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GPS Based Toll Collection System

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***Abstract*— Developing countries like India need to improve critical infrastructure such as roads or highways. building these highways is an expensive Matter in which investment cannot be made by the Government Lonely. Usually done for public-private partnerships Make such a big project. money spent on Projects can be retrieved by collecting tolls from Passengers who use the roads. toll collection system, especially in India faces some problems like a long time Queueing, avoiding toll plazas, etc. These systems can serve only 300 vehicles per hour, and if more than several vehicles arrive at that plaza, server traffic There may be jams. To solve this, we are proposing to send a message using GPS by giving latitude and longitude, Vehicle Number, Registered Mobile Number, Vehicle Type, User Vehicle email id, etc for maintenance of the toll plaza Office. By comparing vehicle and toll status Plaza, is to be charged from the owner of the vehicle account by sending the required amount and payment Link the vehicle with the registered mobile number.**

Keywords — Toll Tax, Toll Plaza, GPS, Latitude, Longitude, etc.

Introduction

Developing countries like India such as Roads or Highways. Construction of these highways is a costly affair, which can't be invested in by the government alone. Normally Public-private partnerships are made to construct such a huge project. The money spent on these projects can be regained by collecting tolls from the passengers who use the roads.

The toll collection system, especially in India faces some problems such as long queue lines, escaping from toll plazas, etc. These systems can service only 300 vehicles per hour, and if more than that number of vehicles arrive at that plaza, traffic congestion may occur.

To solve this we are proposing to create GPS based system by giving the latitude and longitude of the entering point of the toll plaza. By comparing the position of the vehicle and toll plaza, the owner of the vehicle can be charged from their account.[1]

Components

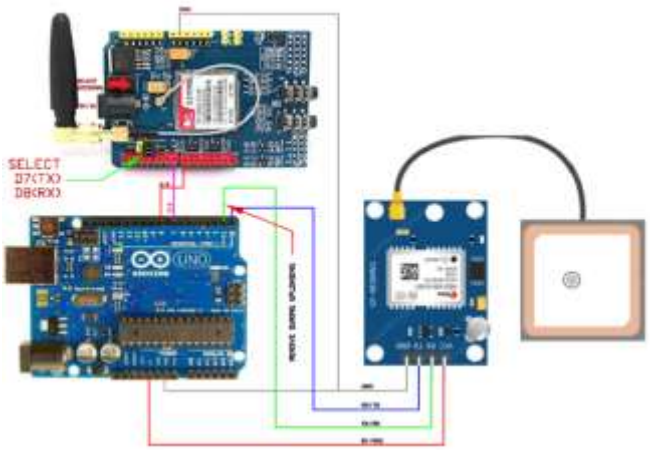
GPS Module (NEO-6MV2) - The Global Positioning System (GPS) is a satellite-based navigation system that provides location and time information. The system is freely accessible with a GPS receiver and an unobstructed line of sight to at least four GPS satellites. A GPS receiver calculates its position based on the precise timing of signals sent by GPS satellites. GPS is widely used nowadays and has also become an integral part of smartphones.

Arduino UNO R3 - The Arduino UNO is an ATmega328P-based microcontroller board. It has a USB port, a power jack, an ICSP header, 14 digital input/output pins, and a reset button. Everything needed to support the microcontroller is included.

GSM-SIM900A - A dependable and incredibly small wireless module is GSM. You can take advantage of its compact dimensions and cost-effective solutions because it is a comprehensive GSM/GPRS module in SMT type and built with a very powerful single-chip processor integrating AMR926EJ-S core.

Male-to-Female Jumper Wires – Any development board's female header pins can be connected to other development boards with male connectors using male-to-female jumper wires. They are simple wires with connector pins on each end so they may be utilized to link two points together.

