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Research Article

Multithreading Real Time Applications on Embedded System Using Fuzzy Controlled Braking System Based on Can and RTOS

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Abstract: To design an advanced electronic active stability control system with ABS assistance for bikes providing the much needed vehicle roll stability control in situations such as high speed cornering etc. In cases of an emergency situation such as crashing, will send the bicycle accident location to nearby hospitals/emergency services without the assistance of costlier GPS tracking systems. Active Stability Control or Electronic Stability Control (ESC) is a safety feature that improves the vehicle stability by sensing yaw rate and roll rate in order to improve steering control in four-wheeled vehicles. It was introduced to improve passengers' safety in critical driving conditions such as cornering or sudden obstacle avoiding manure. This system uses the ABS at its heart for its longitudinal braking control and senses vehicle dynamics and drivers intention in order to stabilize the vehicle by avoiding rolling, skidding and loss of traction.

Keywords: Multithreading, CAN, RTOS, Fuzzy Control

INTRODUCTION

The future of two wheeled motor cycles in the coming decades is more complicated and with less safety measures so we turned to look for ways to make the bicycle riding into a much safer experience. One important safety technology used in high end cars and trucks is called ABS (Anti-

Lock Braking System) which has already become a mandatory feature for vehicles in US and Europe. ABS is an electro-mechanical system that helps reduces / reduced wheel skids in automobiles by controlling the brake force applied to each wheel, making it easier to stay in control while riding. ABS equipped bicycles are still evolving. The design is a low cost fuzzy logic controlled electronic ABS for e-bicycles providing enhanced safety for riders and second to design a system that, in case of an emergency situation such as crashing, will send the bicycle accident location to nearby hospitals/emergency services without the assistance of costlier GPS tracking systems. Fuzzy based ABS control system takes multiple sensor inputs to find the optimal braking force to be applied. The system measures the force applied to the brake levers, the angle of the vehicle, along with the speed of both wheels in order to calculate the braking force. If it detects a skid/ lock-up on one or both wheels, fuzzy controller calculates the braking pressure needed and applies it differentially to each wheel using electrical motors, counteracting the rider's squeezing force on the levers. Adjustment Keypad allows the rider to set the skid threshold level at which the system activates, allowing for different performance characteristics depending on the trail surface. Vehicle location tracking systems reads 3-axis MEMS Magnetometer that will be used as e-compass for tracking the vehicle without GPS. During a crash situation, sensed via the 3-axis MEMS Accelerometer, the system automatically sends an emergency message to home/hospital/emergency services with embedded vehicle location data.

RELATED WORK

The entire system has three ECU (Electronic Control Units) interconnected with each other. Couple of ECUs dedicated to individual fronts and rear wheel control. The wheels are controlled by two DC Motors's, one for fronts and the other rear side. The ECU interfaces with Rotary Encoders to measure the speed and direction of the wheels. The third ECU is the dashboard unit. It interfaces with three sets of Stretch Sensors to measure the force that the rider applies to the two brake levers and accelerator. It is also interfaced with a Graphics LCD that acts as front dashboard display and provides a GUI to monitor the vehicle status. MEMS Magnetometer and Accelerator are connected to this unit.

PROPOSED SYSTEM

The design is low cost fuzzy logic controlled electronic ABS for e-bicycles providing enhanced safety for riders and second to design a system that , in case of an emergency situation such as crashing , will send the bicycle accident location to nearby hospitals/emergency services without the assistance of costlier GPS tracking systems . Fuzzy based ABS control system takes multiple sensor inputs to find the optimal braking force to be applied. The system measures the force applied to the brake levers, the angle of the vehicle, along with the speed of both wheels in order to calculate the braking force. If it detects a skid/ lock-up on one or both wheels, fuzzy controller calculates the braking pressure needed and applies it differentially to each wheel using electrical motors, counteracting the rider's squeezing force on the levers. Adjustment Keypad allows the rider to set the skid threshold level at which the system activates, allowing for different performance characteristics depending on the trail surface. Vehicle location tracking systems reads 3-axis MEMS Magnetometer that will be used as e-compass for tracking the vehicle without GPS. During a crash situation, sensed via the 3-axis MEMS Accelerometer, the system automatically sends an emergency message to home/hospital/emergency services with embedded vehicle location data. The entire system has three ECU (Electronic Control Unit) interconnected with each other. Couple of ECUs dedicated to individual fronts and rear wheel control. The wheels are controlled by two DC Motors's, one for fronts and the other rear side. The

