# MONITORING CHILDREN IN THE SHOPPING MALL USING RFID TECHNOLOGY-CONTROLLING MODULE

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## ABSTRACT

Normally, security system at shopping mall still at the low level and unsecure. Nowadays, cases of losing children at the shopping mall always happen due to old fashion of security system there. Monitoring Children In The Shopping Mall Using RFID Technology-Controlling Module is being developed as a high level of security system at the shopping mall to decrease this becoming worst problem in this country. Moreover, the risk of lost children in the shopping mall is really high. Usually parents bring along their children when go to shopping mall. Many parents cannot monitor their children at the hectic situation in the shopping mall. Normally, security guard can just monitor part of the shopping mall area. So the possibilities of the losing children to find are really low. This system is created to help the security guard in order to perform their task that is being responsible for the security purpose at the shopping mall. In the other hand it also can prevent the risk of lost children in the shopping mall. This system is all about Radio Frequency Identifier (RFID). RFID is the use of an object applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Each child that entered the shopping mall must were the RFID band for the security purpose. This system will appear the alert message when the children are pass through the antennae that is located at the entrance. After that, the security guard will announce the parents name for them to take action.

# ABSTRAK

Biasanya, sistem keselamatan di pusat membeli-belah masih berada pada tahap rendah dan tidak selamat. Pada masa kini, kes-kes kehilangan anak di pusat membeli-belah yang selalu terjadi kerana cara lama dari sistem keselamatan yang terdapat disana. Pemantauan Kanak-Kanak Dalam Pusat Membeli Belah Menggunakan Teknologi RFID-Mengendalikan Modul (*Monitoring Children in the Shopping Mall Using RFID Technology-Controlling Module*) sedang dibangunkan sebagai satu peningkatan bagi sistem keselamatan di pusat membeli-belah untuk mengurangkan masalah ini sebelum menjadi lebih buruk lagi di negara ini. Selain itu, risiko kanak-kanak yang hilang di pusat membeli-belah benar-benar tinggi. Biasanya ibu bapa membawa anak-anak mereka apabila pergi ke pusat membeli-belah. Para ibu bapa tidak boleh memantau anak-anak mereka pada situasi sibuk di pusat membeli-belah. Biasanya, pegawai keselamatan hanya boleh memantau sebahagian daripada pusat membeli-belah. Jadi kemungkinan untuk kehilangan kanak-kanak amat tinggi. Sistem ini dibuat untuk membantu pegawai keselamatan untuk melaksanakan tugas mereka yang bertanggung jawab untuk tujuan keselamatan di pusat membeli-belah. Sistem ini dibagunkan berdasarkan Identifier Frekuensi Radio (RFID) teknologi. RFID adalah penggunaan objek diterapkan atau dimasukkan ke dalam produk, binatang, atau orang untuk tujuan pengenalan menggunakan gelombang radio. Setiap kanak-kanak yang memasuki pusat membeli-belah perlu memakai gelang RFID untuk tujuan keselamatan. Sistem ini akan menerima mesej amaran apabila kanak-kanak melalui antena yang terletak di pintu masuk. Setelah itu, pegawai keselamatan akan mengumumkan nama ibu bapa mereka bagi mereka untuk mengambil tindakan.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

This system is all about Radio Frequency Identifier (RFID). RFID is the use of an object applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal.

This system will use East Coast Mall (ECM) as a case study. Nowadays, kidnapping of kids cases in Malaysia is increase rapidly. Furthermore, parents always lost their children while they are busy shopping things at shopping mall. To overcome this kind of problem, RFID is one of the solutions. When parents go for shopping at East Cost Mall (ECM), they bring along their children. Before they enter the mall, they must go to counter and the security guard at the mall gives the

children RFID rubber band. Their parents have to make sure that their children wear the RIFD rubber band. The purpose of wearing the RFID rubber band is to make sure the security guard know the location of the children at the East Coast Mall (ECM) area. This can be done by using remote RFID id surveying. The children are monitored by computer at a security guard's room. If parents notice that their children is lost, they can go to the security guard's room and ask for their children's location.

## 1.2 Problem statement

Normally, security system at shopping mall still at the low level and unsecure. Nowadays, cases of losing children at the shopping mall always happen due to old fashion of security system there. The system is being developed as a high level of security system at the shopping mall to decrease this becoming worst problem in this country.

The risk of lost children in the shopping mall is really high. Usually parents bring along their children when go to shopping mall. Many parents can not monitor their children at the hectic situation in the shopping mall. Normally, security guard can just monitor part of the shopping mall area. So the possibilities of the losing children to find are really low. This system is created to help the security guard to detect the location of the lost children and automatically can prevent the risk of lost children in the shopping mall.

