UVM Innovations

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Wireless Sensor Approach to Bicycle Suspension Tuning

Case #83

Method of tuning bike suspension that uses signal processing to gather data on the acceleration of the suspension while the cyclist is using the bike.

Inventor:

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Description:

The mountain bike industry exhibits some of the fastest and most dramatically progressing technology of any sport. Athletes now push their equipment to handle pressure that would have been thought impossible just 15 years ago. The suspension is particularly incredible, allowing a rider to drop off a 10 foot cliff or charge through a field of small boulders at 20 miles per hour.

Among various improvements in bicycle suspension has been the ability to customize the way suspension responds to different riding styles and anatomical differences in cyclists. The two main adjustments that can be made on suspension are the pressure and the rebound speed. The pressure in the air chamber modulates how much the suspension compresses upon impact, and the rebound speed modulates how quickly the suspension retracts to its full position.

Currently there exist two methods of tuning suspension for a specific cyclist. One is to follow the factory recommendations, which only take into account the dimensions of the cyclist. The other method is to ride the bike on trails and adjust the suspension according to what feels right, which can allow the settings drastically deviate from the recommended range, eventually leading to damage within the suspension components, or possibly injuring the rider.

Professor Frolik has invented a method of tuning suspension that uses signal processing to take data on the acceleration of the suspension while the cyclist is using the bike to determine exactly how the suspension should be set up. This allows the suspension to be tuned to the optimal settings while not deviating dangerously far from the factory recommendations. The technology makes use of wireless accelerometers that are now found in many handheld electronics.

The general set up would involve sensors placed on the lower of the suspension fork and on the headset to test the front suspension, and sensors placed on the rear axle and the seat tube to test the rear suspension. The suspension is initially set to factory-recommended setting for the cyclist's height and weight. The cyclist then rides the bike, and signal processing techniques employed. If the system response then disagrees with the current settings, then manual adjustments are made and the test is redone. Professor Frolik's system provides a systematic and efficient way to optimize the suspension tuning according to all variables.

Applications:

- Full suspension and front-only suspension mountain bikes
- Potential to be expanded to motorized sports that are similar to mountain biking, such as motocross, ATV, and snowmobiling

Advantages:

- Introduces a novel method of tuning suspension for the optimal settings given a cyclist's riding style and size
- Helps protect the cyclist from injuries due to improperly tuned equipment

Patent Information:

USPN 7,395,167 and 7,831,403