The auto change bicycle

January 13 2009

Researchers in Taiwan are designing a computer for pedal cyclists that tells them when to change gear to optimize the power they develop while maintaining comfort. The system is described in the latest issue of the *International Journal of Human Factors Modelling and Simulation*.

As environmental pressures mount to find greener modes of transport, more and more people are turning to bicycling not only as an enjoyable form of exercise but also as their main mode of transport for commuting. But, athletes aside, few people know how to adjust the gears on their bicycle to get the most power out of their pedaling without becoming uncomfortable either through having to pedal too fast in a low gear on level roads or straining when going up hill or to maintain a high speed.

T.Y. Lin, Y.C. Chen, and H.C. Ping at the Department of Mechanical Engineering, at National Defense University, Tashi, Taiwan, ROC, explain how ergonomic studies show that cyclists can be in an optimum state during cycling with a fixed output power and cadence (pedaling speed). They have now developed a computer algorithm that gives any cyclist a gear shift strategy to cope with almost any cycling conditions and maintain this optimal state without reducing comfort.

The researchers point out that bicycles are a nineteenth century invention but there has been little fundamental change in the bicycle's components in the last 75 years or. Indeed, good derailleur gearing systems allow riders to move efficiently and feel comfortable but not necessarily optimally so for the untrained cyclist. Nevertheless, the derailleur gear

system can fine-tune the relationship between the cyclist's leg strength, their cardiovascular system, and the riding environment.

Efforts to improve bicycles have tended to focus on modifying components and ignored the fact that seated in every saddle is a human being. Lin and colleagues have factored in the human element of cycling and considered that a fit and healthy non-athlete should be able to ride a bicycle for several hours generating 75 Watts of power without suffering fatigue and at a comfortable cadence of between 60 and 100 revolutions per minute.

The algorithm devised by the team and tested by simulation of a 12-speed bicycle provides a gear-shifting sequence with minimal power losses and gear shifts. "By following the sequence, riders can operate the derailleur system more easily," says the team, "Riders will also feel comfortable because all gear-ratios can be used, and gear-shifting actions will be smoother." The computer will automatically adjust to riding conditions, satisfying the human element. It would not be hard to imagine extending the concept to entirely automatic mechanical gear-changing system.

Paper: "Development of an optimum bicycle shifting strategy based on human factors modeling" in Int. J. Human Factors Modelling and Simulation, Vol. 1, pp 159-173

Source: Inderscience Publishers