

# **Smart Toll Collection using RASPBERRY PI 2**

# Sanniti Ramakrishna<sup>1</sup> & K Kameswar Reddy<sup>2</sup>

<sup>1</sup>M-Tech Dept of ECE, Geethanjali Engineering College NANNUR-V, KURNOOL-DIST Mail Id :- <u>manasajoshnaarthi@gmail.com</u>

<sup>2</sup>Associate ProfessorDept ECE, Geethanjali Engineering College NANNUR-V, KURNOOL-

## DIST

**Abstract:** - The automated toll collection system using passive Radio Frequency Identification (RASPBERRY PI 2) tag emerges as aconvincing solution to the manual toll collection method employed at tollgates. Time and efficiency are a matter of priority of present day. In order to overcome the major issues of vehicle congestion and time consumption RASPBERRY PI 2technology is used. RASPBERRY PI 2 reader fixed at tollgate frame reads the tag attached to windshield of vehicle. The objectdetection sensor in the reader detects the approach of the incoming vehicle's tag and toll deduction takes placethrough a prepaid card assigned to the concerned RASPBERRY PI 2 tag that belongs to the owners' account. This makes tollgate transaction more convenient for the public use.

Keywords— Smart Toll Collection, (RASPBERRY PI 2)

## 1. INTRODUCTION

In our day to day life, we pay certain amount of tax through toll plaza to the government. The toll gates are mostlyfound on national highways and bridges etc., and we pay standing over a queue in the form of cash, although, themobility of vehicles gets interrupted by this method which takes longer travel time, more consumption of fuel and alsopollution level get increased in that region, instead of that the method commonly used by industries and in advancedcountries is the Electronic Toll Collection System.Electronic toll collection system is the technology that enables the automatic electronic toll collection from theprepaid account registered on the name of vehicle owner, determining whether the vehicle is registered or not andinforms the toll authorities avoiding toll violations. Over last decades, electronic toll collection system have been

Implemented in United States and many other countries with a new improvement in



it.By thiswe don't have to carry a handsome amount of cash with us relates to security as well. This system does notrequire any manual operation of toll barriers and collection of toll amounts, it is completely automated toll collectionsystem. The vehicle owners are registered with their vehicles proper information and their account is created, wherethey can recharge their account with required amount. When the vehicle passes through the toll gate, the information isshared between RASPBERRY PI 2 tag and RASPBERRY PI 2 reader and the amount is deducted from the owners account. This method reduces the traffic congestion problems, also reduces the travel time and reduces the fuel consumption.

# 2. IMPLEMENTATION Software

The raspbian os is used in the raspberry pi board. It is a free operating system that is based on Debian which is particularly optimized for the Raspberry Pi hardware. It comes with over 35,000 packages and precompiled software bundled in a simple format for easy installation in the Raspberry Pi. The coding for all the sensors and the robot movement are done using the python coding. Python is preferred since it is a simple and a minimalistic language. It is also free and open source software. This can be used in many platforms such as Linux, VxWorks, and PocketPC etc. Also, it supports procedure-oriented programming as well as OOPS. The web browser is created by using HTML. The static IP address should be configured in the raspberry pi for the Wi-Fi dongle. This assigned static ip address is for connecting with the Wi-Fi of the mobile phone for the live video transmission. Since a normal usb camera is used it must be initially installed in the raspberry pi 2 board using the linux commands.

# Raspberry pi

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. Raspberrypi block function v01.svg This block diagram depicts Models A, B, A+, and B+. Model A, A+ and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the PI Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and



later models the USB/Ethernet chip contains a five-point USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. The Broadcom BCM2835 SoC used in the first generation Raspberry Pi is somewhat equivalent to the chip used in first generation smartphones (its CPU is an older ARMv6 architecture), which includes a 700 MHz ARM1176JZF-S processor, Video Core IV graphics processing unit (GPU), and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) caches of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the glued to RAM chip, so only its edge is visible. The Raspberry Pi 2 uses a Broadcom BCM2836 SoC with a 900 MHz 32-bit quad-core ARM Cortex-A7 processor (as do many current smartphones), with 256 KB shared L2 cache. The Raspberry Pi 3 uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache.

#### **Power Supply**

It supplies various voltages as per requirement to each unit. This portion consist of transformer, rectifier, regulatorand capacitors for filter. The rectifier is used as a bridge rectifier which converts 230V to desired 5V/12V DC.