Circuit Diagram

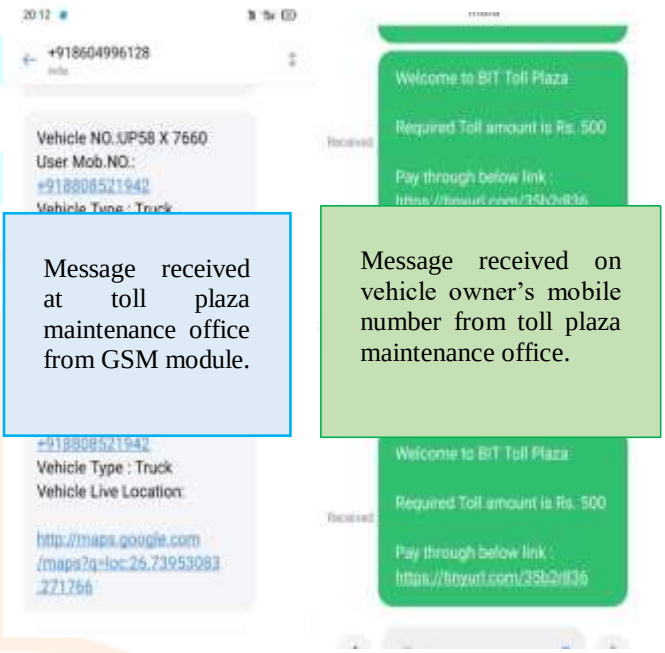


Working Process

The operating principle of the GPS-based Highway Toll Collection System is easy to follow. The system tracks the travel of the moving vehicle from the acquired GPS coordinates. The acquired coordinates were continuously compared with the predefined coordinates of the toll collection points in the database Whenever a match is detected, a message containing the vehicle number, vehicle owner's mobile number, vehicle type, and live location of the vehicle will be sent to the toll plaza maintenance office through SMS with the help of the GSM module and they will send a payment link with the help of GSM module to the toll plaza maintenance office. Vehicle owner's mobile no. Toll collection was done through a debit transaction by the vehicle owner with the required amount for the matched destination with the help of a payment link within the prescribed time limit.

When the user does not pay the desired amount within the stipulated time frame, the government can levy a penalty.[2]

Features



Message received at toll plaza maintenance office from GSM module.

Message received on vehicle owner's mobile number from toll plaza maintenance office.

Advantage

- It will prove beneficial to travelers as the vehicles don't have to stop at toll plazas as all the physical toll booths and toll plazas will be removed. Thus it will help in less congestion on roads and will help in avoiding jams on highways.
- There are no limitations to vehicles entering toll plazas like as FASTag technology there is a limitation of approx. 300 vehicles enter per hour.
- Time-saving technology because no traffic jams occur near the toll plaza.
- No need to make a manual collection toll plaza on the highway only have to define the position of the toll plaza entering point. So, there is no cost of making a toll plaza.
- This system will also be helpful in vehicle security as your vehicle can be tracked regularly based on GPS and you will be informed about your vehicle's location in case of theft.

Acknowledgment

The research work carried out could not have been done without the support of Dr. Saiyed Salim Sayeed Sir. He is the Assistant Professor of ECE he helps with network and coding.

References

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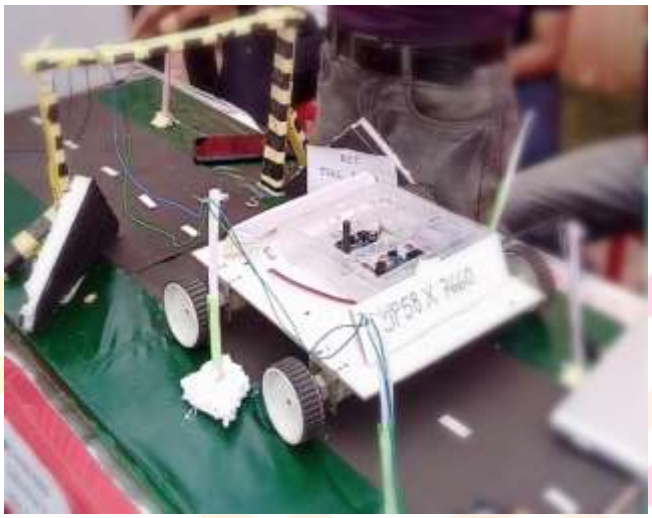

This is the final project image of GPS Based Toll Collection System.