Beside that, parents also faced the hardness of monitoring children especially when they are busy in a shopping mall. Due to hectic situation in a shopping mall, parents face difficulties of monitoring their children. This system can help parents as well to overcome their problem in monitoring their children in a shopping mall while they are busy shopping their things.

Nowadays, our country finds a lot of children kidnapping cases. The cases increase rapidly day by day. Because of this problem, many parents worry to bring their children to the crowded places especially shopping mall. This system creates to monitoring children even in a crowded area. Parents no need to worry to their children anymore.

## 1.3 Objectives

The objectives of the system are:

1.3.1 To develop a monitoring system that can detect losing children at the shopping mall using RFID technology

1.3.2 To help parents monitoring their children in East Cost Mall (ECM)

## 1.4 Scopes of project

The scopes of the system are:

1.4.1 The target user of this system is the security guard at the East Cost Mall (ECM) in order to ease the security guard while using this system.

1.4.2 The system is use simple database that have name of the children and parents, address, and parents mobile number.

1.4.3 This system is developing for the infrastructure of the East Coast Mall (ECM).

1.4.4 This system is being developed for security guard's use to detect the location of children at the level 1 of East Coast Mall (ECM).

1.4.5 This system is the upgrading of security system in the East Cost Mall for the customer's needs especially to upgrade the system for monitoring children at the shopping mall.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Lost Children

There are too many cases of lost children especially in the shopping mall. The case is increase rapidly day by day. There are several techniques to overcome the cases of lost children and at the same time to prevent the problem.

### 2.1.1 GPS

One of a parent's greatest fears, maybe their greatest fear, is losing their child. Amber Alert GPS can overcome the fear. Imagine having a product that uses the latest in GPS and cellular technology. The company is run by parents for parents and revolves around the President's initiative to protect children and give parents peace of mind. The Amber Alert GPS 2G is the world's smallest, most powerful GPS tracking device. Tracking your child is as easy as placing a call or sending a text. Simply place the device in a pocket, purse, backpack or car. You can also attach it to a wrist, ankle, or belt. Call or text the AAGPS device, and within seconds you will receive a detailed map and address of their exact location right on your web-enabled phone. You can also track one or more devices from your

computer. You can make Safe Zone area in your neighborhood. You will receive an alert when your GPS is carried outside that location. The safe zone can easily be changed or cancelled in seconds from your cell phone or from our website. You receive an SOS Button so if your child needs help, he can press the GPS SOS button and you will immediately receive an alert with his location. If your child is in a threatening or dangerous situation, or has a medical emergency, he can press and hold the SOS button. There are no limits to the uses of the Amber Alert GPS. Vehicle tracking, pet tracking, special needs children and seniors, luggage tracking, and more. An amazing and efficient new technology [1].

### 2.1.2 Microchip

A Mexican company has launched a service to implant microchips in children as an anti-kidnapping device. The Mexican distributor of the VeriChip invents a rice-size microchip that is injected beneath the skin and transmits a 125-kilohertz radio frequency signal. The Mexican distributor is marketing the device as an emergency ID under its new VeriKid program. The service has even garnered the backing of Mexico's National Foundation of Investigations of Robbed and Missing Children, which has agreed to promote the service. According to a press release announcing the collaboration, the foundation has estimated that 133,000 Mexican children have been abducted over the past five years. The chip also could be used to identify children who are found unconscious, drugged, dead or too young to identify themselves. The VeriChip is injected under the skin of the upper arm or hip in an outpatient procedure. A special scanner reads the RF signal emitted by the microchip to obtain the device's ID number, which then is entered into a database to access personal data about the individual. Other potential uses of the chip, according to company officials, include scanning unconscious patients to obtain their medical records or restricting access to high-security buildings by scanning workers to verify their clearance [2].