#### **Stepper Motor**

It is for opening and closing of a barrier on the toll gate. It is done when the customer successfully performs thebilling operation through RASPBERRY PI 2 with sufficient balance.

#### Buzzer

Buzzer will ring when there will be insufficient balance in customer account.



Fig:-1 Flow of the Project





# International Journal of Research

Available at <a href="https://edupediapublications.org/journals">https://edupediapublications.org/journals</a>

p-ISSN: 2348-6848 e-ISSN: 2348-795X Volume 03 Issue 14 October2016

Fig:-2 Live Project

# **3. EXPERIMENTAL RESULTS**

National Highway Authority								
<b>RFID TollGate Monitoring System</b>								
Opened database successfully								
ID = 1 V	ehicle = CAR TAG N	lumber = 0B003815684E	TIME = 2016-08-09 11:06:41.165228					
	Available Amount = 1000							
ID = 1 V	ehicle = CAR TAG N	lumber = 0B003815684E	TIME = 2016-08-09 11:14:14.103944					
Available Amount = 1000								
ID = 1 V	ehicle = CAR TAG N	lumber = 0B003815684E	TIME = 2016-08-09 11:15:24.272913					
	Available Amount = 1000							
ID = 3 Veh:	icle = TRUCK TAG	Number = 0B002A3DE7FI	B TIME = 2016-08-09 11:17:14.010081					
Available Amount = 900								
ID = 1 V	ehicle = CAR TAG N	Tumber = 0B003815684E	TIME = 2016-08-09 12:50:23.313651					
		Available Amount = 9	00					

Fig:-3 Home Screen on Web Results



Fig:-4 Payment for Buses

Documents				
Downloads		webcam.sh		
Email	RFID EE.db			
pi@raspberrypi:~ \$	cd /var/www			
pi@raspberrypi:/va				
Bussafety.db image html mydau	=1234.jpg RFID_ERFA tabase.db RFIDtoll.	ttendance.py H db	RFID_toll.py	
pi@raspberrypi:/var	/www \$ nano RFID to	11.py		
pi@raspberrypi:/va	/www \$ sudo python	RFID_toll.py		
Tag Number 0B00381	5684E			
Personal Details				
ID: 1				
Vehicle: CAR				
Tag Number: 0B0038:	15684E			
Amount: 760				
Avail Amt: 700				
AT+CMGS="9985787078	3 **			
Message Sent				
Tag Number 0D0087B0	27046			
Personal Details				
ID: 2				
Vehicle: BUS				
Tag Number: 0D00878	3C7046			
Amount: 600				
Avail Amt: 500				
AT+CMGS="9985787078	3"			
Message Sent				
Tag Number 0B002A31	DE7FB			
Personal Details				
ID: 3				
Vehicle: TRUCK				
Tag Number: 0B002A	3DE7FB			
Amount: 520				
Avail Amt: 400				
AT+CMGS="9985787078	3**			
Message Sent				
^ [ [A				

