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Automatic RF-ID System for vehicle access differentiation in urban zone

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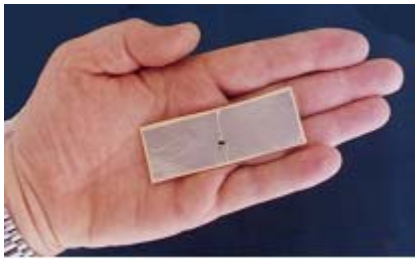
ABSTRACT

Today the traffic flow control is an important part of city mobility management.
Air pollution growing day-by-day and new forms of traffic regulation are needful to improve weather situation.
With the system presented here automatic vehicle access differentiation become a reality.

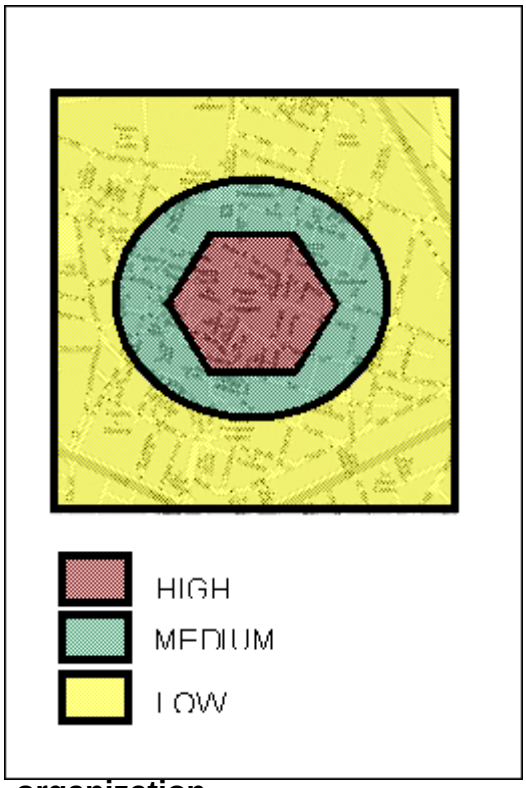
INTRODUCTION

A good vehicle access differentiation is very efficient when it can be applied to all cars that daily cover the roads of the city. It means that the RF-ID system part mounted on car must be small, cheap and easy to apply from specialized services.



The better solution that all the customers would wish is a small adhesive to apply inside car windshield. The system we present is started from this concept.

We found a good technical prospective in new 900 MHz transponder systems, an high frequency based device that give us the possibility to reduce the tag dimensions and the capability to discriminate thousands vehicles.



organization

SYSTEM STRUCTURE

The system is organized by many gateway dislocated in the perimeter of the center of the city.
The city's zones are organized and differentiated by air pollution impact (Fig.1).

Every gateway is composed by (Fig.2):

- A receiver antenna
- A passage dissuasive system
- Internal CPU that processes information coming from vehicle tag

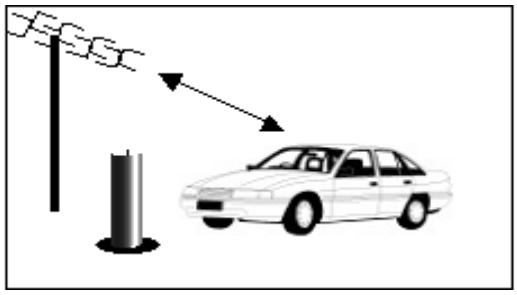


Fig. 2 - Gateway structure

An important propriety of this gateway is the ability to read with precision a passive transponder when it is in motion.
High frequency helps us to identify a little tag when its speed is approximately an urban city speed limit.

The receiver antenna can be integrated in architectonic urban structures, so it can be less intrusive for the ambient that frequently have an historical valence.

The passage dissuasive system is also designed to have less impact as possible with urban architecture.

It will be very fast in descending phase to allow to driver to have not big discontinuity in his way.

The internal CPU make the very discrimination of passing vehicles, it reads tags by antenna and then processes information to enable or not enable passage dissuasive that is collocated in the middle of interdicted road.

SISTEM OPERATION MODE

When a car is near the gateway the transponder is identified by antenna system and so internal CPU processes data.

If the car has authorization for that zone the obstacle will remove and so the authorized vehicle can pass. (Fig.3).

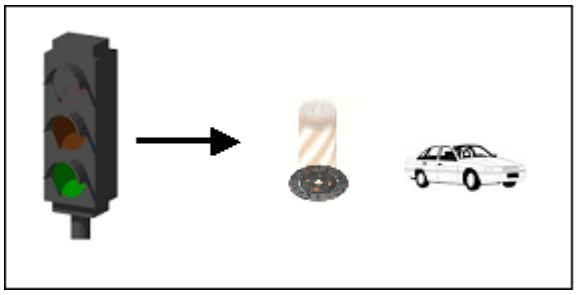


Fig. 3 – Authorized vehicle

If the car don't have authorization for that zone the obstacle will not removed and

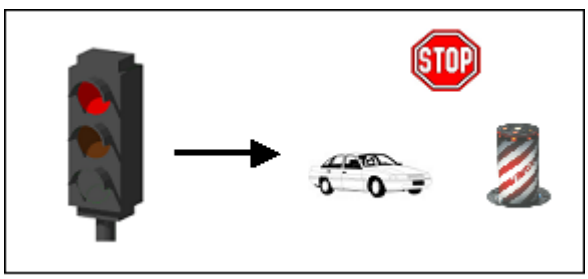


Fig. 4 – Not Authorized vehicle

so the vehicle is stopped. (Fig.4).

This system has a big advantage, it can be real time modified.
In fact when there's a particular traffic restriction the differentiation passage condition can be modified the reconditioning traffic flow.
So if there is high air pollution in the city the political administration can reprogram all gateways to permit a more restricted circulation based on vehicle classification (with a new geographical zones division) only for emergency days.

VEHICLE CLASS DETERMINATION

The vehicle class determination is made at first service session or directly after sales by car vendor.

The belongings class is assigned in function of vehicle homologation year, for example:

- **CLASS A (Yellow):** Diesel vehicles registered before 1994 and petrol vehicle registered before 1996.
- **CLASS B (Green):** Diesel vehicles registered before 2000 and petrol vehicle registered before 1999
- **CLASS C (Red):** Diesel and petrol vehicles not included in other classes and vehicle with methane or LPG fuel supply.
- **and so on…**

Fig. 5 – An adhesive tag example

Every class has a geographical circulation zone identified with a color (i.e. Fig.1)
The respective adhesive transponder is assigned and applied from the service to windshield after instrumental control of vehicle.

The vehicle instrumental specialized controls and so also belonging class are done following local norm emanated by local administration.

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