Presented at the DLSU Research Congress 2014
De La Salle University, Manila, Philippines
March 6-8, 2014

Integrated Electronic Toll Collection System Using RFID and GSM Technology

Engr. Ann E. Dulay, Aldred John Y. de Leon, Bernhardt Andrew B. Ducante, Ann Lorainne R. Paragas, Cyrus Jason Reyeslao

Department of Electronics and Communications Engineering
De La Salle University, Manila
2401 Taft Ave., Malate, Manila 1004, Philippines
ann.dulay@dlsu.edu.ph

Abstract: The electronic toll collection system in the Philippines at the time of this research uses microwave technology. It is dubbed as e-pass, it allows motorists to pass through the toll gates by simply slowing down until the system detects the signal. However, microwave detectors are expensive. Hence, the full deployment is not practicable. As the number of vehicles that use the tollgates increases, the need to fully implement the e-pass system is desirable. RFID offers a cheaper alternative.

The Integrated Electronic Toll Collection System using RFID and GSM Technology (ETC RFID) developed in this study has four main functions: (1) to detect the RFID tag of a vehicle that enters the tollgate, (2) to detect the RFID tag of a vehicle that exits the tollgate, (3) to send the data read by the reader to the database server and (4) to notify the balance of the customer's RFID tag through SMS. The graphical user interface that shows the computation of the toll fee is displayed using Visual Basic6.0.

The ETC RFID system is implemented in a pseudo toll gate. The system comprises the reader, the tag, the GSM module, a local PC containing the GUI for the logs and a central server that contains the database. The reader is placed in the pseudo toll gate, while the tag is installed inside the vehicle. Several tests were done to determine the optimum angle of the reader with respect to the tag. The angles are 30^0, 45^0, 60^0, and 90^0. It is observed that as long as the speed of the vehicle is 50 kph or less, the position of the reader does not affect its detecting capability. A 100% success rate is achieved. However, when the speed is increased, only the 45^0 angle position enabled the reader to detect the tag installed in the vehicle that is running at a maximum speed of 80 kph.

The GSM capability test shows in all trials hundred percent success rate in sending the notification whenever the customer's account is below the set limit.

Key Words – RFID; microwave detectors; eletronic toll gate; SMS; ETC; e-pass