

Data Mining in Equipment of Parked Vehicles

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Abstract. Because of a rapid growth and evolution of networks of Vehicles we need to manage them in everywhere. In this paper we discuss park intelligent vehicles system through Wired and wireless Techniques for helping drivers to find vacant spaces in parked vehicles the shortest possible time, provide safety and reach to them by means of communication such as internet. To overcome on any problems as they exist in the GPS, cellular networks and other to provide suitable vehicles place it is designed vehicles that they are able to maneuver in: 1) the processing of vehicles with sensors to obtain information sensory. 2) combining technologies such as analysis of image and video and uses radio signals, ultrasonic and infrared sensors .3) equipping vehicles with wireless devices to communicate with other vehicles and wired and wireless infrastructure which are distributed on the sides of the road, such as Access Point (AP) and Gateways that they are covered a scope of their sending . Vehicles are capable of maneuvering is called Vehicular Ad Hoc Networks (VANets). Intelligent Vehicles (IV) are dealing with park intelligent vehicles system to help in searching for vacant places without losing time, save fuel and prevent of stealing vehicles. Fuzzy logic are not able to learn, adapt, and compute by parallel way so we use Genetic algorithm but it has lack in flexibility, and does not interact and represent the knowledge like human which is existed in Fuzzy logic that why we use in this paper Genetic fuzzy systems (GFSs) to complete each other. That means providing ability of the learning and adaptation inside parked vehicles.

Keywords: VANets, Wireless sensor network, Intelligent Vehicles (IV), Intelligent Parking System (IPS), the genetic fuzzy systems (GFS).

1 INTRODUCTION

Nowadays the vehicles are equipped with all the necessary connections, such as Global Positioning System (GPS)[6][8] , smart infrastructure, packages , cameras and antennas to enable vehicles to be aware the unfamiliar environment like beetle that it can aware its environment by using antennae. Cooperative communication is focused on the techniques of the physical layer to exploit spatial diversity, Point-to-point (telecommunications) and increase throughput. Intelligent Vehicles (IV) use wireless multi-casting between infrastructure on roadside and moving vehicles like mobile [7]. Maneuvers of vehicles include traffic, dynamic driving, safety strategies, assistance and adaptation inside the parallel parked vehicles and vertical positions (Garage) such as the gaps among vehicles and parks. In order to provide a realistic environment by dissemination of information and details by using wireless networks to give drivers the vacant positions, alerts and warnings inside the parked vehicles to avoid congestion. Intelligent Transport System (ITS)[18] This system integrates advanced electronics, communications, information technology and wireless sensors to ensure safety and comfort for drivers on the roads whether highways or parked vehicles .Wireless sensor network (WSN) consists of too many nodes, which are situated in the surveillance zone and are equipped with different kinds of sensors, and they are including computation and communication units. These units can cooperate in collecting, processing, and transmit

information to the sink. They are characterized by lower cost and consumption of power and working very well in the indoor or harsh environmental climate, but its accuracy depends on the density of the deployed sensors and their transmission power. Enhance and strengthen intelligent transport systems (ITS) through Vehicular ad hoc networks (VANets)[3] and communication between vehicles and a infrastructure of road to obtain road safety, to help drivers and passengers to overcome the limitations of GPS, cellular networks and etc and able to mobility and traffic handling even if there is any increasing complexity in communication vehicles network. Connected Vehicle Technology (CVtech) has advantages and they are a precise and a reliability of interactions among vehicles [5]. CVtech consists of 1) vehicle to vehicle (V2V) for example platoon. 2) Vehicle infrastructure (V2I) it is called Vehicle to Roadside Communication (V2R) and its applications are GPS satellites, application servers (ASs) [3] and roadside unit (RSU) which is static stations and they are distributed on the streets. Its benefits not because of improvement of road safety from avoidance of collision by using adjustment cruise control, but also the drivers can drive immediately and get an experience in the driving. roadside unit (RSU) Includes a) Access Points (AP) , b) base station (BS) (WiMax, 3G or 4G) [17] it is called Intelligent Transportation Tower (ITT) ,c) mobile terminal (MT) and d) devices (mobile, laptop, etc).

