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## RFID GPS and GSM based logistics vehicle load balancing and tracking mechanism

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### Abstract

Logistics management is very important aspect in real time applications. This paper addresses the problems in cargo loaded vehicles such as the delayed delivery of goods, overloading on vehicles, and identification of vehicle location and misplacement of goods. The proposed system uses RFID tag to identify the goods to avoid misplacement and Weight sensor is used to avoid the overloads of goods in vehicle. The GPS and GSM are used to track the vehicle and also send the details of goods to source periodically.

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**Keywords:** GSM; GPS; RFID; PIC Microcontroller.

### 1. Introduction

In recent years, important developments have emerged in the field of Real-time Location Systems (RTLS). Radio Frequency Identification and Detection (RFID) is rated as one of the most promising and significant RTLS in industries and applied techniques. It can be deployed in different applications and offer various additional functions. RFID is a non-contact automatic identification technique, by which of radio frequency can automatically identify object and obtain relevant data without human involvement. The Global Positioning System (GPS) is the most promising technology to acquire the position information in outdoor environments. In [1] RFID and GPS system was explored and tested, which allowed for the real-time location of human and resources both indoor and outdoor. In this project GSM is used to send the message after receiving the goods.

RFID tag is placed in each of goods and the RFID reader is placed in the vehicle [1]. SN74HC00 are used to interface GSM, GPS, and RFID with PIC microcontroller. Weight sensor is for to find out the overload in the vehicle. GSM is for sending the message to user .

### 2. Over view of the system framework

RFID systems play a key role in managing updates of stocks, transportation and Parcel tracking. The key component of an RFID system is the tag. The functional characteristics of the tags are divided into active and passive classes. Passive tags are much cheaper than the active tags and are widely used. Here the code is maintained for each company before the despatchment of goods. The purpose of code is for when the vehicle reached to particular destination the user has to press the code in the keypad for taking the specified goods from the vehicle .Generally goods weight is calculated per item, but here the weight is calculated for the entire goods in the vehicle [2].

Weight sensor is used to find the overload of goods in the vehicle. The weight sensor is connected with PIC microcontroller .The current value and predefined value will be compared, if the weight is more than the predefined value the alarm should be ON. GPS technology has provided major breakthroughs in Transportation management (vehicle

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tracking, speed, waiting time, etc.). Through GPS, the object position coordinates and the time determination which is related to a value referred to the clock, can be obtained by picking up signals and measure the time[3]. PIC 16F877A is a 40-pin 8-Bit CMOS FLASH microcontroller from Microchip. The core architecture is high-performance RISC. GPS is used for tracking the vehicle. With the help of mapax tracking of vehicle was used in early days [4]. But GIS software to find the latitude and longitude position. This system is used to track the vehicle and also message will be sent through GSM. The RFID contains RFID tag and RFID reader. RFID reader placed in the vehicle. RFID tag is placed in the each goods. The user needs to type the particular code in the KEYPAD, before the goods are dispatched to the user. If the user enters wrong code the alarm will be ON. In case if the wrong goods have been taken by the user the ALARM will ON.

### 3. Prototype design & design process

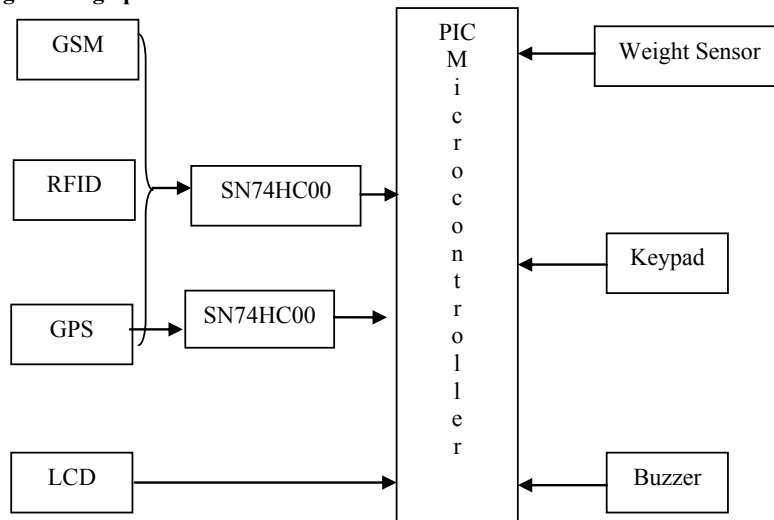


Figure .1 shows the schematic diagram of Prototype Design

In this process design and implementation of RFID, GPS, and GSM based logistics vehicle load balancing and tracking mechanism. Misplacement of goods, overload of goods in the vehicle, Weight sensor is used to find out the overload of goods in the vehicle. Weight sensor consists of 3 pin, 2 for supply and 1 for output. The output wire of weight sensor is interfaced with microcontroller in PORT A of ADC pin. Comparison is made with predefined value which is set earlier and if the values are not equal, ALARM is activated.

