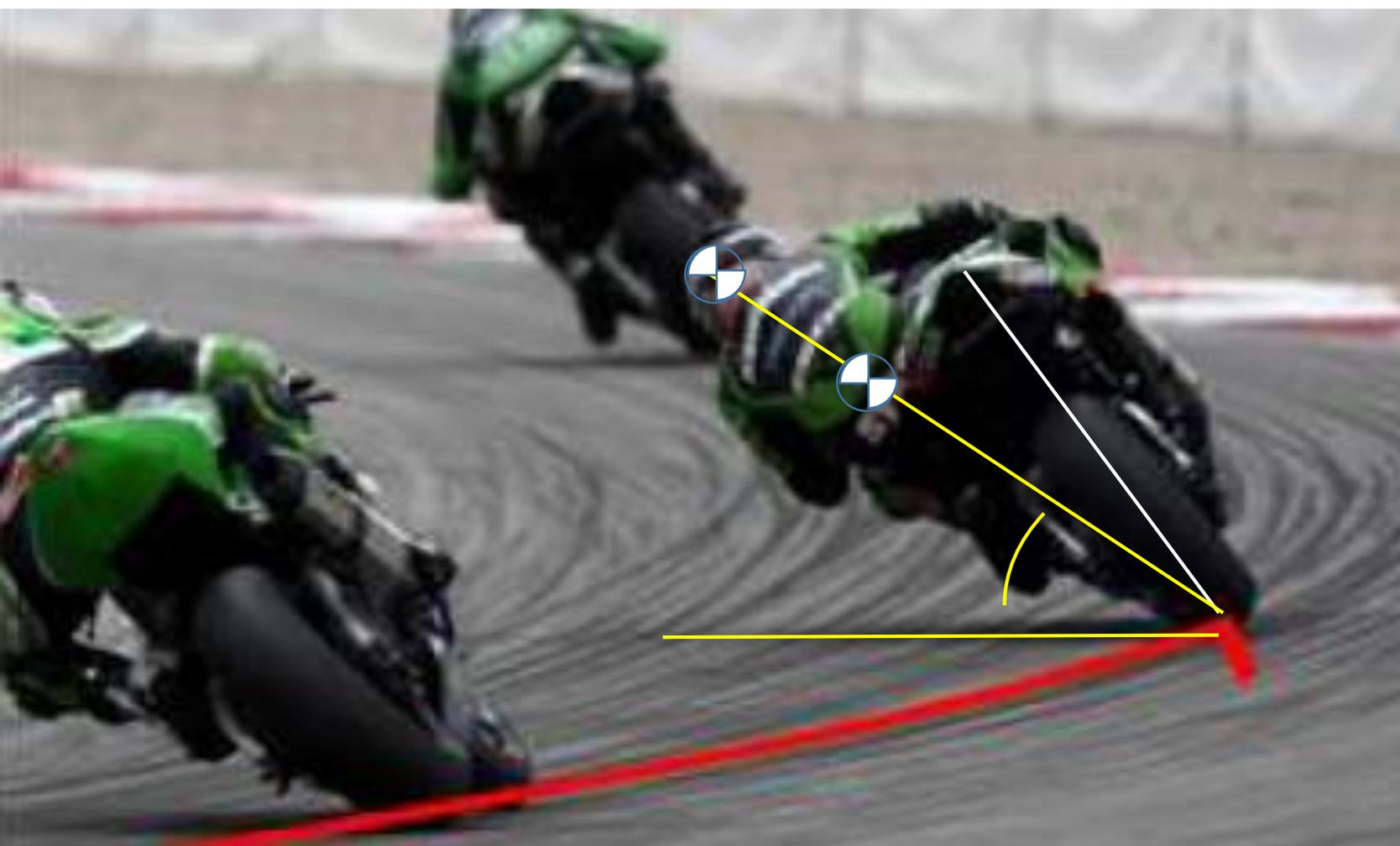
② Smart helmet : has more potentials.



Gyro-sensor on the Motorcycle
(measuring the bank angle)
2016~

Now already MC System calculates the bank angle by Gyro-sensor.

② Smart helmet : with the gyro sensor



MC makes turn by the rider's weight shifting.

