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Design and Development of Authentication Locking and Tracking System

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Abstract: ***Authentication-locking and tracking system(ALTS) is used to prevent people from accessing systems such as vehicles, objects in ware houses, arms and mobile communication systems in security services of an authorized user, so that they are not misused. In this project, the system is embedded with an electronic based Tracking and Locking Unit (TLU). This unit locks the system when the RFID tag is not authenticated and transmits the information of the system to a Mobile Unit (MU) and Control Station (CS), which will continuously monitor a system and report the status of the system. The GPS technology is used to identify the current geographical position on earth. GPRS in LTU establishes a communication link with MU and CS. GPRS transmits the data of GPS to MU and CS, and also transmits RFID data if necessary. It also receives data from MU and CS. This unit is very useful to reduce the theft and misuse of thing.***

Keywords: FRDM-KL25Z Microcontroller, GPS and GPRS Modem, RFID Module, Locking Mechanism

1. Introduction

Authentication-Locking and Tracking System (ALTS) is a security system used to help the people to authenticate and track the system in order to avoid the misusing of their system. The user of the system should be authorized before using the system the user data is stored in the tag and also the RFID unit, so that the user can be authorized to use the system. If there is any missing the user system can be tracked.

There is a positioning system which is used to locate the exact position of the system where it is located. The GPS (Global Positioning System) is used to send the exact location by the frame format. So the position can be continuously monitored by the monitoring station i.e.; Mobile unit. As the data can be sent using GPRS (General Packet for Radio Service). The data is send to the monitoring station by the wireless technology. The GPS tracking system is used to send the information about the user system continuously or in some time difference based on the requirement of the tracking.

2. Proposed system

2.1 Methodology

In this proposed method the system is embedded with an electronic based Authentication Locking and Tracking Unit (ALTU). This unit consists of a GPS and GPRS modem for tracking and also the RFID module for authentication. This system transmits the information of the monitoring system to a Mobile Unit (MU) and Control Station (CS). It relies on information received from ALTU. The CS takes care about all the information of the ALTS.

The authentication of the system is done by the RFID (Radio Frequency Identification System), The system consists of the information about the user in the RFID tag. If the information present in the tag is valid and the security system will allow the user to use the system and in case of the invalid information is detected by the ALTU unit then the system will be in the locked position so the system cannot be used by the user and immediately the GPS information is send to the monitoring station for tracking the system.

2.2 Block Diagram

FIG: Block Diagram of Authentication-Locking and Tracking System (ALTS).

3. Hardware Implementation

3.1 Processor

The microcontroller MKL25Z128VLK4 is used in this project. It is a free scale microcontroller which consists of the

ARM Cortex M0+ core with high processing speed and low power consumption controller. The MKL25Z128VLK4 controller supports various serial communication protocols, 128 KB of flash, On board RGB LED, a 3-axis digital accelerometer and a capacitive touch slider also works under 48MHz operating frequency. This micro controller is interfaced with the GPS/ GPRS Modem, RFID module and the Micro Servo motor with Locking Mechanism.

3.2 GPS and GPRS MODEM

GPS: The Global Positioning System (GPS) is a satellite-based navigation system which is used to locate the current position on earth, the GPS data is in the NMEA frame format which consists of the latitude, longitude, date, time and speed.

GPS data
$GPRMC,061114.000,A,1732.459377,N,07823.084075,E,9.592,143.3,201014,,,A*65

This is the NMEA frame format which shows the exact position on earth which consists of the latitude and longitude positions. The GPRMC frame format is transmitted to the CS and the MU along with the IMEI number of the modem and also the RFID TAG information if required which is used for authentication.

GPRS: The General Packet Radio Service (GPRS) provides actual packet radio access for Global System for Mobile Communications (GSM) and Time-Division Multiple Access (TDMA) users.

The module consists of both GPS and GPRS. The module has Low power consumption, Quad band 850 / 900 / 1800 / 1900 MHz, The GPS engine can also be powered down based on the usage of the module. Best in class acquisition and tracing sensitivity and Power supply is from 3.2v to up to 4.8v.

GPRS establishes the connection with the MU and CS. GPRS transmits the GPS data to the server system i.e.; CS and the mobile unit i.e.; MU at the same time through the established TCP/IP connection between the ALTU and the server.

3.4 RFID Module

RFID (Radio Frequency Identification) is the wireless use of electromagnetic fields to transfer data. RFID consists of the reader and the tag.

Reader is nothing but an interrogator or scanner that sends and receives data from the Tag via antenna.

Tag is a silicon microchip also known as transponder which contains electronically stored information.

The RFID module is integrated to the microcontroller and when the valid tag is detected the reader will send the tag information to the reader for the process. The tag does not need any line-of-sight for detection and also can be camouflage within the military personnel. So that there will be no loss of tag.

The module is an ultra-small, 2 port, 500mW EPC Class 1 Gen 2 reader/writer module (ISO18000-6C protocol). Efficient power supply with 2.0-5.5V, Supported host interfaces include USB, TTL level RS232, SPI, I2C.

In this project the Tag consists of the information regarding the user/ owner of the system. User Name, User ID, System Information, IMEI No etc.

