A cover for the single-person pedal-powered vehicle

Pedal-powered vehicle has become increasingly popular as it is environment-friendly and convenient. Considering the comfort while cycling, the cover has entered consumers’ vision, as well as the vision of researchers. The cover is usually made of synthetic fabric, attached to vehicle by a metal pole. Properties of the cover vary due to different physical and chemical characteristics.

Great effort has been paid to gain more knowledge of one of these properties -- resistance coming from cover. For example, it has been discovered that covers with an inclination of 5°can reduce the resistance by at least 10% while moving forward than those without any inclination, thus improving cycling speed[[1]](#endnote-1). Similarly, cycling speed could be improved by reducing the size of cover[[2]](#endnote-2). Moreover, it has been demonstrated that covers made in small molecule material tended to generate low resistance, and the average cycling speed by volunteers could be improved by 5m/s[[3]](#endnote-3). There were also some qualitative researches; for example, Tony et al.(2020) discussed how the height of the cover related to cycling resistance[[4]](#endnote-4). However, there is no union definition of resistance among these existed research, and only few studies delved into the mechanism about how these aspects act on reducing resistance cooperatively, which is vital information for both manufacturer and cyclist. This research aimed to bridge these gaps.

In this research, “resistance” is defined as the variation of velocity, with the velocity of a no-cover vehicle as reference standard. It adopts random forest, a machine learning regression algorithm, to model this mechanism. Cover’s material, size, shape and height are selected as X and resistance is seen as Y to train and test random forest regression algorithm. Although the performance of the algorithm showed discrepancy among different regions, the average accuracy to calculate resistance achieved 87% worldwide.

References

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1. [↑](#endnote-ref-1)
2. [↑](#endnote-ref-2)
3. [↑](#endnote-ref-3)
4. [↑](#endnote-ref-4)