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# Received Signal Strength Indicator (Rssi) Based Car TheftDetection System

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## Abstract

*This work provides a possibility to track using Received Signal Strength Indication technique (RSSI). In 2021, there are more than 35000 vehicle theft cases hasbeen reported and only 30% the vehicles have been returned without any damage. In this work, the Received Signal Strength Indication Technique (RSSI) is used here to track the Theft vehicle. The ZIGBEE module is used in this technique, A ZIGBEE transmitter is placed in a Car and the receiver will be placed in the common places, so when the car comes in range with the receiver, the vehicle will be detected and the data will be uploaded in cloud using IoT Module with the time when the vehicle came into the range and the movement of the vehicle will be stopped through the motor driver placed in the transmitter section, This Process commands will be stored in the Arduino and it is kept both in the transmitter and Receiver Section.*

Keywords- *RSSI, ZIGBEE, Arduino, IoT Module (Wi-Fi Module).*

## INTRODUCTION

In this work, the Received Signal Strength Indicator (RSSI) monitors the theft attack using ZIGBEE technology. A ZIGBEE Transmitter will be placed in the Car with the Arduino and the ZIGBEE Receiver will be connected with the Arduino along

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with a IoT Module, By placing the ZIGBEE Receiver in many common places and near Traffic Signals, it will be used to detect when the car with the ZIGBEE Transmitter crosses the receiver, the data is uploaded in the cloud. The detected signal data will be transmitted to the server through IoT Module and the details of the car will be displayed in the LCD monitor in the Receiver Section and when the Theft car passes or comes in range with receiver section, movement of the car will be stopped by the motordriven connected through the arduino.

## DESCRIPTION OF THE PROPOSED SYSTEM

In the proposed system, ZIGBEE technology is used to detect theft car. The ZIGBEE technology helps in reading the vehicle signal strength and update the information in Web page and stop the movement of the car, when the theft car is detected.

## LITERATURE SURVEY

Ricardo Tesoriero, José A. Gallud and et al (2009) describes about GPS seems to be the best solution to develop outdoor location systems, but performance of these systems is not good enough to locate entities within indoor environments, mainly if accuracy and precision are required. In this article we propose a tracking indoor system based on passive RFID technology that is able to accurately locate autonomous entities,such as robots, people, etc, within a defined surface. In order to validate the proposal, we compared our system technology performance against other alternatives built on different technologies (Wi-Fi, Bluetooth, IrDA, ultrasound, etc). We also include the system evaluation and final remarks with future improvements.

Mauro Boccadoro, Francesco Martinelli and et al (2010) describes about a global localization problem of a robot moving in a known environment is considered. The environment is equipped with a relatively sparse set of passive RFID (Radio Frequency

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Identification) tags. The robot can detect the presence of the tags when traveling in their proximity and combines this information with the one given by other sensors (e.g. odometry). The RFID measurements are characterized by a highly non Gaussian noise: for this reason in the literature Particle Filter (PF) methods have often been used to fuse these data with the measurements coming from other sensors. In this paper a different approach is pursued, based on the observation that RFID readings can be considered as noisy quantized measurements of the pose of the robot or as noisy dynamic constraints on the pose itself.

Emidio DiGiampaolo and Francesco Martinelli (2014) describes about paper a global localization system for an indoor autonomous vehicle equipped with odometry sensors and a radio-frequency identification (RFID) reader to interrogate tags located on the ceiling of the environment. The RFID reader can measure the phase of the signals coming from responding tags. This phase has non-univocal dependence on the distance robot tag, but in the considered frequency, it is really sensitive to a change in the position of the robot. For this reason, a multihypothesis Kalman filtering approach provides a really satisfactory performance even in the case that a very small density of tags is used: In the experimental tests, an average position estimation error of about 4 cm is achieved using only two tags for an area of about 5 m2.

Simo Särkkä, Ville V. Viikari and et al **(**2012) describes about an UHF RFID location tracking system, which is based on measuring the phases of backscattered signals from RFID tag using multiple spatially distributed antennas at a single carrier frequency. The wavelength ambiguity of the phase measurements is resolved by using the extended Kalman filter (EKF) and the Rauch-Tung-Striebel (RTS) smoother, where the state includes the position, velocity and the phase offsets of antennas. The performance of the methodis experimentally verified at 890 MHz using a commercially available RFID reader.

