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Smart Vehicles Speed Monitoring System Using RFID

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ABSTRACT: The core idea of this research paper is how to monitor speed of vehicles using RFIDs and how to take necessary action like fining based on over speeding and violation of rules. In this research paper it is suggested that RFID can be used other purposes like managing database of vehicles speed, locations, car identity etc.

KEYWORDS: RFID tag, Active RFID reader, speed monitoring, allowed speed margin, intelligent system

I.INTRODUCTION

RFID is one of the fast and reliable means of identifying objects. There are two main components. One is RFID reader which can be active or passive. Active reader can transmit and receive signal while passive reader can only receive radio signal. Second component is RFID tag which can be active or passive .RFID tag is has a unique identity number and are attached to the object required to be monitor. Depending upon application decides where should use active and passive RFID reader and tag. RFID technology is progressing daily and has proven its prominence. RFID is widely using in access control, advertisement, agriculture, navigation system, waste disposal, human identification, managing data base and lot more areas. RFID is emerging technology, lot of work has been done but lot is requiring to be done. For securing data from unauthorized user different encryption techniques have been applied and still in progress as each RFID is holding information of its user.

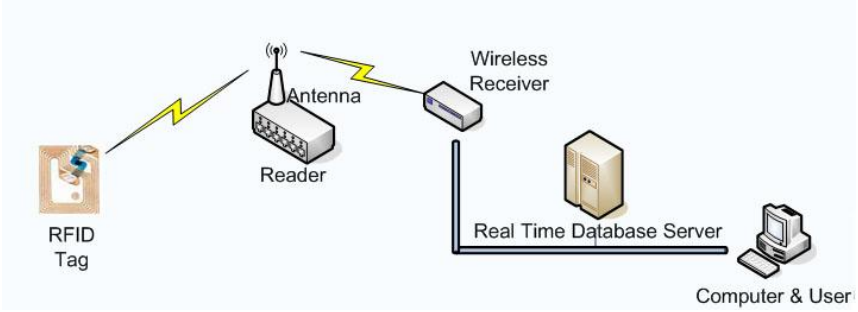

Figure 1: General RFID systems

II. BACKGROUND

Earlier various researchers had work on the RFID based vehicles; here we are discussing one of the possible ways of RFID based system which can manage database and generate traffic fine for the vehicles violating speed limits. Traditional car speed control system checks car speed on highway or roads on specific location where they are installed. For daily user of these highways after certain time it comes to their knowledge where they are installed. They slowdown their speed on these specific locations and the problem remains as it is. Although some time speed cameras is fitted on vehicles but succeeding cars give signals to following cars about the presence of camera fitted vehicle. In

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this paper it is suggested that how efficiently we can use RFID technology for solving this problem without any additional infrastructure.

Figure 2: RFID car tag and RFID reader

III. METHODOLOGY

Considered Vehicles speed monitoring system stations, consisting of RFID reader, speed checking camera and snap camera are there. These monitoring system stations are placed on different locations .On this highway each car has its RFID tag. In each station through RFID reader and cameras system is saving information of vehicles like vehicle identity, time when it is crossing, speed, picture etc. Here it is important to mention even car speed is lower than the speed limit, RFID reader will save information for all these vehicles which are passing through this RFID reader. Another station is doing the same task at some distance. Every station is connected to main data base station which is collecting data from all these stations. In signal highway there may be different speed limit as on some location highways is straight, curve, crossing and intersection of cities, fog areas and construction area. Speed monitoring system stations are fitted on starting and ending part of different part of highway to monitor speed on this specific area, like one station is there at the start of Straight area of and one at the end of Straight area of highway.

Let

S_1, S_2, S_3, S_4 and $S_5$are the length of different parts of highway.

Where

S_1 = Straight area of highway,

S_2 = Curve area of highway,

S_3 = City crossing area of highway,

S_4 = Construction area of highway,

S_5= Fog area of highway,

V_1, V_2, V_3, V_4, V_5 and be the allowed maximum speed limit of S_1, S_2, S_3, S_4 and S_5respectively.