Rider weight movement

Input

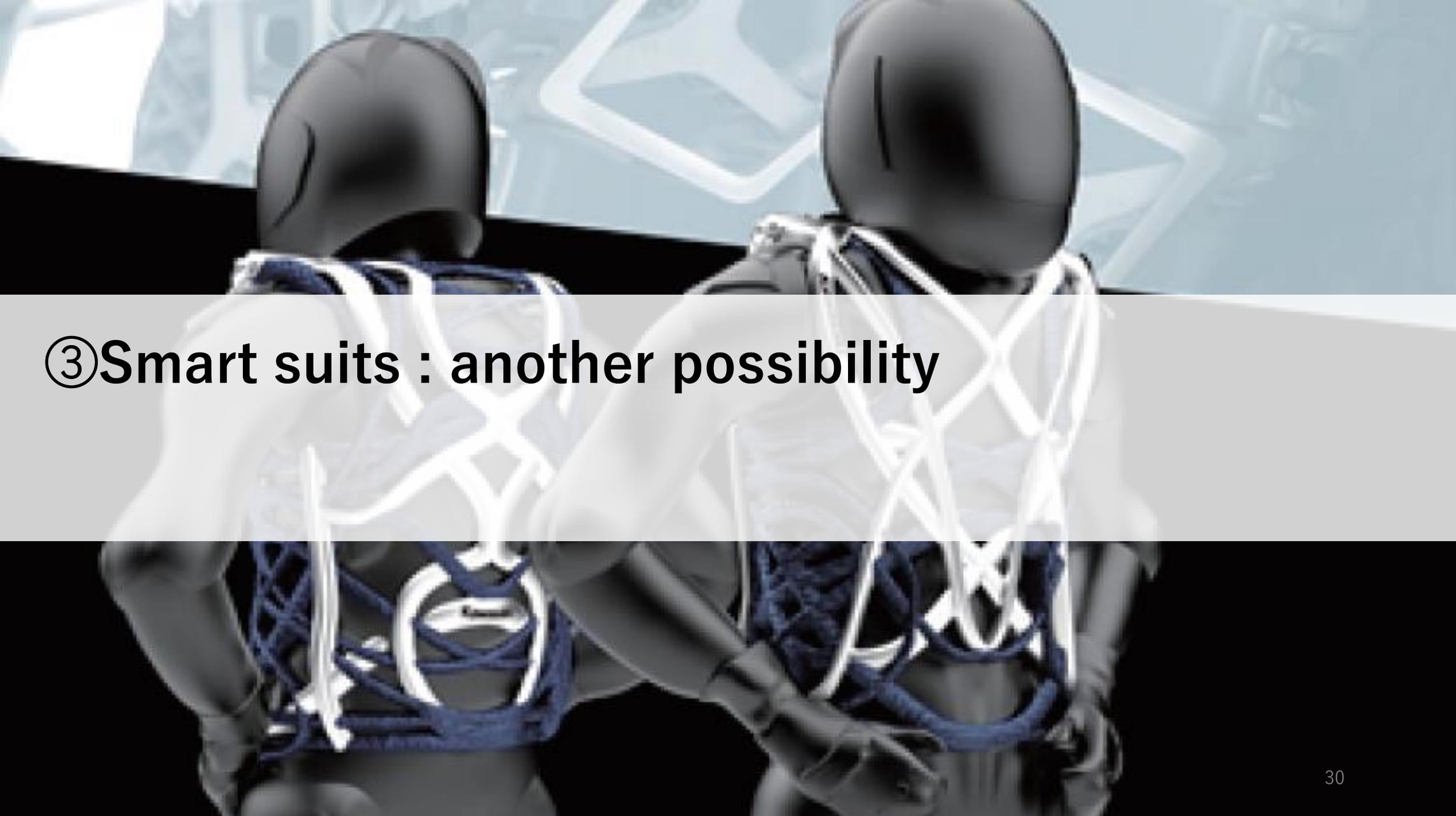


Output

Predict MC Motion

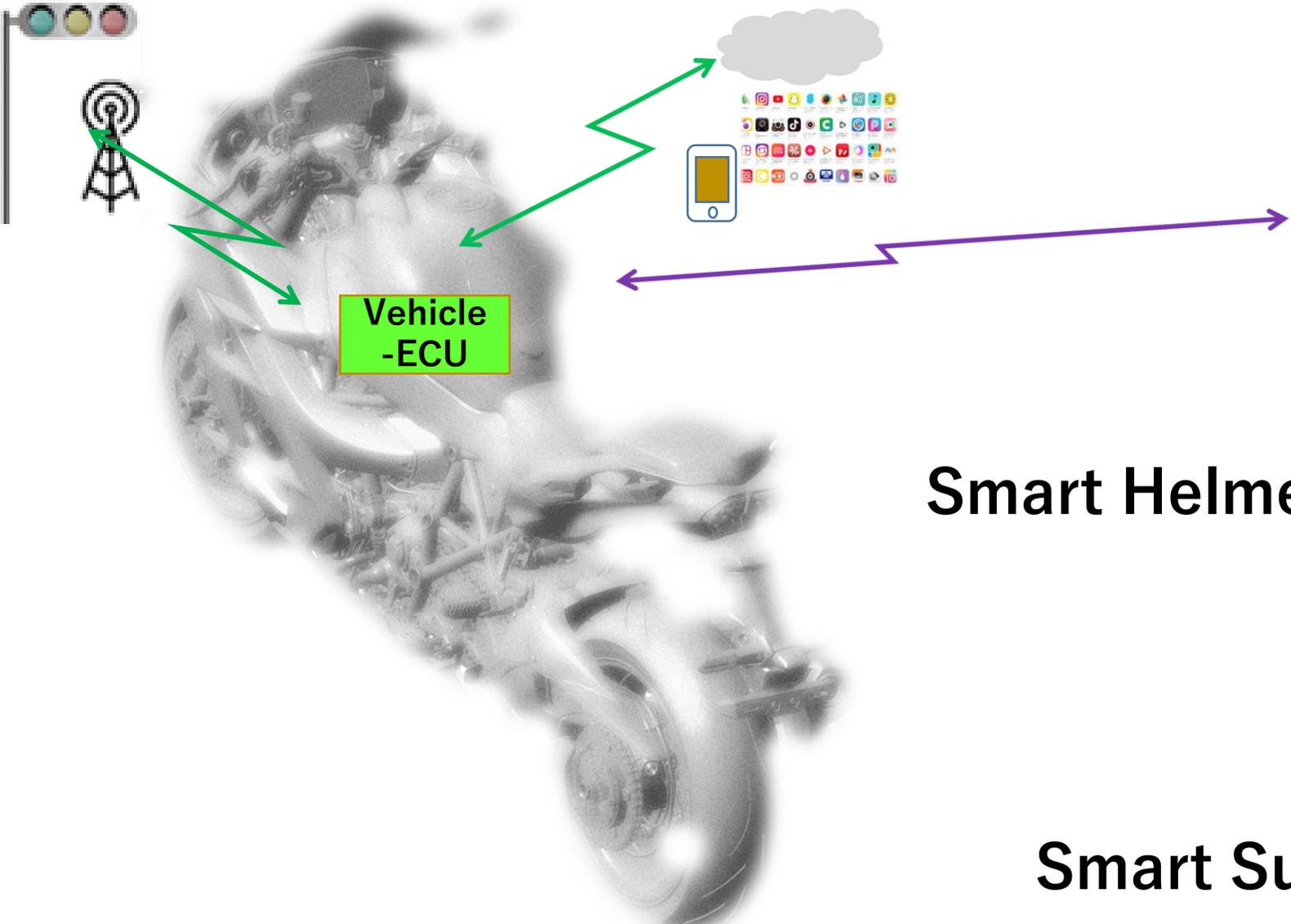
