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Stability Driven Automobile Automation

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***Abstract*— The ever increasing need for vehicular stability never seems to cease. Be it faster automobiles on smoother roads or the slower off-roaders on hilly terrain, one does need maximum levels of stability for smooth operation. A number of accidents occur due to the driver losing control of his vehicle. This may happen due to the unevenness of the road, the texture of the road or simply his loss of focus. The Stability Driven Automobile Automation allows the user to adjust the axel length and wheel base of the vehicle according to the terrain he or she is driving on. This project is aimed to reduce the number of on-road casualties and enhance driving experience through a number of clever automations.**

***Keywords*—ATMEGA 328P, Axel, Chassis, Motor Driver, Scissor Jack, Stability, Traction Control.**

I. Introduction

An all-terrain vehicle (ATV), also known as a quad, quad bike, three-wheeler, four-wheeler, or quadricycle as defined by the American National Standards Institute (ANSI) is a vehicle that travels on low-pressure tires, with a seat that is straddled by the operator, along with handlebars for steering control. As the name implies, it is designed to handle a wider variety of terrain than most other vehicles. Although it is a street-legal vehicle in some countries, it is not street-legal within most states and provinces of Australia, the United States or Canada.

By the current ANSI definition, ATVs are intended for use by a single operator, although some companies have developed ATVs intended for use by the operator and one passenger. These ATVs are referred to as tandem ATVs. The rider sits on and operates these vehicles like a motorcycle, but the extra wheels give more stability at slower speeds. Although equipped with three or four wheels, six-wheel models exist for specialized applications.

II. Literature Review

[i] "Wheel Slip Control for Improving Traction-Ability and Energy Efficiency Of A Personal Electric Vehicle", Kanghyun Nam, Yoichi Hori and Choonyoung Lee.

The basic idea behind the need for a traction control system is the loss of road grip that compromises steering control and stability of vehicles because of the difference in traction of the drive wheels. Difference in slip may occur due to turning of a vehicle or varying road conditions for different wheels.

When a car turns, its outer and inner wheels rotate at different speeds; this is conventionally controlled by using a differential. A further enhancement of the differential is to employ an active differential that can vary the amount of power being delivered to outer and inner wheels as needed. For example, if outward slip is sensed while turning, the active differential may deliver more power to the outer wheel in order to minimize the yaw (essentially the degree to which the front and rear wheels of a car are out of line.) Active differential, in turn, is controlled by an assembly of electromechanical sensors collaborating with a traction control unit.

Working Of a Scissor Jack to Control Axle Length:

[ii] "Design And Optimization of Scissor Jack", Chetan S. Dhamak, D. S. Bajaj, Savitribai Phule.

There are two main kinds of car jack: those operated by screw and those operated by hydraulics. For standard road vehicles, the screw type is most common, often coming in the form of a scissor jack. Their popularity is a result of their ability to generate a great mechanical advantage – i.e. large force amplification from a manually operated arm tool.

These jacks work by using a two-piece mechanism – similar to those found on extending bathroom mirrors – in partnership with a self-locking central screw.

Combined, these elements not only enable a vehicle to be lifted through the extension of the scissor mechanism, but also to be held in place by the resistive force of the screw, which without the jack would instantly collapse.

The central screw is also how the jack is operated, with an end-mounted circular ring designed to accept a large Allen key-shaped metal arm. When inserted and turned clockwise this arm drives the screw through the scissor mechanism's central pivot points' thread, elongating the jack and, thus, raising the vehicle. In contrast, rotating the screw counter-clockwise unthreads the screw, shortening the jack and, in turn, lowering the car to the ground.

III. Block Diagram

The proposed Automobile consists of two sections viz.

i. Automobile Section ii. Controller Section.

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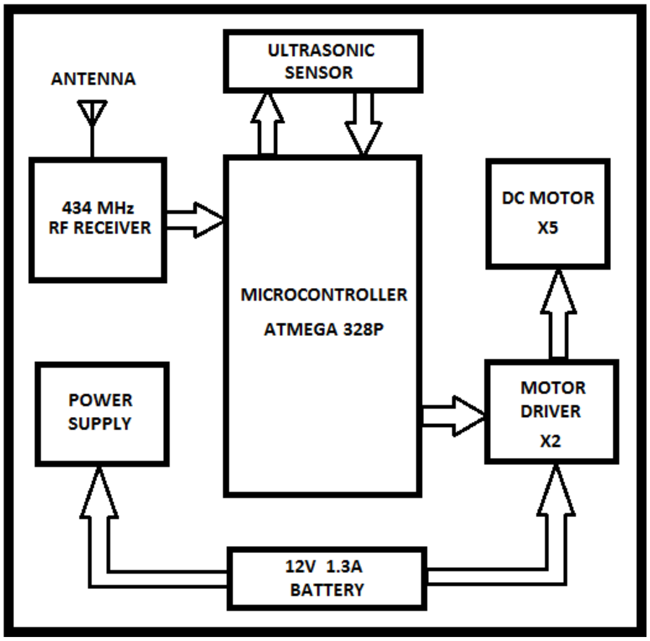

Fig i: Automobile Section

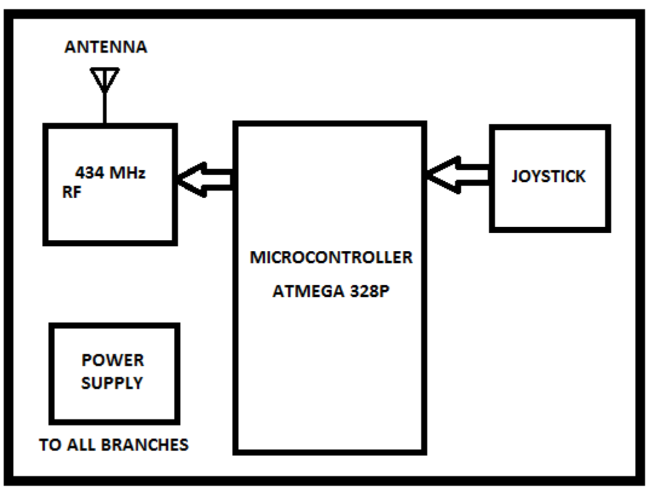

Fig ii: Controller Section

IV. Major Components Used

- Ultrasonic Sensor
- RF Transmitter & Receiver
- Microcontroller ATMEGA 328P
- Motor Driver
- D.C. Motor
- 12V 1.3A Battery
- Power Supply

V. Working Principle

The scissor jack mounted in the centre of the axel expands the contracts the outer chassis. The central body mounted on the load bearing beams stays unaffected. The contracted mode provides for a narrower width making it possible for it to squeeze through crowded lanes and propel at higher speeds. The expanded mode allows the vehicle to tread more safely on slipper terrain. This makes it ideal as an off-roader. It also proves beneficial for wet roads during monsoons when slipping and skidding of tires is a primary concern and a major cause of accidents..

VI. Disadvantages

In this system, the road offers a considerable friction making it difficult for expansion on rougher terrains, thereby consuming more power. Having a flexible size chassis would make taxation of vehicle on dimension more complex.

VII. Conclusion

The Stability Driven Automobile Automation provides for a one stop solution for solving on-road stability and safety issues. It proves invaluable in reducing millions of annual on-road casualties that result due to vehicles loosing grip of tarmac while in motion. A flexible axel aids in reducing size of vehicle as well making it ideal to zip through lanes and make its way through crowded lanes.

Acknowledgement

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