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Yoshito Watanabe and Yozo Shoji (2009) describes a technique to detect an approaching vehicle aiming at alerting a pedestrian by observing the variation of the received signal strength indicator (RSSI) of the repeatedly radiated beacons from a vehicle, called the alert beacons. A linear regression algorithm is first applied to RSSI samples. The decision about whether a vehicle is approaching or not is made by the Student's *t*-test for the linear regression coefficient.

Gyu-Ho Kim, Kwan-Hyung Lee and et al(2013) describes a smart key system allows the driver to enter and start a car without using a mechanical key through a wireless authentication process between the car and the key fob. Even though a smart key system has its own security scheme, it is vulnerable to the so-called relay attacks. In a relay attack, attackers with signal relaying devices enter and start a car by relaying signals from the car to the owner's fob. In this study, a method to detect a relay attack is proposed. The signal strength is used to determine whether the signal received is from the fob or the attacker's relaying devices. Our results show that relay attacks can be avoided by using the proposed method.

Sandeep Singh, Member and Poonam Kumari (2019) describes An efficient automotive security system is implemented for anti-theft using an embedded system integrated with Global Positioning System (GPS) and Global System for Mobile Communication (GSM. System presented has Two types of tracking, one is online tracking with GPS system can only receive the vehicle location information from satellites and other is offline tracking. GSM system is installed in the vehicle for sending the information to the owner of the vehicle. The preventive measures like engine ignition cutoff is installed in the vehicle which is controlled using user or owner GSM mobile.

M. Uday Kumar Naidu, Dr. K. Prahlada Rao (2017) describes system uses GSM system, a Buzzer and solenoid valve to cutoff the fuel supply for the engine from the carburetor. If anyone starts the ignition of the engine the microcontroller sends the signal to send the SMS to the owner, If theft detected by the owner then he simply sends the SMS to stop the vehicle from his mobile then ignition, fuel supply system gets off and buzzer gives a loud sound.

Simon J. Julier and Jeffrey K. Uhlmann **(**2004**)** describes about an extended Kalman filter (EKF) is probably the most widely used estimation algorithm for nonlinear systems. However, more than 35 years of experience in the estimation community has shown that is difficult to implement, difficult to tune, and only reliable for systems that are almost linear on the time scale of the updates. Many of these difficulties arise from its use of linearization. To overcome this limitation, the unscented transformation (UT) was developed as a method to propagate mean and covariance information through nonlinear transformations. It is more accurate, easier to implement, and uses the

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same order of calculations as linearization. This paper reviewsthe motivation, development, use, and implications of the UT.

Veerandi Kulasekara, Pasan Dharmasiri and et al (2020) describes solutions can provide relatively accurate data, but they are required advanced communication technologies and constant access to the power source, which becomes a challenge for electric transport applications with limited energy resources. An analysis of the system design along with the network architecture and the implemented approach to determinethe location using ZigBee topology are discussed in the paper.

Wittaya Koodtalang, Thaksin Sangsuwan (2016) describes the improvement of motorcycle anti-theft system (MATS) utilizing Bluetooth Low Energy (BLE) 4.0. In the our previous work, the couple RFID passive tags were installed on motorcycles to detect the larceny conditions. The main problem was found in the last experiments that the RFID tags attached with the ignition key cannot be hung flexibly. Therefore, the BLE4.0, which is the low-power-consumption device, is dangle on the motorcycle's key and the RFID tags is installed on the bike's hidden body. The anti lost devices have been applied for responsibility of BLE-tags slave mode, installed on a key. The HM-11 BLE 4.0 module combination with an Arduino board has a function as the master mode, reading the MAC address (called ID) of BLE slave devices. The results show that the maximum distance, in which the BLE master module can detect the BLE slave's ID, is approximately 18 meters

H.song, S.zhu, G.Cao(2008) describes the design, implementation and evaluation of a Sensor-network-based Vehicle Anti-Theft System (SVATS) to address these limitations. In this system, the sensors in the vehicles that are parked within the same parking area first form a sensor network, then monitor and identify possible vehicle thefts by detecting unauthorized vehicle movement. When an unauthorized movement is detected, an alert will be reported to a base station in the parking area, which sends warning messages to the security office. This paper focuses on the technical issues specific to the system such as topology management, theft detection, and intra-vehicle networking.