ECU interfaces with Rotary Encoders to measure the speed and direction of the wheels. The third ECU is the dashboard unit. It interfaces with three sets of Stretch Sensors to measure the force that the rider applies to the two brake levers and accelerator. It is also interfaced with a Graphics LCD that acts as front dashboard display and provides a GUI to monitor the vehicle status. MEMS Magnetometer and Accelerator are connected to this unit. All three ECU is connected with each other over the most popular vehicular network called CAN (Controller Area Network). CAN is an event-driven protocol that is very reliable for automotive applications. To meet the real-time deadlines , and to make the system robust , the software runs under Free RTOS , the most popular open source real-time kernel in the world . Automobile ABS controller, based on fuzzy control, don't need complicate controlled plant's mathematical model, it can efficiently solve the influence of varying duty and nonlinearity happened during automobile ABS braking, and increase automobile brake system's security and stability. Through the simulation of Automobile ABS controller based on fuzzy control , whether brake time or brake distance are all achieve a great control effect, guarantee the steady of braking , the fitness of brake efficiency , and the requirements of national safety specifications for vehicles operating on roads . This research fully brings out that automobile ABS fuzzy control system is worth to be further developed and its application prospect is bright.

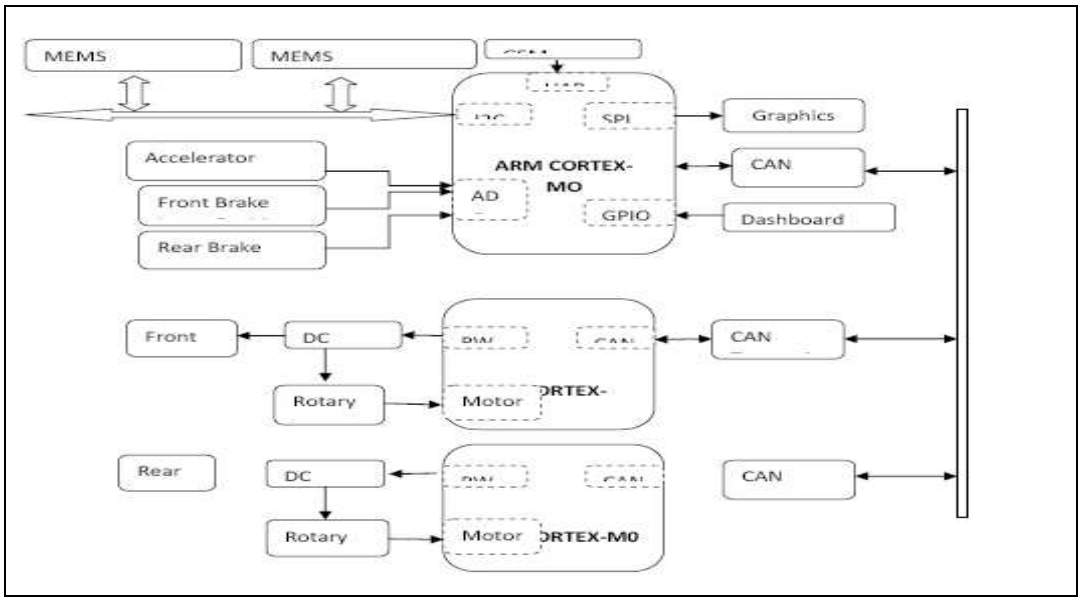

Figure 1: Block Diagram of Proposed System

RESULTS AND DISCUSSION

The increase in number of the sensors commensurate with the energy consumption. It is apparent that the increasing number of sensors ultimately decreases energy consumption. Initially each node has 1000 joules. Comparison made between Greedy Energy Consumption of the proposed algorithm has lesser than the existing algorithm. Throughput is one more metric which is used to measure the performance of the network. The throughput of two wireless sensor networks algorithms is compared. Where in case 1, ABS Algorithm shows throughput of mesh network when ARS is not used and in case2, static shows with using ARS. From the results it can be easily said that throughput of Wireless Sensor Network which uses ABS is better than a simple Wireless Mesh Network. Throughput of a network in case 2 increases because it reduces the link failure and link degradation as a result expected throughput for the system is achieved. Depict performance evaluation of end-to-end delay