### 2.1.3 RFID combine with Wifi Technology

A children's theme park in Denmark is using a combination of wireless technologies to track very important assets: kids gone astray. Not only does the service use RFID and Wi-Fi, the interface to it is through the parents' mobile phones. It recently began offering a service called "Kidspotter," which entails renting a wristband with Wi-Fi-enhanced radio frequency identification (RFID) tag on it for a child's arm. Parents also get a map of the site. If they lose sight of their child, parents can send a text (SMS) message to the Kidspotter system, which will automatically send a return message stating the name of the park area and the coordinates of their child's location. Parents can locate their child on the map provided. The application is representative of synergies emerging between wireless technologies. Wi-Fi, as you know, has been honed primarily for locally mobile communications. Meanwhile, RFID has garnered attention for real-time asset tracking - whether those assets are animal, vegetable or mineral. These two technologies shall meet, at least occasionally, when organisations decide it doesn't make sense to run separate wireless infrastructures to support both capabilities. High-frequency RFID systems operate in the 850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz ranges, overlapping somewhat with 802.11b and g, which run at 2.4 GHz. wireless LAN real-time location tracking system can pinpoint the whereabouts of both traditional 802.11 devices (computing devices and handsets with 802.11 interfaces) and other types of assets (medical equipment affixed with 802.11-enabled RFID tags, for example) using a single Wi-Fi network infrastructure. For location tracking, this technology called time difference of arrival (TDOA). Three or more receivers in Wi-Fi access points document the arrival times of a radio signal. Then triangulation software uses the measurements to determine an asset's location [3].

## 2.2 Radio Frequency Identification (RFID)

RFID (radio frequency identification) is a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (**RF**) portion of the electromagnetic spectrum to uniquely identify an object, animal, or person. RFID is coming into increasing use in industry as an alternative to the **bar code**. Furthermore, radio frequency identifier (RFID) also is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies.

A **bar code** (often seen as a single word, *barcode*) is the small image of lines (bars) and spaces that is affixed to retail store items, identification cards, and postal mail to identify a particular product number, person, or location. The code uses a sequence of vertical bars and spaces to represent numbers and other symbols. A bar code symbol typically consists of five parts: a quiet zone, a start character, data characters (including an optional check character), a stop character, and another quiet zone.

**Radio frequency** (RF) is a term that refers to alternating current having characteristics such that, if the current is input to an antenna, an electromagnetic (EM) field is generated suitable for wireless broadcasting and/or communications. These frequencies cover significant portion of the electromagnetic radiation spectrum, extending from nine kilohertz (9 kHz),the lowest allocated wireless communications frequency (it's within the range of human hearing), to thousands of gigahertz(GHz).

RFID does not require direct contact or line-of-sight scanning. An RFID system consists of three components: an **antenna** and **transceiver** (often combined into one reader) and a **transponder** (the tag). The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. The data is used to notify a programmable logic controller that an action should occur. The action could be as simple as raising an

access gate or as complicated as interfacing with a database to carry out a monetary transaction. Low-frequency RFID systems (30 KHz to 500 KHz) have short transmission ranges (generally less than six feet). High-frequency RFID systems (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) offer longer transmission ranges (more than 90 feet). In general, the higher the frequency is the more expensive the system.

An **antenna** is a specialized transducer that converts radio-frequency (RF) fields into alternating current (AC) or vice-versa. There are two basic types: the receiving antenna, which intercepts RF energy and delivers AC to electronic equipment, and the transmitting antenna, which is fed with AC from electronic equipment and generates an RF field..

A **transceiver** is a combination transmitter/receiver in a single package. The term applies to wireless communications devices such as cellular telephones, cordless telephone sets, handheld two-way radios, and mobile two-way radios. Occasionally the term is used in reference to transmitter/receiver devices in cable or optical fiber systems. Some transceivers are designed to allow reception of signals during transmission periods. This mode is known as full duplex, and requires that the transmitter and receiver operate on substantially different frequencies so the transmitted signal does not interfere with reception.

A **transponder** is a wireless communications, monitoring, or control device that picks up and automatically responds to an incoming signal. The term is a contraction of the words transmitter and responder. Transponders can be either passive or active. A passive transponder allows a computer or robot to identify an object. Magnetic labels, such as those on credit cards and store items, are common examples. Active transponders are employed in location, identification, and navigation systems for commercial and private aircraft. An example is an RFID (radio-frequency identification) device that transmits a coded signal when it receives a request from a monitoring or control point [4].

### 2.2.1 Types of RFID

RFID can be dividing into three types. There are be either active, semi-passive (semi-active) or passive.

**Passive** RFID tags have no internal power supply. The minute electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the CMOS integrated circuit (IC) in the tag to power up and transmit a response. Most passive tags signal by backscattering the carrier signal from the reader. This means that the aerial (antenna) has to be designed to both collect powers from the incoming signal and also to transmit the outbound backscatter signal. The response of a passive RFID tag is not just an ID number (GUID): tag chip can contain nonvolatile EEPROM (Electrically Erasable Programmable Read-Only Memory) for storing data. Lack of an onboard power supply means that the device can be quite small: commercially available products exist that can be embedded under the skin. As of 2005, the smallest such devices commercially available measured 0.4 mm × 0.4 mm, and are thinner than a sheet of paper; such devices are practically invisible. Passive tags have practical read distances ranging from about 2 mm (ISO 14443) up to about few meters (ISO 18000-6) depending on the chosen radio frequency. Due to their simplicity in design they are also suitable for manufacture with a printing process for the antennae. Development targets are polycarbon semiconductor tags to become entirely printed. Passive RFID tags do not require batteries, and can be much smaller and have an unlimited life span.