J.Helguero, G.Astudilo, R. Estrada (2009) describes the design and implementation of a solution to control theft of outboard motors of small fishing boats. The lack of control of outboard motors inventory, in-situ identification and especially thefts have come up with a possible solution of the problems mentioned before by using passive RFID tags. The RFID equipment that is part of the solution should adjust to adverse conditions where they will work: salinity, high temperatures, vibrations and external interferences particularly those that come from the outboard motor. The essentials in this paper are the specific tests that will provide the knowledge of the real coverage and

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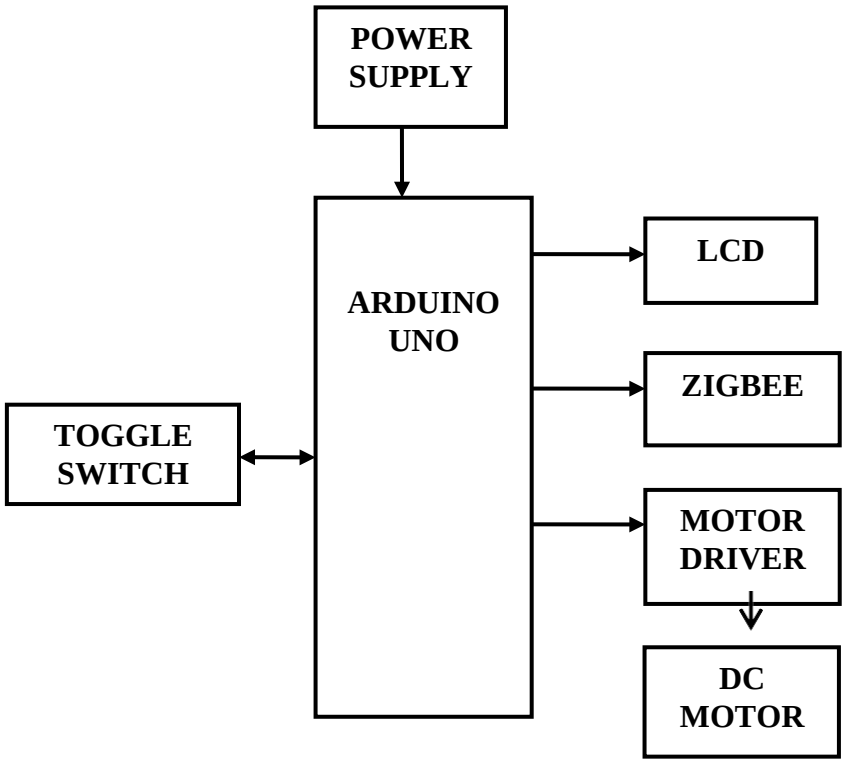
reception of data using RSSI (received signal strength indication) and theuse of propagation models in the forward and reverse link.

Shabinar Binti Abdul Hamid, Anis Diyana Rosil **(**2012) describes high value assets loss due to theft can be reduced if the attempt to remove the asset is detected at once. This paper study the design of anti-theft system based on RFID technology. The RFID tag that attaches to an object is integrated with motion sensor. The interrupt function is utilized to the tag to automatically detect motion of an object. The real-time notification of theft is realized using multi-communication principle between a tag and a reader. The anti-theft system proposed here was tested for motion detection efficiency and RF communication performance in multi-floored building to verify its reliability.