# Fig:-5 Results

3	TRUCK	0B002A3DE7FB	2016-08-09	11:17:14.010081	900
1	CAR	0B003815684E	2016-08-09	12:50:23.313651	900
1	CAR	0B003815684E	2016-08-09	12:51:26.004927	900
1	CAR	0B003815684E	2016-08-09	12:52:42.131949	900
1	CAR	0B003815684E	2016-08-09	12:53:55.317254	900
2	BUS	0D0087BC7046	2016-08-09	12:54:23.322846	900
3	TRUCK	0B002A3DE7FB	2016-08-09	12:54:42.367981	900
3	TRUCK	OB002A3DE7FB	2016-08-09	12:56:16.235858	900
2	BUS	0D0087BC7046	2016-08-09	13:11:22.338728	900
2	BUS	0D0087BC7046	2016-08-09	13:11:49.875487	900
2	BUS	0D0087BC7046	2016-08-10	05:50:04.404557	900
2	BUS	0D0087BC7046	2016-08-10	05:50:45.251638	900
1	CAR	0B003815684E	2016-08-10	06:21:27.760115	940
3	TRUCK	OB002A3DE7FB	2016-08-10	06:21:47.339609	880
3	TRUCK	0B002A3DE7FB	2016-08-10	06:44:12.524637	880
8	TRUCK	0B002A3DE7FB	2016-08-10	06:44:23.424126	880
3	TRUCK	0B002A3DE7FB	2016-08-10	06:49:09.434615	880
3	TRUCK	0B002A3DE7FB	2016-08-10	06:49:44.459512	760
2	BUS	0D0087BC7046	2016-08-10	06:50:13.475253	700
1	CAR	0B003815684E	2016-08-10	06:53:52.194676	940
3	TRUCK	0B002A3DE7FB	2016-08-10	06:54:38.325965	760
2	BUS	0D0087BC7046	2016-08-10	06:55:04.193441	700
3	TRUCK	0B002A3DE7FB	2016-08-10	07:08:14.198492	520
3	TRUCK	0B002A3DE7FB	2016-08-10	07:08:38.417526	100
1	CAR	0B003815684E	2016-08-10	07:14:55.141048	940
2	BUS	0D0087BC7046	2016-08-10	07:15:21.812410	900
3	TRUCK	0B002A3DE7FB	2016-08-10	07:15:32.094359	880
1	CAR	0B003815684E	2016-08-10	07:16:01.414448	880
1	CAR	0B003815684E	2016-08-10	07:16:20.034794	820
3	TRUCK	0B002A3DE7FB	2016-08-10	07:16:49.565078	760
3	TRUCK	0B002A3DE7FB	2016-08-10	07:17:09.544310	640
2	BUS	0D0087BC7046	2016-08-10	07:17:45.768560	800
2	BUS	0D0087BC7046	2016-08-10	07:18:01.195828	700
1	CAR	0B003815684E	2016-08-10	08:03:15.825299	760
2	BUS	0D0087BC7046	2016-08-10	08:04:59.370205	600
3	TRUCK	0B002A3DE7FB	2016-08-10	08:05:28.388449	520
1	CAR	0B003815684E	2016-09-22	06:40:55.010200	
2	BUS	0D0087BC7046	2016-09-22	06:41:55.762970	500
3	TRUCK	0B002A3DE7FB	2016-09-22	06:42:30.096076	400

Fig:-6 Results

## 4. CONCLUSION

The Smart toll collection system in expressway based on RASPBERRY PI 2, a design scheme was put forward. It has characteristics of low cost, high security, far communication distance and high efficiency, etc. It improves technology level of charge and also improves passage ability of expressway. Smart toll collection system is an effective measure to reduce management



costs and fees, at the same time, greatly reduce noise and pollutant emission of toll station. In the Smart Toll Collection system, real time toll collection system has been designed. This reduces the manual labor and delays that often occur on roads. This system of collecting tolls is eco-friendly and also results in increased toll lane capacity.One of the most important impacts of technology is the development of sustainable technologiesthat reduce the traffic conjunction and that need of future generation, save energy and time.Our project mainly impact full in these aspects, by saving the time on the toll, and also for to save fuel and by regulating the pollution and usage of vehicle at toll gates; as shown itmakes the toll collection payment easy by using automatic toll cash collection process.

#### 5. REFERENCES

[1] Takeshi Horie, Takahiro Saida (2000), Hitachi Makes a SignificantContribution to the Construction of Secure and Reliable ETC Systems inJapan: 49, no.3, April 2000. [2] Shobit Shanker,Syed Masud Mahmud
(IEEE 2005) An IntelligentArchitecture for
intelligent area parking and toll collection
[3] Mitretek Systems(June 2001) Intelligent
transportation system Benefit: June2001.
[4] Thomas Kaiweit (2003), Exacting a Toll

:GPS magazine, June 2003.

[5] S. Rama Reddy(2002), Wireless bluetoothtechnology:IEEECommunicationMagazine, June2002.

[6] Weiming Liu,(2004), study on the method of the Service Level classification for ETC Toll Plaza : IEEE transaction.

[7] A Novel Chipless RFID System Basedon Planar Multiresonators for BarcodeReplacement Stevan Preradovic, Isaac BalbinNemai C. Karmakar and GerrySwiegers2008.

[8] "Software Engineering", by IanSomerville, Sixth Edition, PearsonEducation Ltd 2007.

[9] "Web Programming", by "Chris Bates"Wiley Dreamtech India, 2nd Edition.

[10] "Database Management Systems", by Navathe, 6th Edition.