Gyro-sensor





③ Smart suits : another possibility

Smart MC=Smart helmet=Smart Suit

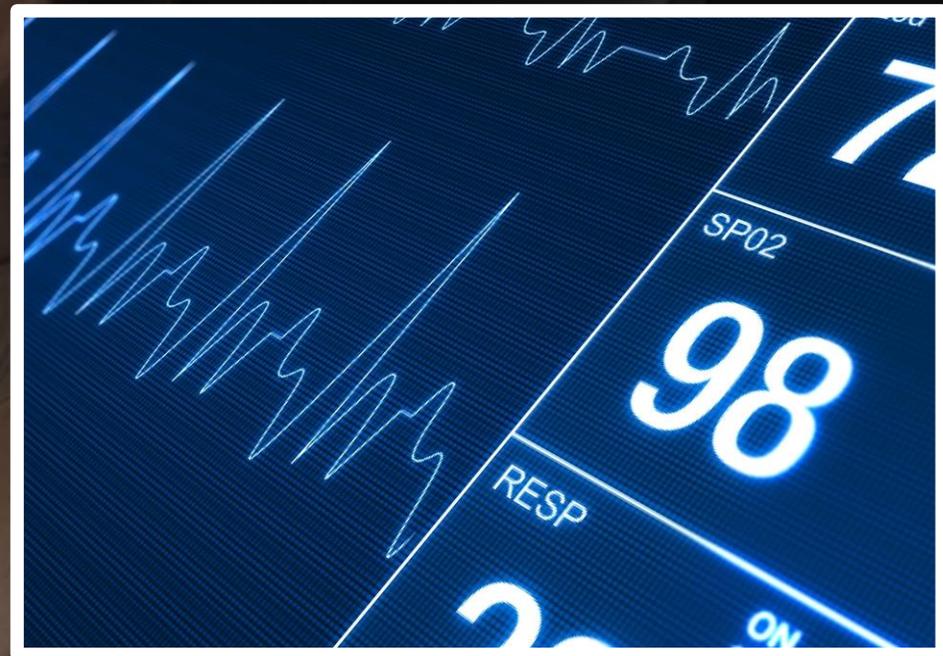