## BLOCK DIAGRAM

### TRANSMITTER SECTION

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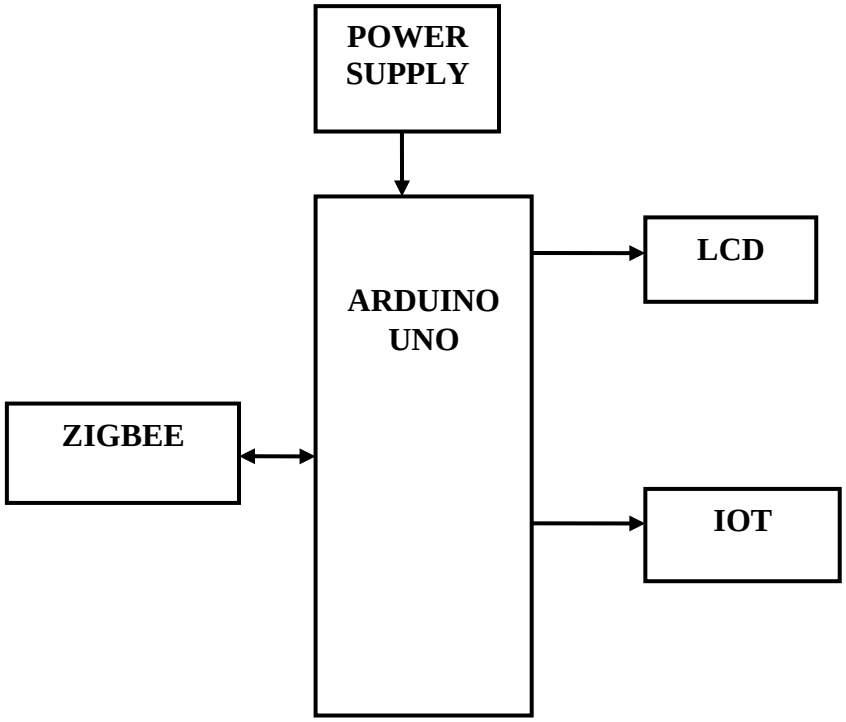
**TRANSMITTER SECTION**

The Transmitter section has the following components Arduino UNO, ZIGBE,LCD Monitor, Power supply, DC Motor, Motor Driver and Toggle Switch.

## RECEIVER SECTION




**RECEIVER SECTION**

The Receiver section has the following components Arduino UNO, ZIGBEE, IoTModule (Wi-Fi) Module, LCD Monitor and Power Supply.

## ZIGBEE

ZIGBEE is a standard-based wireless technology to which low-cost, low-power wireless machine-to-machine (M2M) and Internet of things (IoT) networks. ZIGBEE is for low-data rate, low-power applications and is an open standard. This enables mixing of implementations from different manufacturers, but, ZIGBEE products have been extended and customized by vendors and plagued by interoperability issues. Opposite to Wi-Fi networks to connect endpoints to high-speed networks, In this work, the ZIGBEE plays the major role and used to detect the theft cars.

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## IoT:

The Internet of things (IoT) defines physical object (or groups of object) with sensors, processing ability, software and other technologies that connect and exchange data with other device & systems over the Internet**.**

## Wi-Fi Module:

The ESP8266 is an effective Wi-Fi chip with full TCP/IP stack. It contains Micro Controller Unit. The Module have an independent SOC. It comes along an AT command set firmware. This provides feasibility to connect Arduino. It's mostly used for development of Internet of Things (IoT) embedded applications, It is used here to send the data to the cloud.

## Arduino UNO

Arduino UNO is Microcontroller board based on ATmega328P ( datasheet). It have 14 digital input/output pins, 6 analog input, 16 MHz quartz, USB connection, an ICSP and reset option. It contain everything to support the Microcontroller, connect it to a computer with USB cable or power it with AC - to-DC adapter or battery to get started, It is used in this work to connect with the ZIGBEE and other hardware components and programmed to run the instructions given to it.

## Liquid crystal display

LCD screen is an electronic display module and they have a very wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. This modules are preferred than seven segments and other multi segment LED. The reasons being LCD are economical easily programmable, they have no limitation of displaying special and even custom characters (unlike in seven segments), animation, It shows the whether the vehicle passes is a Theft or Normal vehicle.

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## Power supply:

The power supply is the most important one. It should deliver constant output regulated power supply for successful working on the project. A 0-12V/1mA transformer is used here. The primary of this transformers is connected in to main supply through on/off switches and fuse for protecting from overload and short circuit protection. The secondary part is connected to the diodes to convert 12V AC to 12VDC voltage. And filtered by the capacitors which is further regulated to +5v, by using IC 7805.