3.6 Locking Mechanism

The Micro Servo motor and the Locking System is used to lock the system from accessing. The gear of the servo motor is inserted in to the groove of the locking mechanism. The micro servo motor is given a pulse according to the detection of the tag, if the tag is detected by the RFID reader then the required pulse is transmitted to the servo motor and the gear of the motor will be rotated and the locking mechanism will set the system open and the system is used for accessing by the authorized user.

If the tag is not detected by the RFID reader then the required pulse is transmitted to the servo motor and the gear of the motor will be rotated in the anti clockwise direction and the locking mechanism will set the system closed and the system will be under locked condition and cannot be used.

4. Flow Chart

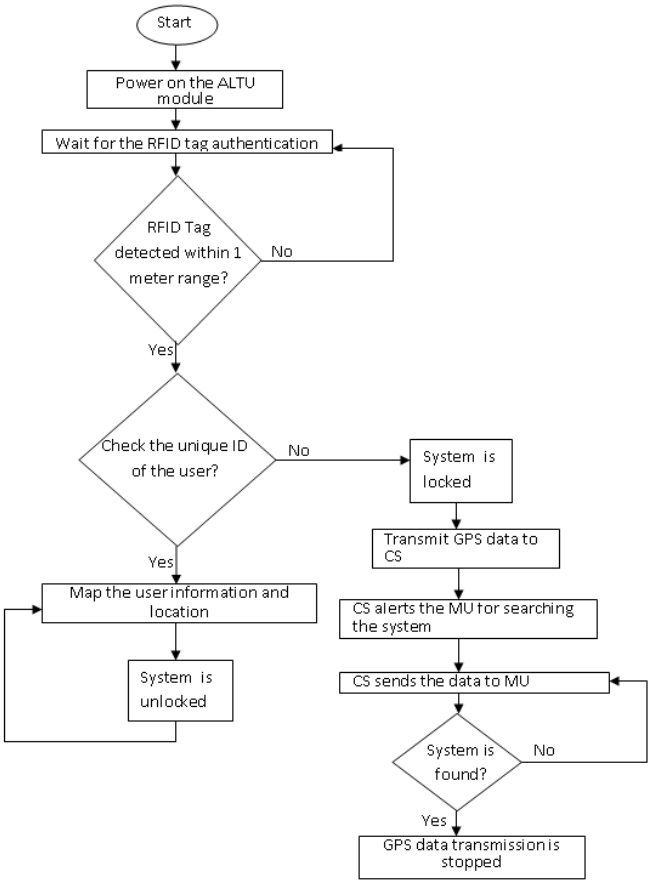

Figure 4.1: Flow diagram for the working procedure of the ALTU

The flow chart shows the process how the ALTU system works. When the RFID tag is detected the system checks for the valid user id and maps the user information then the system is allowed to use by the user. If the tag is not detected the system is locked and tracked using GPS.

5. Result

5.1 Hardware of ALTU

Figure 5.1: Authentication Locking and Tracking Unit

The Hardware of ALTU consists of the micro controller interfaced with GPS and GPRS module including the RFID reader for authentication. The locking unit consists of the motor for locking and unlocking the user system.

5.2 Server output

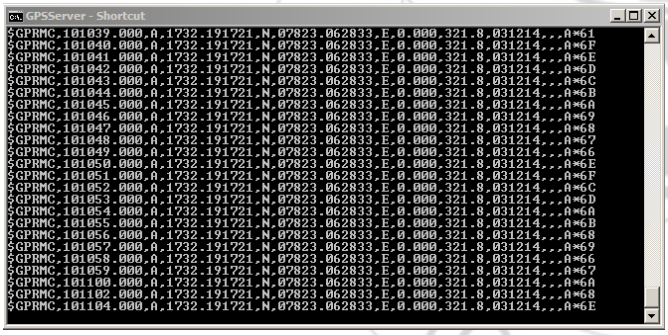

Figure 5.2: GPS data received at the server

The GPS data is received at the server located at control station. The exact position is located by using the data acquired at the server it consists of the latitude and longitude position including with date and time.

5.3 Locating Position at Server

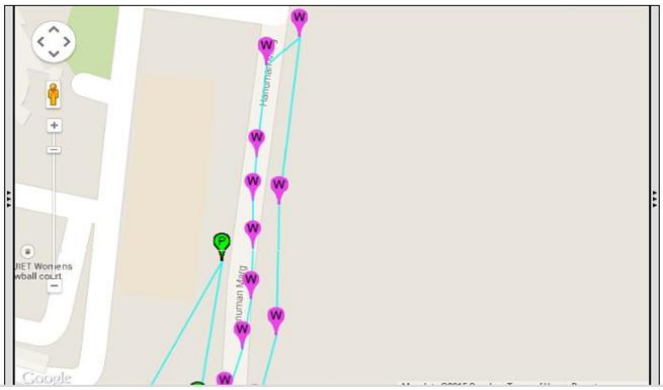

Figure 5.3: Mapping the GPS data received at the server.

The figure shows the exact position of the mobile unit and the ALTS unit.

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