GPS is good in analysis of vehicle location tracking [6]. To know about the details of vehicle in which latitude and longitude vehicle move through GIS software. The GPS is connected to the PIC microcontroller with the help of 2 (SN74HC00) QUADRUPL 2-INPUT POSITIVE-NAND GATES IC. The 74HC00 devices contain four independent 2-input NAND gates. The 74HC00 perform the Boolean function  $Y = (A \cdot B)$  or  $Y = A + B$  in positive logic. The operating voltage frequency is 2V to 6V. The GSM RX is directly connected to TX of PIC microcontroller. In GSM TX is connected with 1A of NAND gate. The 1B of NAND gate is connected to controller port pin. The GPS TX is connected with 2A of NAND gate and 2B is connected with controller port pin. RFID reader is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data. RFID tag is placed in each goods. Each RFID tag has unique id. RFID communicates with TX and Rx. The TX is connected to 3A and 3B is connected to any one of the port pin of microcontroller. 3Y is connected with 4A and 4B of NAND gate. 4Y is connected to IC2 SN74CH00 of 1A and 1Y of previous IC1 SN74CH00 is connected with 1Yi and Yi is connected with RXD pin of PIC.

Every goods has the RFID tag which contains the EPIC number. When the vehicle reached to particular destination, the user has to press the code in the keypad. The EPIC code number should be predefined in the microcontroller. RFID reader reads the goods id which is lifted for the moment and the controller will match this goods id with the EPIC. If these goods are same then goods can be unloaded. Otherwise the controller will activate the ALARM unit to give alert on wrong delivery of goods. Weight sensor is also embedded with controller unit which checks for the overload while the goods are been loaded on the vehicle. Give the ALARM indication about the overload by checking the current load with the threshold value set earlier in the controller. The user will be given authentication code by which the goods can

be unloaded by entering in the KEYPAD. Then only the controller will check the codes read by RFID reader with the predefined EPIC code of the specific company or product. The number of goods for the specific product loaded on the vehicle will be entered as the count in the controller while it is loaded and this will be decremented when each piece is unloaded. When this count become zero the controller will send message through GSM. The travel of vehicle can be traced with GIS software at the remote end, since the controller unit has the GPS module. The modules are written in embedded C using MPLAB4 IDE and it is dumped with PICKIT2.

### 3. IFlow Diagram

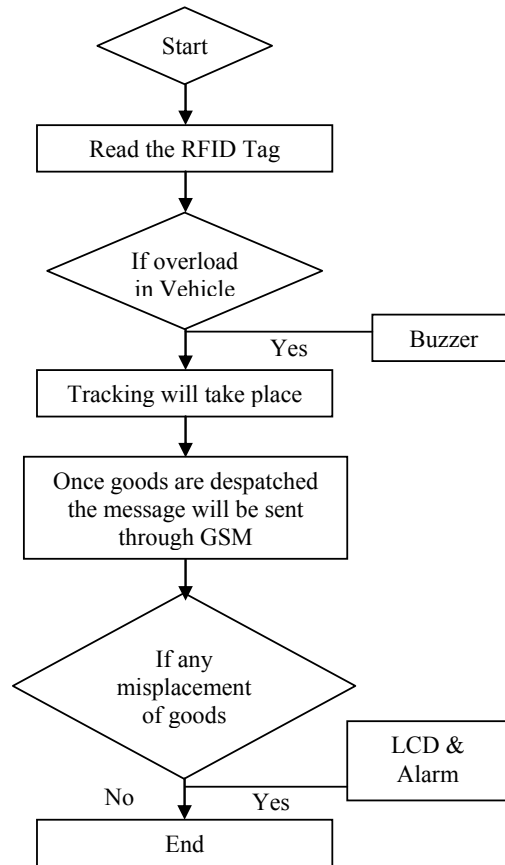


Figure 2: System Flow Diagram

### 4. Conclusion

This work solves the issues like misplacement of goods and overload of vehicles. Tracking of cargo vehicle and periodic information about arrival of goods is also accomplished. This project can be extended further with interlocking system for wrong delivery of goods. Since RFID is the simplest and better technology for RTLS, this work effectively utilized the scope of RFID technique for Logistics Management System.

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