T_1, T_2, T_3, T_4 , T_5 is minimum time required to cross S_1, S_2, S_3, S_4 and S_5respectively. Also n_1, n_2 , n_3 , n_4 , n_5 is the allowed speed margin above maximum speed and can be calculated as

n = (allowed speed above maximum speed + maximum speed) / (maximum speed)

So $T_1= S_1* n_1, / V_1,$ $T_2 = S_2* n_2 / V_2,$

$T_3 = S_3* n_3/ V_3,$ $T_4 = S_4* n_4 / V_4,$

$T_5= S_5* n_5 / V_5, T_6=$ ……..

$T_{calculated} = T_1+ T_2 + T_3+ T_4+ T_5+ T_6+$ ……..

$T_{calculated} = S_1* n_1, / V_1+ S_2* n_2 / V_2+ S_3* n_3/ V_3+ S_4* n_4 / V_4 + S_5* n_5 / V_5$

$T_{Vehicle} = T'_1 + T'_2 + T'_3+ T'_4+ T'_5+ T'_6+$ ……..

(Where T'_1, T'_2 ... T'_6 is actual time taken by vehicle)

If we compare real time taken by vehicle to calculated minimum time and if

$T'_1< T_1$ or $T'_2< T_2$ or $T'_3< T_3$ or $T'_4< T_4$ or

$T'_5< T_5$ or

($T_{Vehicle} = T'_1 + T'_2 + T'_3+ T'_4+ T'_5+ T'_6$) <

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($T_{calculated} = T_1 + T_2 + T_3 + T_4 + T_5 + T_6$)

Then it indicates over speeding in certain part of highway, as indicated in below table I

Highway Type **(S_i)** Length KM	Speed Limit **(V_i)** KM/HOUR	Allowed speed margin above speed limit **(n_i)**	Minimum time Required **($T_i = S_i * n_i / V_i$)** HOUR	Actual Time taken by vehicle **T'_i** HOUR
Straight Area / S_1 140	V_1 120	n_1=130/120=1.083	T_1= 140*1.083/120 =1.26	T'_1 = 1.22 over speeding
Curve Area/ S_2 20	V_2 70	n_2=70/70 =1	T_2= 20*1 /70 =0.28	T'_2 =0.30
City crossing Area/ S_3 10	V_3 75	n_3=80/75 = 1066	T_3= 10*1.066/75 =0.142	T'_3 =0.144
Construction area/ S_4 15	V_4 60	n_4 =70/60 =1.16	T_4= 15*1.16/60 =0.29	T'_4 =0.30
Fog area/ S_5 20	V_5 50	n_5=50/50=1	T_5= 20*1/50 =0.44	T'_5 =0.40 over speeding

Table I

Here $T'_5 < T_5$(minimum time required is 1.26 hours and vehicle cross in 1.22 hours)

$T'_1 < T_1$(minimum time required is 0.44 hours and vehicle cross in 0.40 hours)

Comparing $T_{calculated}$ and $T_{Vehicle}$

$T_{calculated} = T_1 + T_2 + T_3 + T_4 + T_5 + T_6 \ldots\ldots$ And $T_{Vehicle} = T'_1 + T'_2 + T'_3 + T'_4 + T'_5 + T'_6$

$T_{calculated} = 1.26 + 0.28 + 0.142 + 0.29 + 0.44 =$ 2.412 Hours= 144 .72 Minutes

$T_{Vehicle} = 1.22 +$ 0.30 + 0.144 + 0.30 + 0.40 = 2.364 Hours = 141.84 Minutes

As $T_{Vehicle}$ is less than $T_{calculated}$ it indicates over speeding in certain parts of highway. In the main data base location of each station is saved i.e. where they are installed and what is distance between different stations. In this main data base server through designed software it can be calculated that what is the average speed of the vehicle on different locations of highway.