Smart Helmet



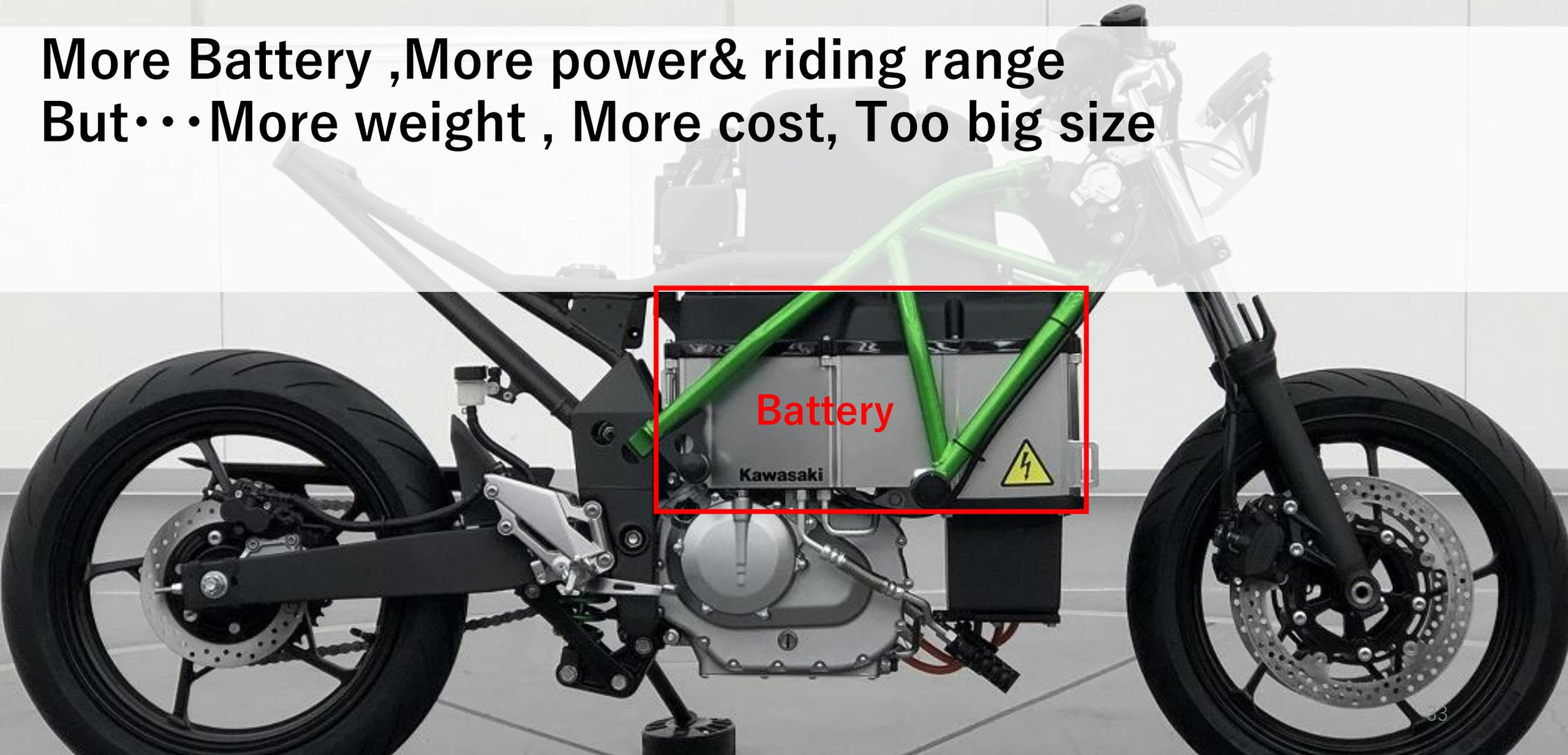
Smart Suit



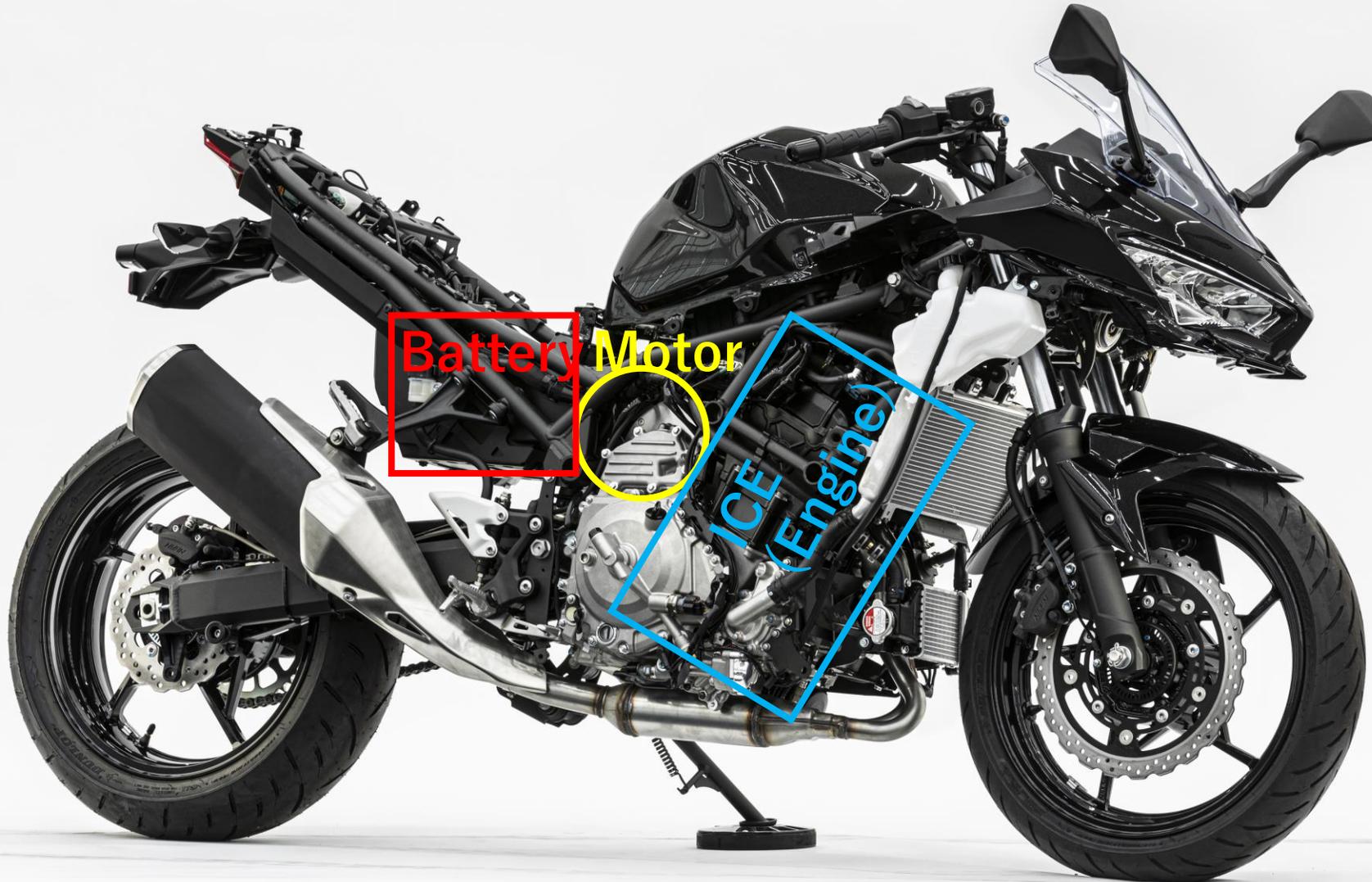


2) Carbon neutral impact to the MC design