**Semi-passive** RFID tags are very similar to passive tags except for the addition of a small battery. This battery allows the tag IC to be constantly powered. This removes the need for the aerial to be designed to collect power from the incoming signal. Aerials can therefore be optimised for the backscattering signal. Semi-passive RFID tags are faster in response and therefore stronger in reading ratio compared to passive tags.

**Active** RFID tags or beacons, on the other hand, have their own internal power source which is used to power any ICs and generate the outgoing signal. They may have longer range and larger memories than passive tags, as well as the ability to store additional information sent by the transceiver. To economize power consumption, many beacon concepts operate at fixed intervals. At present, the smallest active tags are about the size of a coin. Many active tags have practical ranges of tens of meters, and a battery life of up to 10 years [5].

### 2.2.2 Advantages of RFID

Radio frequency identifier (RFID$) can track inventory in a warehouse or maintaining a fleet of vehicles, there is a clear need for a fully automated data capture and analysis system that will help you keep track of your valuable assets and equipment. Active Wave RFID technologies provide unique solutions to difficult logistical tracking of inventory or equipment which is particularly in applications where optically based systems fail and when read/write capabilities are required. The technology is stable, and evolving, with open architectures becoming increasingly available [6].

### 2.2.3 RFID Benefits Vs Barcode

The optical nature of barcode requires labels to be "seen" by lasers. That line-of-sight between label and reader is often difficult, impractical, or even impossible to achieve in industrial environments. In order to function properly, a barcode reader must have clean, clear optics, the label must be clean and free of abrasion, and the reader and label must be properly oriented with respect to each other. RFID technology enables tag reading from a greater distance, even in harsh environment. In addition, the information imprinted on a barcode is fixed and cannot be changed. Active Wave RFID tags, on the other hand, have electronic memory similar to what

is in your computer or digital camera to store information about the inventory or equipment. This information can be dynamically updated [7].

There are the advantages of RFID Vs Barcode:

- No line of sight requirement.
- The tag can stand a harsh environment.
- Long read range.
- Portable database
- Multiple tag read/write.
- Tracking people, items, and equipment in real-time.

### 2.2.4 Disadvantages of RFID

Dead areas and orientation problems - RFID works similar to the way a cell phone or wireless network does. Just like these technologies, there may be certain areas that have weaker signals or interference. In addition, poor read rates are sometimes a problem when the tag is rotated into an orientation that does not align well with the reader. These issues can usually be minimized by properly implementing multiple readers and using tags with multiple axis antennas.

Security concerns - Because RFID is not a line of sight technology like bar-coding, new security problems could develop. For example, a competitor could set up a high gain directional antenna to scan tags in trucks going to a warehouse. From the data received, this competitor could determine flow rates of various products. Additionally, when RFID is used for high security operations such as payment methods, fraud is always a possibility.

Ghost tags - In rare cases, if multiple tags are read at the same time the reader will sometimes read a tag that does not exist. Therefore, some type of read verification, such as a CRC, should be implemented in either the tag, the reader or the data read from the tag.

Proximity issues - Tags cannot be read well when placed on metal or liquid objects or when these objects are between the reader and the tag. Nearly any object that is between the reader and the tag reduces the distance the tag can be read from.

High cost - Because this technology is new, the components and tags are expensive compared to barcodes. In addition, software and support personnel that are needed to install and operate the RFID reading systems (in a warehouse for example) may be more costly to employ.

Unread tags - When reading multiple tags at the same time, it is possible that some tags will not be read and there is no sure method of determining this when the objects are not in sight. This problem does not occur with barcodes, because when the barcode is scanned, it is instantly verified when read by a beep from the scanner and the data can then be entered manually if it does not scan.

Vulnerable to damage - Water, static discharge or high power magnetic surges (such as from a close lightning strike) may damage the tags [8].

## 2.3 RFID vs. Lost Children

Parents taking their children to Legoland theme parks need not worry about losing their children. Children entering the parks will be fitted with an RFID bracelet that can be tracked anywhere within its boundaries which is means that should they run off and find themselves lost, the parks' staff will easily be able to track them down and alert parents via SMS. The scheme launched in Denmark last month and if successful it's likely to be seen in other amusement parks in the group such as Legoland Windsor in the UK. The 'Kidspotter' scheme represents the latest