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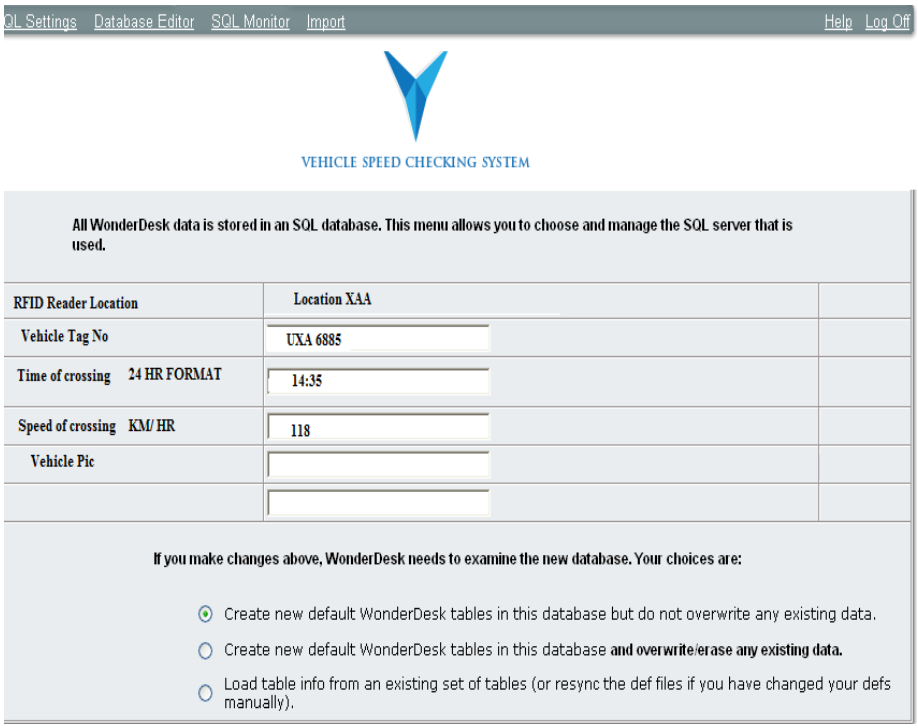

Figure 3: Vehicle Speed Checking System Software Window

In the fig 3, speed monitoring windows is showing vehicle information like vehicle tag no, time at which car crossed that RFID reader etc.

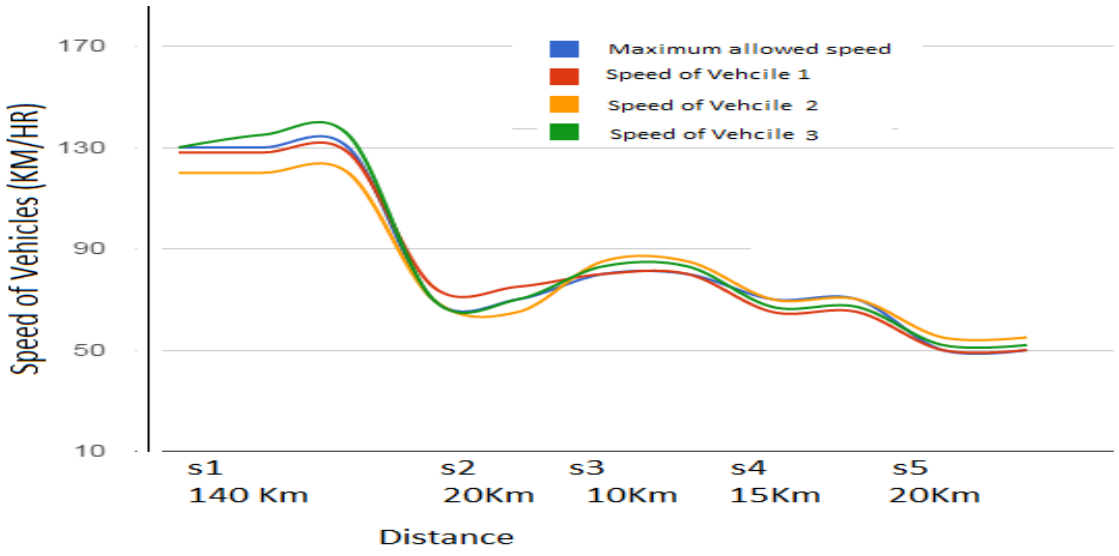

Figure 4: Vehicle Speed graph of different vehicle

In the fig 4, shows the graph for comparison of cars speed with maximum allowed speed