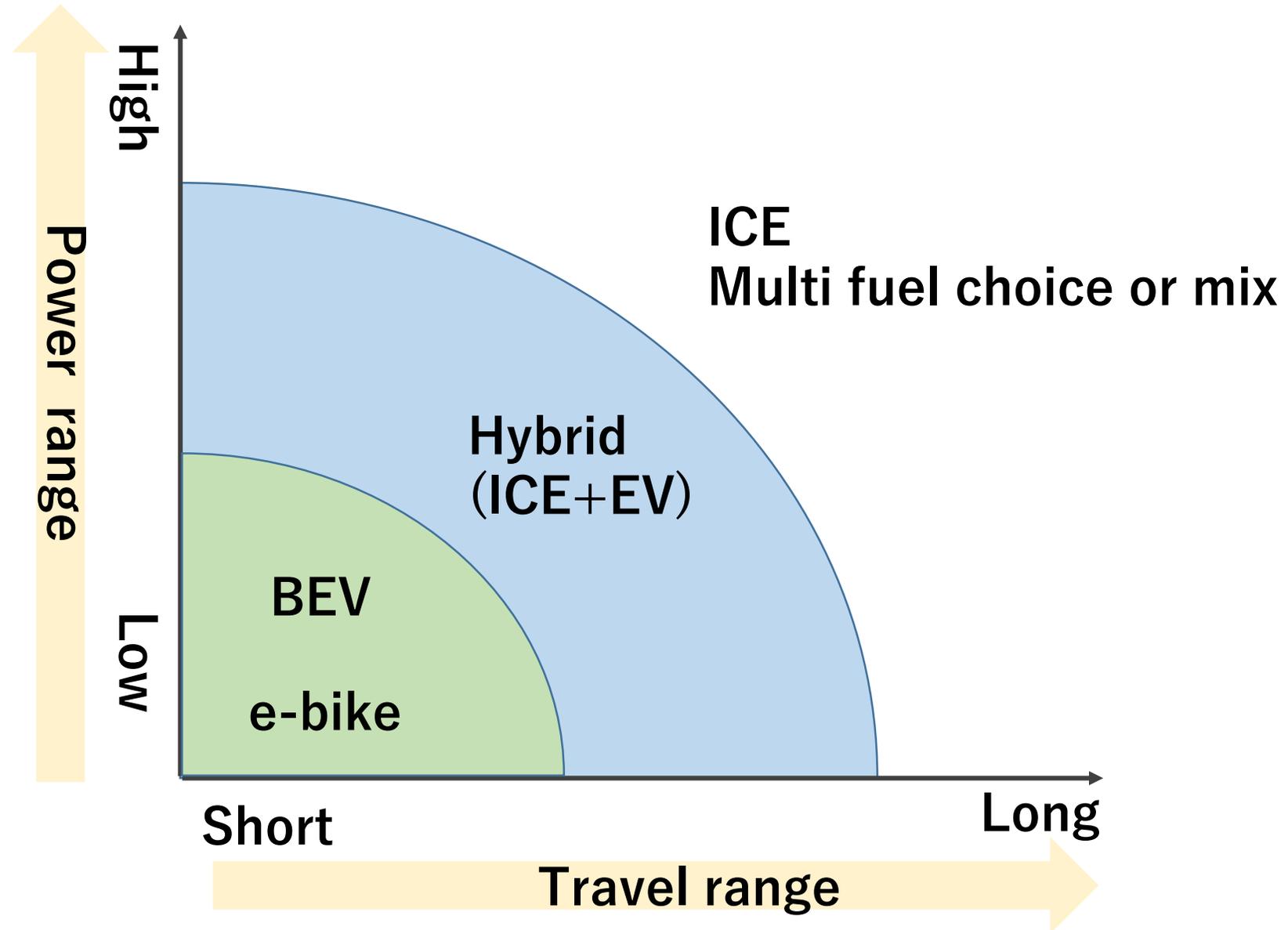
More Battery ,More power& riding range
But···More weight , More cost, Too big size