2 VEHICLE INFRASTRUCTURE (V2I)

Roadside unit (RSU) it is called Gateways or Head Unit (HU) which is deployed along the roadside, broadcasts packets periodically and receives the packets from the wireless channel such as Intelligent Vehicles (IV) by using wireless multicasting between roadside infrastructure and mobile vehicles. Each vehicle broadcasts information periodically about location, speed, acceleration, time, nature of the road and the distance between other vehicles .Vehicle Navigation System (VNS) determines a route on static road (length and speed limit), Traffic Information Service System (TISS) collects handlings and broadcasts traffic data, to increase travel safety and comfort and optimize traffic flow. vehicular communication systems (VCs)[17] there are three major types of them :1) inter vehicle communication systems (IVCs) ,2) roadside to vehicle(R2V) communication systems (RVCs) [18]which are communications between roadside infrastructure that includes roadside units (RSUs)[13][3] and on-board unit (OBUs)[19] sometimes it is called in-vehicle equipment (IVE) . 3) hybrid vehicular communication systems (HVCs), Roadside to vehicle communication (RVC) there are two different types of infrastructure can be distinguished 1) sparse roadside to vehicle communication (SRVC) .2) ubiquitous roadside to vehicle communication systems (URVC). Sparse roadside to vehicle communication systems (SRVCs) are capable of providing communication services at hot spots examples of applications are a busy intersection, a gas station, and parking availability. RVCs can be used in wireless personal area network (WPAN)[10] within its range which is from a few centimetres to a few meters whereas many factors play a role in selecting the proper sensor and it depends on size, reliability, adaptability with environmental changes, strength and cost such as the dedicated short range communications (DSRC) ,IEEE 802.11 standard (Wi-Fi or DSRC)[17], IEEE 802.15.1(Bluetooth), IEEE 802.15.4 (Zigbee)[2][10], IEEE 802.16 (WiMAX (Worldwide Interoperability for Microwave Access)[7][17] standard, Wireless USB ,or LTE advanced standard. wireless local area network (WLAN) and wireless wide area network (WWAN)use to mobility management and resource management ,WLAN is used to connect a number of mobile terminal (MT , vehicles) to the Access Points (AP) whereas wireless wide area network (WWAN)is used to connect the Access Points (AP) and the base station (BS) in order to reduce transmission cost so WLAN supports higher data rate than WWAN [10].Therefore, vehicles can be aware of the speed and direction of motion, detect nearby, acceleration/ deceleration, traffic events and position at any time. The Application Servers (AS) is connected with roadside unit (RSUs) that is cryptographic protocols which a server provides

software applications with services such as data services. They are often used for web servers and security such as the transport layer security (TLS) protocol, with wired or wireless connections and benefits of comfort, safety, reduced travel time and reduced environmental pollution that vehicles systems and infrastructure which is an attractive feature for the consumers.

2.1 Broadcast Roadside Unit (RSU)

Vehicle can't rely just on GPS signal where sensors in vehicles cannot deliver data with sufficient accuracy which limits the car's ability to driving that means less precision (up to 15 meters in position and 0.5 km / h for speed). GPS signal includes: 1) satellite signals and they are weak because the signal is reflected from building, rocks and atmosphere layer and that prevents access to the receiver (vehicles). 2) Signal obstructions cannot work indoors, underground, underwater environment or dense areas (urban canyons) such as forests and tunnel. There are challenges which prevent connection vehicles with network and they are: 1) Gateways which are distributed on roads aren't able to communicate with moving vehicles during different periods. 2) Communication cut with Gateways When the vehicle is moving at high speed so degradation of link quality. 3) Difference of manufacturer makes conditions of wireless channel is different and that effect on quality and can't able to decode packets.

