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Presentation on

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1. Introduction

Identification of vehicle class and speed is very important parameter for road traffic management. It is highly essential for deciding:

- Type of vehicle to be allowed on the road
- Speed limit of the vehicle passing through the road

Presently a very huge infrastructure and large manpower is involved for extracting the above two information.

In order to provide lucid solution for the above difficulties, work has been going on very intensively all around the world.

This paper tries to present one of the solution for the above task using Fuzzy Logic Controller.

It also suggests the design approach to improve the performance of the controller by hybridizing fuzzy logic with neural network and finally optimization of hybrid fuzzy neuro controller using genetic algorithm.
For achieving the above task the signals are obtained from the sensors. 

Inductive loop sensor provides information for:
- axle distance
- height of the chassis

Microwave and infrared sensors provides information for:
- length of the vehicle and
- speed

These conclusions are based on the report submitted to Federal Highway Administrations (FHWA) Intelligent Transportation Systems Joint Program Office.
The inputs to controller are

1. Axle Distance
2. Height of Chassis
3. Vehicle body length
4. Occupancy time

The outputs are

1. Vehicle Class
2. Speed of vehicle
2. Literature Survey

- Sensor technology
- Fuzzy Logic Controller
- Fuzzy neural network
- Fuzzy neural controller optimized by genetic algorithm
Block diagram of fuzzy logic controller
Fuzzy Logic Controller GUI window in MATLAB
Neuro Fuzzy System
Genetic Algorithm for optimization of NF System

- Design approach uses hybrid genetic algorithm which combine BP with GA to improve searching speed and convergence speed.

The learning process as follow:

1. Produce populations that have $S$ individuals.
2. Calculate every individuals’ fitness value.
3. Select $S-s$ individuals by gambling model, and placed in selection pool, then the optimum individual is learned for $s$ times by BP algorithm with $s$ different learning speed. $S$ new individuals are produced.
4. $S-s$ individuals are operated by crossover and mutation, while $s$ individuals is added to produce new populations.
5. If new populations is desired, the optimum individuals is chosen, else go to (2).
3. Design and Implementation

- Design and simulation of fuzzy logic controller
- Implementing fuzzy-neural network
- Applying genetic algorithm to optimize fuzzy-neural network
Step 1: FLC design
Cont …
Output 1 (Vehicle Class)

- Small car
- Van
- Lorry
- Mid size car
- Big size car
- Truck/bus
- Trolley
Output 2 (Speed)

- Very low
- Low
- Medium
- Fast
- Very fast
Step 2: Designing Fuzzy Neural Network
Step 3: Optimization of Fuzzy Neuro system

Fuzzy-neural system, combines
qualitative reasoning ability of fuzzy logic
quantitative numeric processing of ANN.

A problem of the fuzzy-neural system is the dimensionality.
As the input dimension increases the fuzzy rule base
increase exponentially, which increases the
computational cost
memory &
training data requirements
This property limits the practical application of fuzzy-neural system to low input dimension problem.

Genetic algorithm provides approach to adjust

- the control points i.e. placement (base) and apex of membership functions and
- the weightings of fuzzy-neural networks

Genetic Algorithm would be used to optimized the hybrid controller
4. RESULT
Fuzzy logic controller is giving two outputs i.e. vehicle class and speed.

The designing and simulation is done with the help of MATLAB fuzzy logic toolbox.

In the future scope part the above controller would be implemented by hybridizing fuzzy with neural then network is optimized using genetic algorithm.

These approach will certainly improve the efficiency of the controller.