➤ Hybrid Motorcycle: ICE + BEV

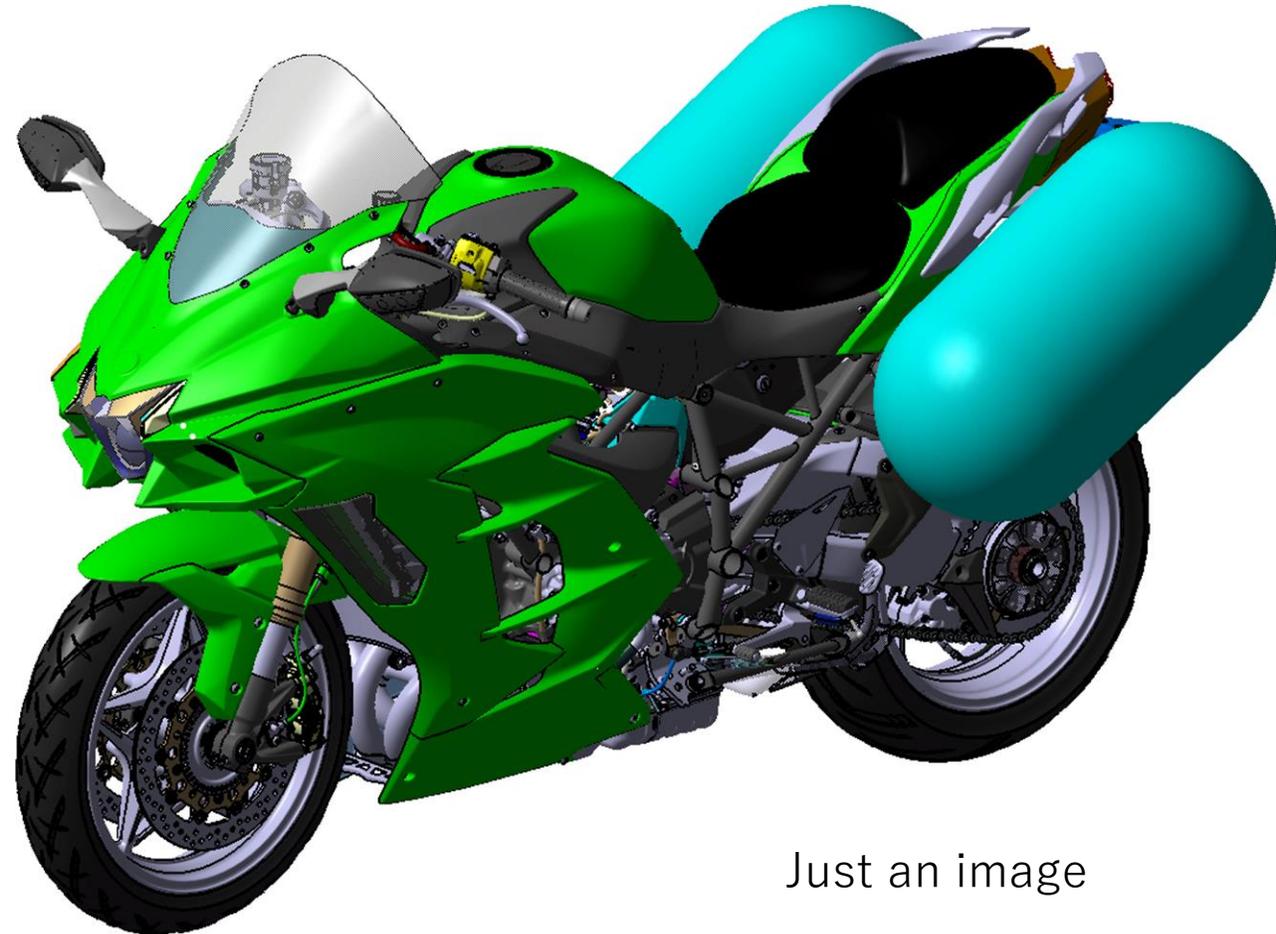


Up to the demands , the motorcycle will be diversified.