## Motor Driver:

Common DC gear head motors need current above 250mA. There are many integrated circuits like ATmega16 Microcontroller, 555 timers IC. But IC 74 series cannot supply this amount of current. When the motor is directly connected to the output of the above ICs then, they might damage. To overcome this problem, a motor control circuit is required, which can acts as a bridge between the above motors and ICs (integrated circuits). There are many ways of making H-bridge motor control circuit, as using transistor, using relays and using L293D/L298 , It is used here to control the movement of the car.

## DIRECT CURRENT (DC) MOTOR:

A Direct Current motor is an electric motor which runs on direct current power. In all electric motor, operation is upon simple electromagnetism. A current carrying conductor generates a magnetic field, when this is placed in an external magnetic area, which will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It's a device which converts electrical energy to mechanical energy. It works as current carrying conductor placed in a magnetic field experiences a force which causes it to rotate with respect to its original position, It acts as the engine of the car.

## EMBEDDED C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.

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Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

## ARDUINO SOFTWARE IDE

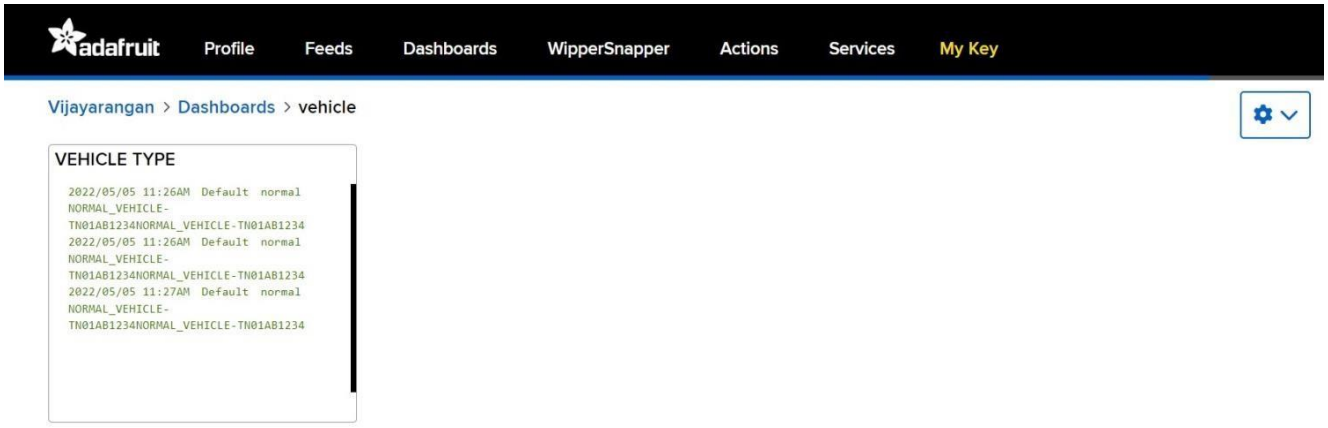
The Arduino Integrated Development Environment / Arduino Software (IDE) - contains text editor for writing code, message area, text console, toolbar with buttons for common functions and series of menus. It connects to Arduino and Genuino hardware to upload program and communicate with them.

## EXISTING SYSTEM AND ITS DISADVANTAGES

There is no these type of existing systems, Targets may escape in the CCTVcamera, It will be of High cost and Manual identification will take more time.

## OUTPUT:

### IoT DASHBOARD INTERFACE:




The details of the car is been shown in the Website when the car with the ZIGBEE Transmitter comes in range with the ZIGBEE Receiver. The Date, Month, Year, Time and the details of the Car like Vehicle Number and whether it is Theft vehicle or Normal vehicle, when it comes in range with the Receiver section will be uploaded in the cloud website using IoT (Wi-Fi Module).

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## OUTPUT IN CLOUD:

| Created at | Value | Location |
|---|---|---|
| 2022/03/31 5:08:45PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:08:37PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:08:28PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:08:20PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:08:12PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:08:04PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:56PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:48PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:40PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:31PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:23PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:15PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:07:07PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:06:59PM | ViewTHEFT_VEHICLE-TN01AB12... | |
| 2022/03/31 5:06:51PM | ViewTHEFT_VEHICLE-TN01AB12... | |

The details of theft vehicle will be uploaded and shown in the theft vehicle log inthe Website.

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