3 INTELLIGENT PARKING SYSTEM (IPS)

Growth in the vehicles industry, which has become more intelligent needs to environment more than smart like Intelligent Vehicles (IV) with Intelligent Parking System (IPS) [20]. Difficult or impossible for the traditional parking of vehicles to find vacant spaces in parked vehicles efficiently, especially at the weekend or holidays. There is too much air pollution because of increase production of vehicles and we have congestion problem. Vacant spaces (spots) of parked vehicles have problems and they are: 1) they aren't seen by drivers 2) they are expensive 3) they are filled during parking from other vehicles. The main factors for choosing a specific parking in order to suit every driver are safety, weather conditions, close to the driver's work and parked vehicle fees. Traditional parked vehicles devices accept payment banknotes and coins but it is difficult to find the amount with the driver and that leads to delay, queues for payment, congestion and it is noisy for drivers. Therefore, exploitation of communications and services make payment convenient and desirable in Intelligent Parking System (IPS). Smart parking uses a number of devices, it includes Presence Sensor car, radio frequency identification (RFID) readers, display parking, wireless access controller, digital video recorder with motion sensor and car active RFID (CARFID) [12][14]. Smart parking vehicles system is characterized of precise it is used in all the technology at the same time, such as signal strength (SS) and The Angle-of-Arrival (AOA), Time of arrival (TOA) measures the space through arrival signal time between the vehicle (MT, AP) and a base station (BS) and arrival signal (a DSRC, IEEE 802.11, radio wave) to know arrival devices time on the roadsides such as antennas, mobile terminal (MT), Bluetooth, access point (AP) and base station (BS) [4]. Parked Vehicle system consists of three subsystems 1) the parking management subsystem is to provide drivers of information by display system for giving them details about what happen inside park such as (database, user interface accounting management). 2) The control and position subsystem is on-board unit (OBU) in the vehicle and able to control the behaviour of the mobile vehicle and knowing current position depend the received signals such as (wheel control, power, and position). 3) WSN network and management subsystem is implemented in the garage and responsible for monitoring the condition of the vehicle and the transmission of commands and data between the parking management subsystem and the control and positioning subsystem such as wireless transceiver, belts inside park, Infrared Devices (IFD), ultrasonic sensors (ultrasound),

magnetic and sensor nodes. They are spread on the ground in vacant spaces (spots) of parked vehicles in order to determine positions, communications and understand a vacant space or occupied in any time. Smart Parking System (SPS)[1] is used In order to find vacant spaces by drivers. They can see light emitting diode (LED) on board which consists of many lights (colors) through parking for (reserved, empty, vacant or handicapped) [16][1][9]as it is shown in Figure 01.

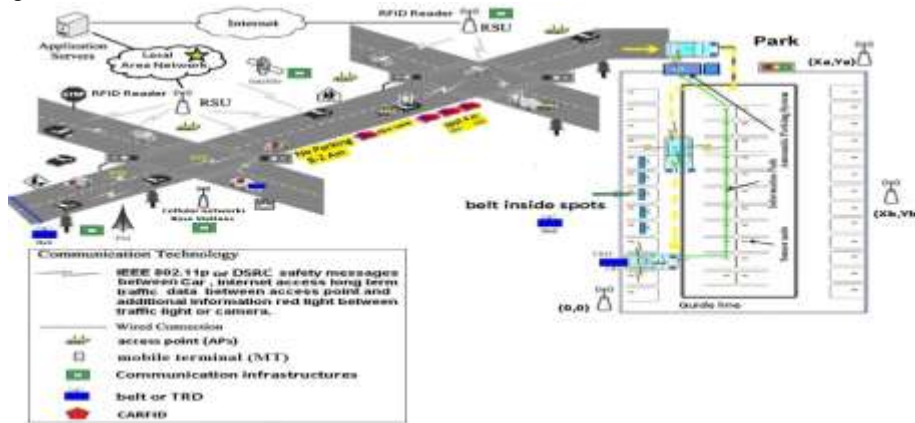


Fig 1: ITS-Base: applications VANETS and connections Intelligent Parking System (IPS).