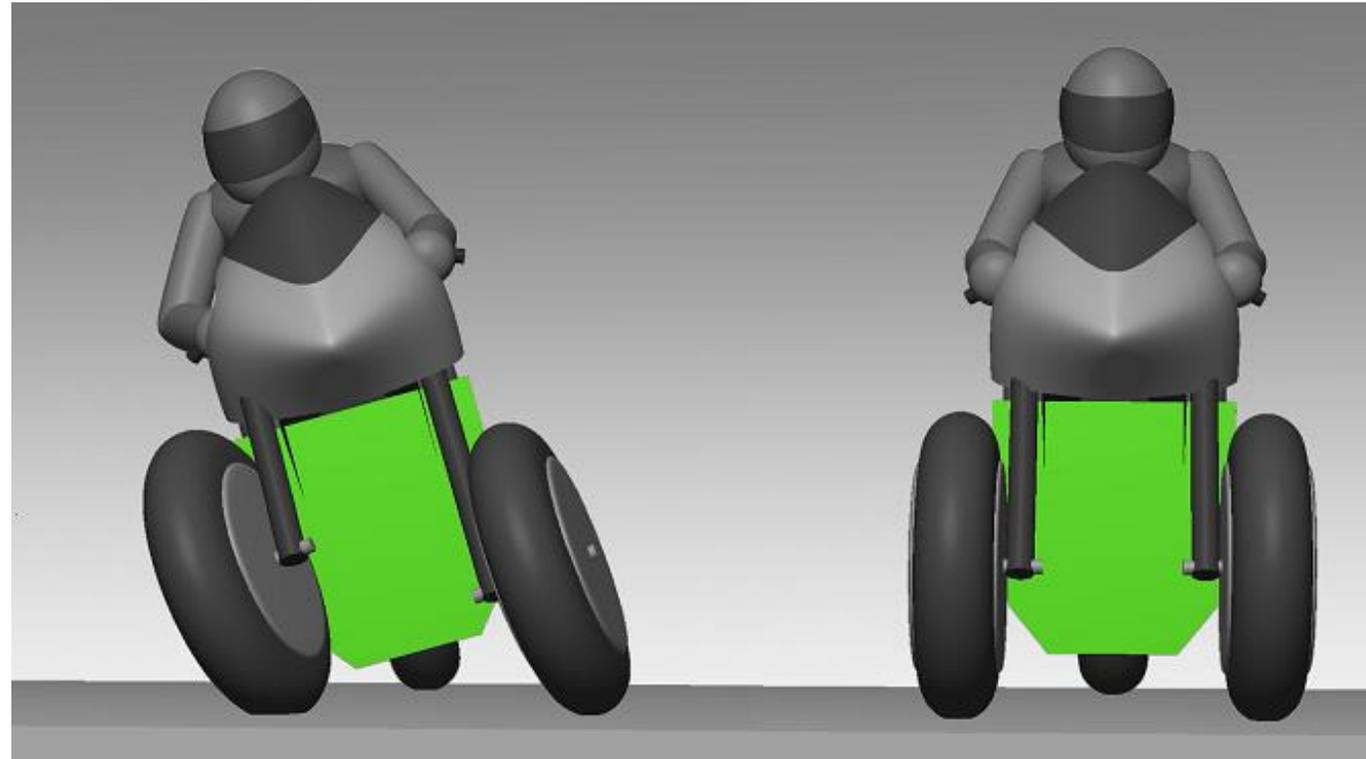
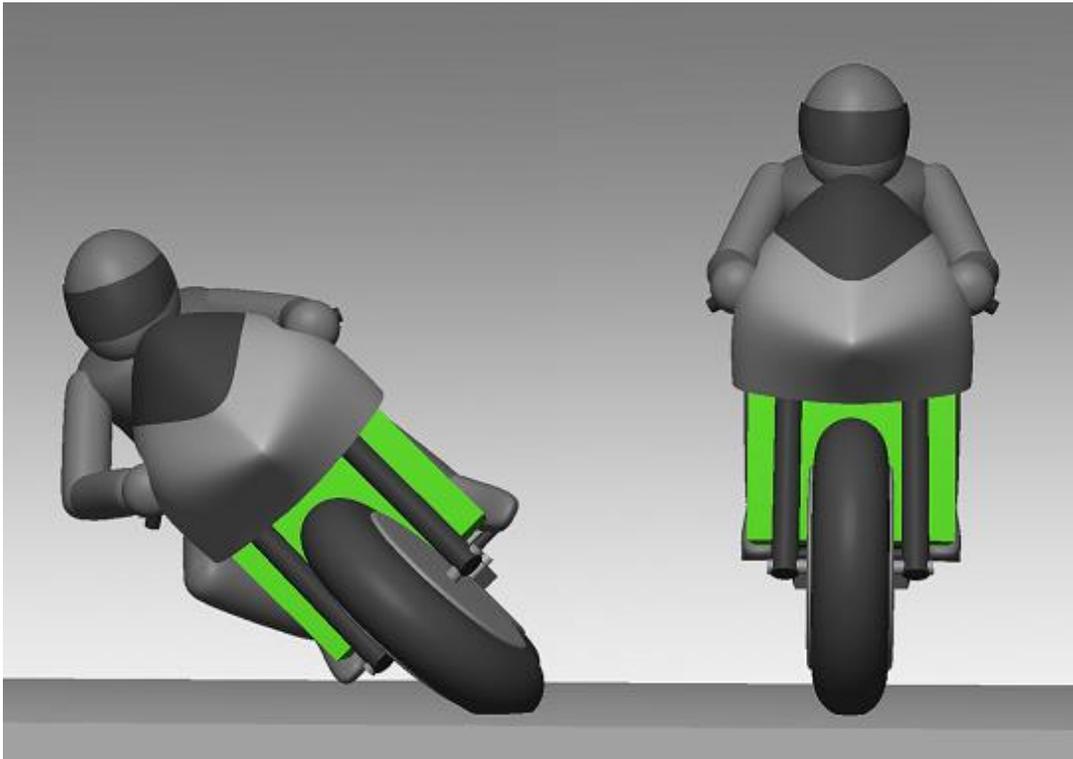
Rough estimation with hydrogen ICE