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IV. RESULT AND DISCUSSION

This intelligent system can be implemented specially for speed monitoring of vehicle, also to identify last location of vehicle and status of vehicle like colour etc. Compare to traditional Speed car checking system which works on specific location, proposed idea is helpful to control average speed of vehicles on different parts as mentioned in paper. Figure 5 shows block diagram of system.

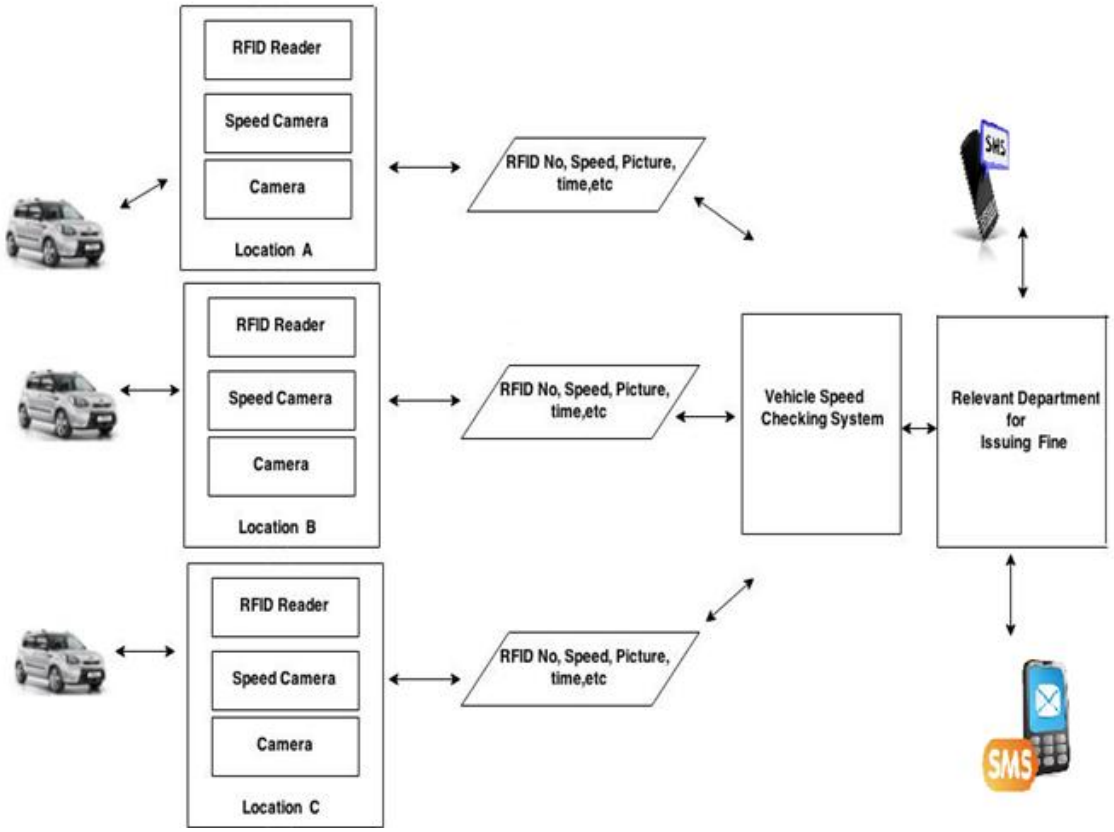

Figure 5: Block diagram of system

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