4 FUZZY LOGIC SYSTEMS

To improve the movement of the vehicle to reach a target inside parked vehicles in order to become safer, continuously and smoothly through 1) adjust and modify of an angle of the steering. 2) A velocity of the vehicle simultaneously. 3) Using fuzzy logic. Autonomous vehicles [15] are used fuzzy logic to control a vehicle because it is able to incorporate human knowledge and experience to react quickly even in sudden changes and unknown environments such as the replacement of the speed in hazardous environments, reaching to the static target inside park (bay, garage), maintaining stable vehicle velocity and avoiding collisions with dynamic and static obstacles through Roadside unit (pylons). Fuzzy system is used to control on throttle during different speed, curve (turns) and sudden stops. The Fuzzy system elements Input and output of functions of the membership are used to accelerate the vehicle to achieve the goal, slow down when close to the goal and stop when you reach the target position. The input consists of three variables 1) the velocity of the vehicle (v). 2) The distance between vehicle and target (d). 3) The changing of velocity from the previously measured value Δv . and the output is the changing in wheel angle ($\Delta \delta_{gb1}$). The input variable has four functions of the membership and they are: Big (B), Small (S), Medium (M), and Zero (Z). The output variable ($\Delta \delta_{gb1}$) has seven functions of the membership and they are: Negative Big (NB), Negative Medium (NM), Negative Small (NS), Zero (Z), Positive Small (PS), Positive Medium (PM) and Positive Big (PB). The Basic Rules of Fuzzy are the inference mechanism in the fuzzy logic controller like that exists in thinking human process. The linguistic control strategy that is decided by "if-then-else" statement. The basic function of The Basic Rules of Fuzzy is representation the expert of knowledge in a form of IF-THEN a structure of the rules combine AND/OR operators. We have 16 fuzzy rules, if (v is B), (d is Z) and (Δv is P), then ($\Delta \delta_{gb1}$ is NB): if the speed is high, the distance to the target is equal to zero and positive change, the driver must provide a large angle. As it is shown in Table 2.

Table 2. The Basic Rules of Fuzzy.

v	Δv	d	Z	S	M	B	v	Δv	d	Z	S	M	B
z	N		PS	PS	PB	PB	M	N		NB	NS	NS	PS
	z		PS	PS	PB	PB		Z		NB	NM	Z	PS
	p		NS	Z	PS	Z		P		NS	NB	NM	Z
S	N		NS	Z	PS	PB	B	N		NS	NS	NM	PS
	Z		NS	NS	Z	PB		Z		NB	NB	NS	Z
	P		NB	NM	NS	Z		P		NB	NB	NS	NB

5 GENETIC ALGORITHMS (GAS)

Genetic algorithms (GAs) try to perform an intelligent search to find a solution from a nearly infinite number of possible solutions by creating new generations. It is obtained from Darwin's Theory which means the law of the jungle (survival of the fittest). Genetic algorithms (GAs) are able to explore a large space, find better offspring (children) in complex search spaces during successive generations by a new generation and it has to be better than the previous generation. Genetic algorithms (GAs) processes for selecting solutions consist of three operators and they are: reproduction, crossover and mutation where all of them are existed in genetics. The advantage of producing process of a new generation: 1) the evaluation which is repeated in order to reach to a better generation. 2) It searches for a solution from a broad range of possible solutions for giving expected results instead of searching in a narrow domain. The Genetic algorithm (GAs) describes attempts in order to arrive to perfect search in vacant spaces in parked vehicles such as medium speed, maximum speed, vehicle location, desired speed, current acceleration, The proper angle of the vehicle and wheel, unique number for selecting the vehicle identification, traffic standstill, resume motion, and return to standstill again, and so on. The genetic learning process aims for designing and optimising the knowledge base (KB). The knowledge base (KB) consists of two components and they are: 1) a database (DB) which consists of the linguistic rules and the functions of the membership. 2) Rule base (RB) that means multiple rules simultaneously for the same input. The use of The Genetic algorithm for automatic learning of Basic Rules of Fuzzy systems (BRFS) can optimize search problem and the design process can be analysed as a search problem in the space of rule sets by coding of the chromosome model. Shortcomings BRFS are not able to learn, but it needs knowledge base (KB), which is derived from expert knowledge. BRFS are analysis process as a search problem in the space of rule sets, through coding of the model in a chromosome and the most extended in GFS. It is used the genetic Basic Rules of Fuzzy systems (GBRFS).