| | | Gasoline | H ₂ |
|--------------|-----|----------|----------------|
| Pressure | MPa | 0.1 | 70 |
| Fuel amount | kg | 13.3 | 1.97 |
| Travel range | km | 341 | 120 |

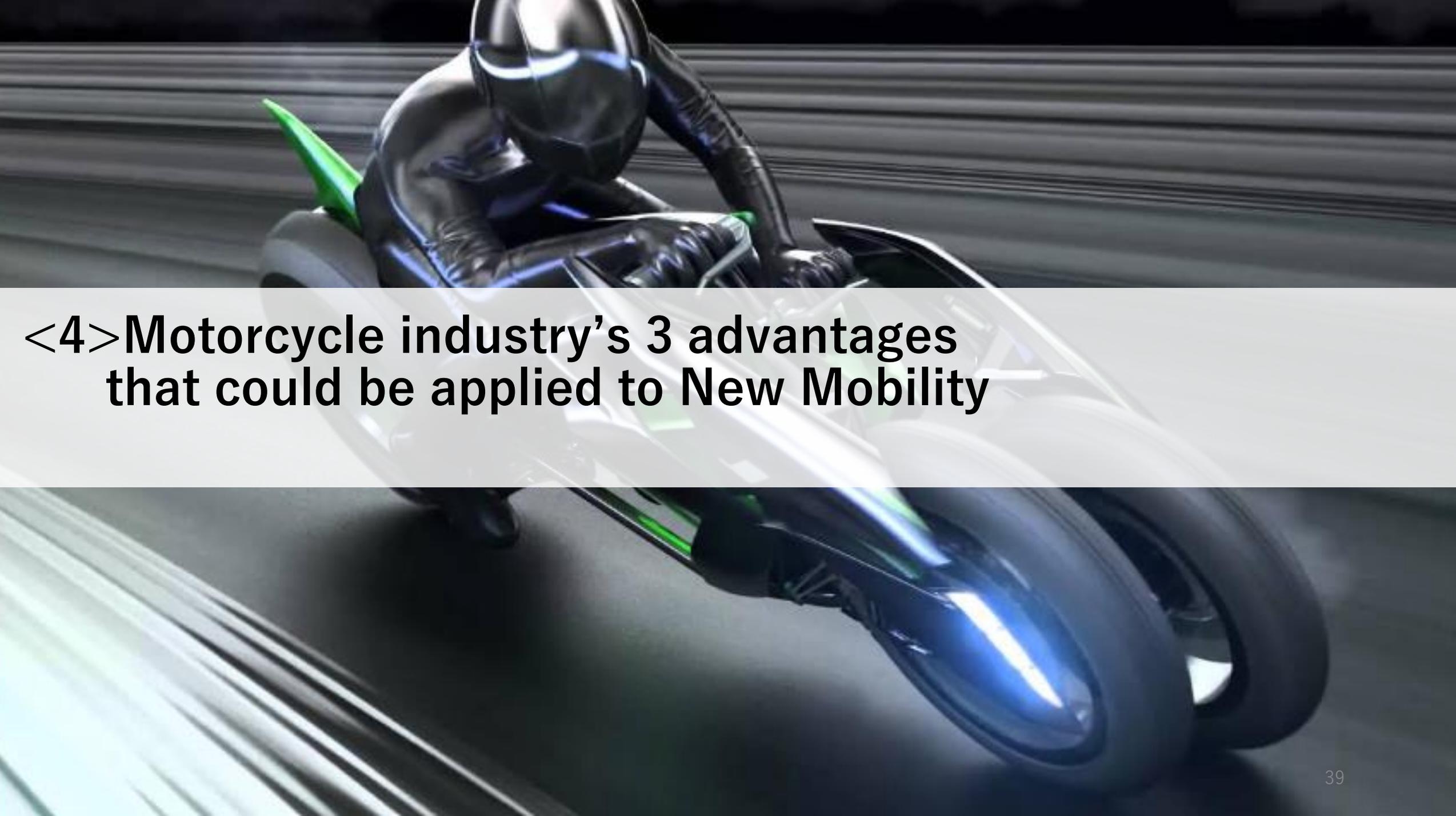


Just an image

➤ More space for the propulsion system: 3 wheeler







<4>Motorcycle industry's 3 advantages that could be applied to New Mobility

1) Durable functional parts of MC technology

2) Flexible Manufacturing of MC

3) MC's Light and small Engine application

1) Durable functional parts of MC technology

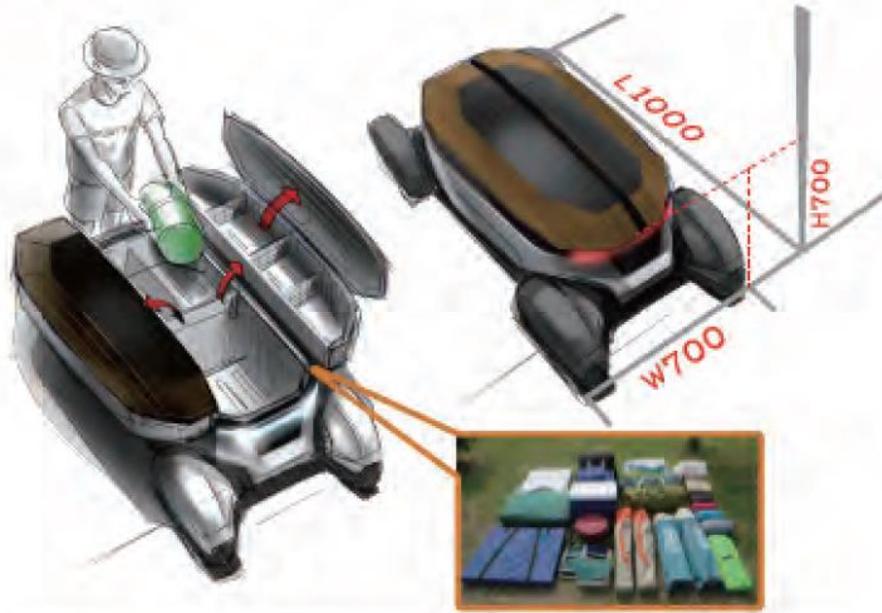
-Water Proof & Vibration proof functional parts; electronics-box, brake, switch, meter, Bluetooth



1) Durable functional parts of MC technology



Apply the motorcycle parts to create New Mobility



Kick Board Style



SPEC / LAYOUT

| SPEC | Value |
|-------------|--------|
| Length | 1000mm |
| Height | 1200mm |
| Width | 800mm |
| Wheel base | 1100mm |
| Seat height | 750mm |



2) Flexible Manufacturing

Short & flexible, low capital cost production line

-The motorcycle manufacturing has more flexible than automobile's.



2) Flexible Manufacturing

The pipe and welded Chassis is suitable for new mobility.



3) MC's Light and small Engine application



Making new mobility: Kawasaki's Advanced Smart Mobility Supervisory Division

Changing the Future Movement of People and Freight



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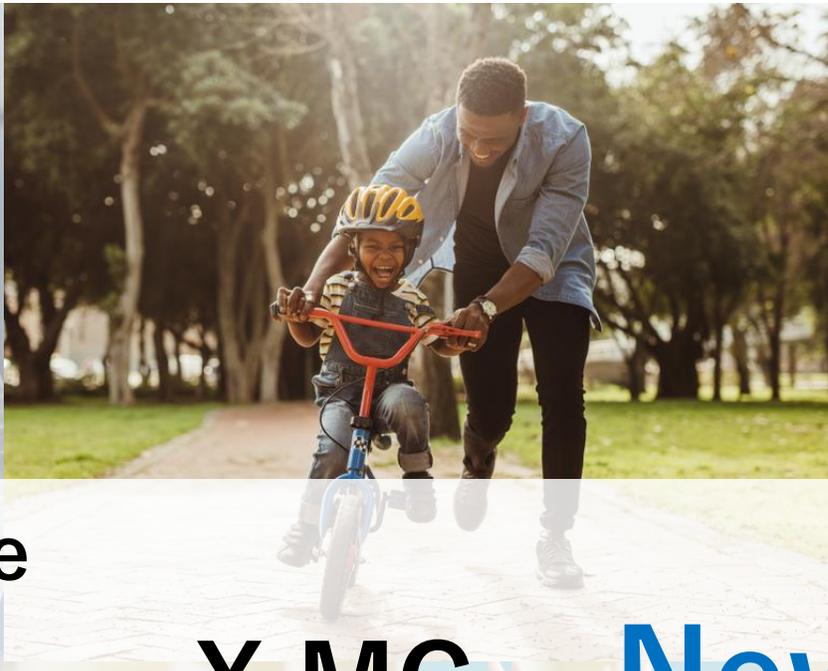


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Providing new solutions

Open question



Medical/health care
Education
Finance/ Insurance
Real estate

X MC = New Business



<5> Summary of my presentation:

1. Motorcycles have always enhanced human ability. New sensors and other technologies will continue this process.
2. The MC industry ecosystem provides important tools for new mobility and manufacturing improvement.
3. Motorcycles will always be fun!

Thanks for your attention!