and also it illustrates the fact that increases in number of packets decreases the delay between sources and destination. The end-to-end delay of two wireless sensor networks algorithms is compared. Delay refers to the time taken for a packet to be transmitted across a network from source to destinations. The delay of Energy Efficient Autonomous Reconfiguration Network System is reduced when compared to the existing failure recovery methods. The packet delivery ratio is generally described by, ratio of received packets by the send packets. At the starting the packet delivery ratio ends to increase while considering both the algorithms. Since the packet delivery ratios are plotted while increasing number of packets. Produced higher packet delivery ratios since the group formation is eliminated in the, it provide higher packet delivery ratios than the existing algorithms. Then the information transmission starts from the source node to the destination node. While transmitting the link failures are occurred. Due to this link failure the packet dropping took place. The packet dropping can be reduced by employing the ABS algorithm.

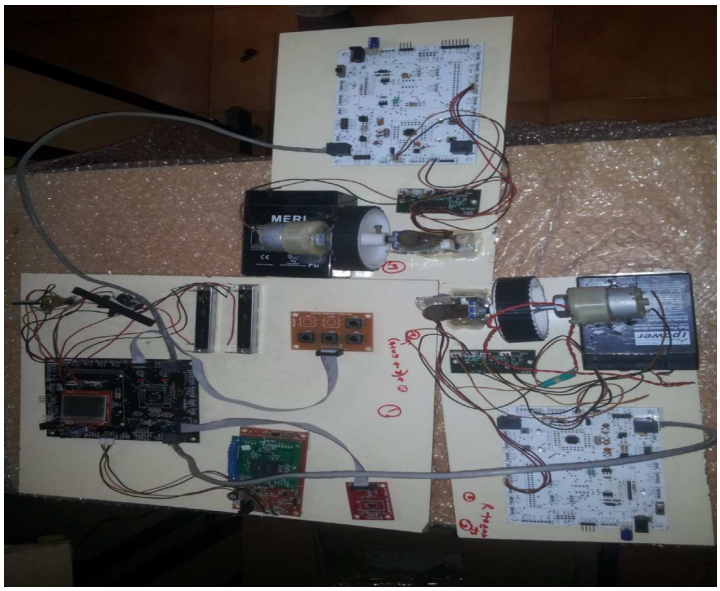

Figure 2: Hardware Kit

CONCLUSION

Automobile ABS controller, based on fuzzy control, don't need complicate controlled plant's mathematical model, it can efficiently solve the influence of varying duty and nonlinearity happened during automobile ABS braking, and increase automobile brake system's security and stability. Through the simulation of Automobile ABS controller based on fuzzy control , whether brake time or brake distance are all achieve a great control effect , guarantee the steady of braking , the fitness of brake efficiency , and the requirements of national safety specifications for vehicles operating on roads . This research fully brings out that automobile ABS fuzzy control system is worth to be further developed and its application prospect is bright. The vehicle control system also features high precision ultrasonic obstacle avoidance modules to improve the security of the smart car driving. Featuring a powerful LPC11C14ARM Free RTOS embedded microcontroller and real-time operating system for smart Bicycle control system hardware and software modular design, the entire system is conducive to the further upgrading and improvements to enhance the efficiency of the system design. This system can be used as the carrier of the mobile robot, after maturity of the technology and can be

applied to access control systems, residential patrol, site investigation, intelligent toys, and other areas, market prospects, has great economic benefits

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