6 GENETIC FUZZY SYSTEMS (GFS)

The genetic fuzzy systems (GFS) are used for designing fuzzy systems. They provide them the learning, adaptation capabilities and sharing in the genetic learning process [11]. GBRFS Support technological development more than BRFS for achieving the automatic generation, modification or part of the knowledge base (KB). The Genetic algorithm (GA) is executed to obtain the best possible solution and steps of algorithm are initialize population, evaluate population, chromosomes selection and chromosomes recombination. This is done by arranging the elements of the chromosome in increasing values which is given by the Fitness Function (σ). It can measure throughout the total driving and waiting times. The genetic process is the result of the interaction among the evaluation, selection and creation of

solutions, which represents the contents of the knowledge base (KB) of a BRFS. As it is shown in figures 3 and 4.

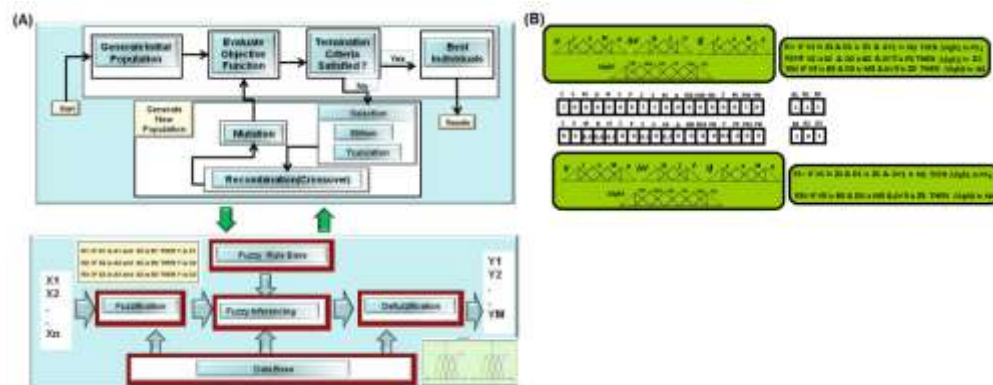


Fig. 3: (A), General Scheme of Evolutionary process in genetic with Fuzzy (GFS).

(B), Example of genetic with Fuzzy (GFS) and rule selection.

7 SIMULATION AND RESULTS

Classification of parked vehicle has two models and they are garage or parallel such as along the road, beside road or inside the building. Drivers seek vacant spaces in parked vehicles to find slots available. Instead of using conventional method to search about vacant space. Using equipped light emitting diode (LED), display different colored lights to differentiate between spaces (reserved, occupied, vacant, handicapped or Very Important Person (VIP)). The Criterion of optimization Finds a vacancy quickly, the decrement length of queues and the average of waiting time vehicles in parking. The parameters of this GA are set as: population size=200, crossover probability=0.5, mutation probability=0.01. Overall the results of the present study have proven that vehicle on parked vehicle by machine learning techniques has the capacity to forecast the timing, highly nonlinear, sudden events and traditional techniques currently fail.

8 CONCLUSIONS

Parked management systems use wireless sensor networks such as Image/Video, ultrasonic sensors, WSN, infrared technologies and GPS. It provides higher level of security for the parked vehicles in the parking spots like intelligent anti theft protection, fast disseminating information led easily implementable in real time, finding an empty space, save the fuels, reduces the traffic and congestion in finding the available parking spots for solve parking hassles. It can be used both for parking space detection and improper parking detection. A parking detection system would decrease searching time for vacant space and reduce instances of cars improperly parking. The GPS signal cannot be accurate enough for parking by the vehicle itself. In the paper, we adopt the WSN and the infrared technologies at the same time to enhance the accuracy of the estimated position. For an unmanned vehicle driving system inside parking by GPS, etc. the development of intelligent systems in parking real time through Enhancing the capacity of roads and traffic flow based on wireless local area networking between roadside smart infrastructure including roadside units (RSUs) and on-board unit (OBUs) like Cellular networks, Wireless Access Points (APs), GPS satellites for position information and the vehicle's speed information. In order to improve with providing security to the broadcasting message, road travel safer inside parking (by avoiding many types of collisions), more efficient (by decreasing travel time), as well as more pleasant (through

locally updated information) and so on the vehicle parking and reduce the total waiting time of the car (earn time) for reach to parking through combine genetic algorithm and fuzzy logic is called GFSS for enhance in the fuzzy systems theory.

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