Problem Chosen	2022 MCM/ICM Summary Sheet	Team Control Number
A		2226807

Best Strategy to Road Cycling

Road cycling is a very popular sport that tests one's endurance as well as perseverance. The purpose of this report is to analyze the influence of different power riders use on riding speed and race finish time by establishing a **power distribution model**, and to provide technical guidance for riders and coaches.

For the first task, we selected **Sprinter** to compare with **Time Trial Specialist**(TTS), search data to draw the power curves of the two types of riders, and defined the power pofile of the two types. It was found that the maximum power output by TTS lasted for 5s was 972.6W, and that by Sprinter was 1405.9W. In addition, we also consider the gender difference of power profile and find that the maximum power lasted for 5s output by female Timer is 773.6W and Sprinter is 953.3W.

For the second task, we applied our model to The Tokyo Olympic Games, UCI Time Trial Course and the customized track. The length of our customized track was 14.4km, and factors such as slope and curves of some sections were taken into consideration. The results showed that Sprinter's finishing time was significantly slower than Timer in Tokyo Olympic Games, while there was no significant difference between the two in UCI Time trial course and self-defined track. In addition, sprinter was significantly faster than Timer at the start and finish of the course.

For the third task,when the slope of a 4.9km straight path changes from 0° to 2° downhill, the average velocity changes from 12.19m/s to 18.99m/s, increasing by 55.81%. When the friction coefficient increases from 0.018 to 0.022, the completion time increases by 0.96min, and the curve slope is roughly estimated to be 240, which has a significant effect. Wind speed and wind speed have similar effects on the results, and the completion time will change significantly only when it reaches 3m/s and 20°, respectively.

For the forth task,Tokyo 2020 Olympic Track and female athletes were selected for analysis. The random simulation of 1000 output power was conducted, and the obtained time was in the range of 34-40.2min, and the overall standard deviation was 5.4, which proved that there was a large gap between the results of power and different schemes. We set up four monitoring points at the turning point according to the change of slope and conducted 10 simulations according to the scheme. The difference in average speed is small, so suggestions can be put forward for cyclists to improve by observing the average speed at these four points.

For the forth task, we turn to that in a team of six rider,the wind resistance compared with single ride will be reduced, in addition, there is 1 to 2 riders on the way up the situation, so we simulated the the position of every rider in the team, and the position of each rider when riding alone, and we find that group cycling improves performance.

Finally, sensitivity analysis of rider mass and maximum energy was made.

Key Words: power distrution model,sprinter, fatigue,Critical power,maximum energy