

## Design of a four-legged mobility vehicle

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This project began with the theme of the "instinctive drive," the idea that "people feel happiness through movement." The question was how to create an unprecedented mobility experience, where humans and machines seem to communicate as if they are communicating with each other. One answer to this question led to the exploration of a new form of mobility that fuses motorcycles and robots. Looking at existing products, smooth-moving quadruped robots already exist, and their movements have reached a high level of perfection. However, these cannot be said to truly function as "mobility." On the other hand, motorcycles, which excel at off-road riding, often face the challenge of a trade-off between enjoyment and safety. Currently, a certain level of piloting skill is required to safely and freely control them. This mobility project aimed to fuse these two aspects at a high level. Inspired by the forms and movements of animals that have evolved in nature, the goal was to create an experience where riders can extend their mobility capabilities as if they were controlling their own bodies, and freely traverse rough terrain.

However, as the design progressed, the need to clarify the direction became apparent, and a positioning map was used to create a shared understanding among project stakeholders. There was only one axis: should the design image lean more towards a "motorcycle" or "animal"? After placing the robot cheetah designs developed in the image sketches and the motorcycle on the map and discussing the results, the conclusion was reached that, although somewhat in the middle ground, a "motorcycle-oriented" approach was more appropriate to express the sense of mobility.

However, the initial proposal for robotic animals gave a somewhat "frightening" impression from an objective standpoint, raising concerns that it might deviate from the project's goal of creating "mobility that adults and children can interact with in a friendly way." Therefore, the neck, face, and tail, which gave a "frightening" impression, were removed, and the design was reconstructed to emphasize motorcycle elements while toning down the animal-like aspects. Furthermore, inspired by how wild animals bend their spines when running, the rotation axis of the waist was likened to the rotation axis of a motorcycle's swingarm, resulting in a configuration that emphasizes the front and rear mass.

In this way, the design and development of this quadrupedal mobile device was carried out as an entirely new form of transportation that had never existed before. Because it was an unprecedented field, the freedom to explore all possibilities was extremely rewarding, but the biggest challenge was how to quickly realize the ideal vision within the limited time before the World Expo. With the development of AI-equipped humanoid robots and drones, it is expected that various new forms of transportation will be introduced to the market in the future. People's attention has already shifted to when this mode of transportation will be introduced to the market. As a challenge to create an entirely new form of transportation that satisfies the human instinct for movement, we hope that this mode of transportation will further expand the possibilities of transportation, enrich people's lives, and bring about a future full of dreams.



Fig.1 Cheetah



Fig.2 Final design