



Faculty of Computer Science and Information Technology

**SMART TREE TAG IN NATIONAL PARK USING MOBILE
APPLICATION**

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(Network Computing)
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ABSTRACT

To implement current technology to local national park, this project is focusing on developing a prototype mobile application that able to read the information of the plants in national park. It is possible by using QR code which will be apply on plants that are available in the park.

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Chapter 1

Introduction

1.1 Introduction

Malaysia is one of the ultimate travel destinations for tourist in Southeast Asia. It is home to a diversity of natural landscape that contains a variety of species of plants and animals. This wildlife environment is managed by National Park to prevent it from any development and set aside for human recreation and environmental protection. But, managing this type of environment has become an extremely hard task. There are many wildlife's that may be hidden in the forest.

There are a few systems that have been proposed to ease the management in National Park. Those system mainly focus on tracking and collecting information of plants and tree by the staff. By having this data, they can label each of the plants and trees so that visitors can read the information. Despite that, there are a few limitations regarding the content of the information that are in the label.

1.2 Problem Statement

- There is no technological interaction during visits in National Park.
- Lack of effective platform and activities to promote National Park in Sarawak

1.3 Aims and Objective

The main aim of this project is to make an interactive information interface in National Park. The following objectives are outlined to achieve the project aim:

- To identify the hardware and software requirements to develop the prototype of the mobile application system.

- To design and develop the mobile application system.
- To evaluate the functionalities of the mobile application system.

1.4 Main contributions

At the end of this project, a prototype of mobile application that able to scan and view the information regarding plants and trees in national park will be developed and tested with real life situation.

1.5 Significance of project

This project demonstrates the use of QR code for the interactive information system. By using QR code which can store information about the trees and plants, visitor will be able to access that information by mobile application using QR scanner technology. It will create a better information interaction for the visitors that are interested on the plants and trees. Soon, this type of system will be able to do more function that will attract more visitors.

1.6 Scope

The proposed system is used by tourist to scan and view the information of trees that implanted with QR code when they are visiting the national park. The National Park staff also can identify new plants and add the information in the system.

1.7 Dissertation Outline

This dissertation consists of five chapters:

Chapter one is an introduction of the project which includes overview, problem statement, research aims and objectives, main contributions, motivation and significance, and dissertation outline.

Chapter two is a literature review where research of the existing system is done and explained in this chapter. Several existing mobile applications are used to compared based on their functionality.

Chapter three is describe about methodology to be use in this project. All the description of design and development details will be inserted into this chapter.

Chapter four is about outcome of the project. This chapter can only be done after development of mobile application is completed. Testing phase details will be explained in this chapter including result and comment.

Chapter five is conclusion. This chapter will conclude on the project findings and brief on future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

After the first chapter has been done, the next chapter is about literature review. This review is one of the most important part in the project where the research is done according to the selected area of study. It includes reviews of existing systems, comparison between existing and proposed systems, details of proposed system with justifications, and evaluation report.

2.2 Background Study

The Quick Response Code (QR Code) is a two-dimensional code developed by Denso Wave in 1994 with the primary aim of being a symbol that is easily interpreted by scanner equipment. The main mission of this code is to store information that is based on numeric, alphanumeric or Kanji symbols. There are a lot of conventional system form various industry that applied QR code technology. In smart tree tag mobile application, there are several existing systems that uses different approaches to accommodate this type of features.

2.3 Review Existing System

2.3.1 Timber Tracking and Forest Management Using Radio Frequency Identification

This radio frequency identification (RFID) system is being used by the Forestry Department of Peninsular Malaysia (FDPM). The system is configured to support activities such as inventory and management of forest resources, as well as research program like growth plots and statistically national inventory. To gather the information, RFID tags has been stapled or nailed to a tree or log. Four RFID-enabled Teklogix Workabout handheld computers, running Helveta's CI Mobile data-capture software, were used in the field to read a unique ID reference number encoded to each tag. From there, RFID-enabled Workabout devices were

utilized to confirm the ID number at the various checkpoints along the supply chain as trees were chopped, and as logs were processed. Figure 2.1 below show an employee reads the RFID tags of a chopped tree.



Figure 2.1 A forestry department employee reads the RFID tags of a felled tree.

(Friedlos, 2009)

The requirement of the system is suitable to improve transparency and traceability in the timber supply chain. According to Friedlos (2009), the system can support activities such as inventory and management of forest resources, as well as research program like growth plots and statistical national inventory. Nevertheless, the project is based on a large-scale deployment which takes a longer period and costly to implement.

2.3.2 RFID-based Tracking System Preventing Trees Extinction and Deforestation

The trees RFID tracking system (TRTS) consists of high-performance passive RFID tags fitted into trees and read by handheld reader devices that function as accurate data retrieval and reliable tracking. Data retrieved is communicated through 3G connectivity and then saved

in a database at the back-station office side. Such action of saving and keeping track of data would enable employees at the office side to access data and optimize its organization through a user interface. The main goal of the system is to enhance forest management efficiency and decrease trees illegal logging cases. The figure 2.2 below show the architecture of TRTS.

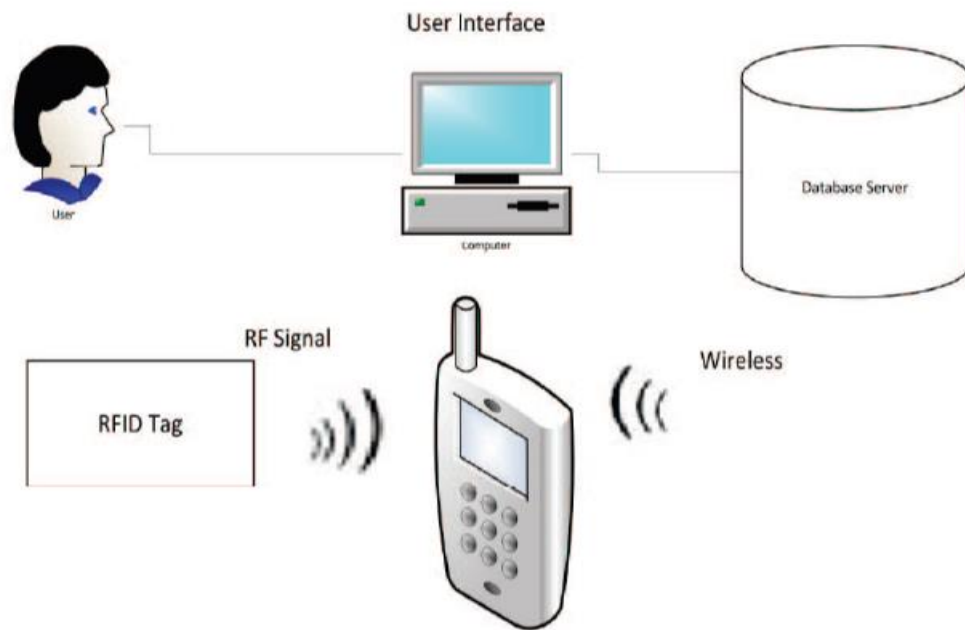


Figure 2.2 Architecture of TRTS. (Aboussaid, Benbihi, & Alj, 2013)

When considering the implementation of such system, it is important to keep in mind the constraints that related to the environment of application and its purpose. Since a wide variety of tags and readers exist, the choice is mainly based on frequency ranges and covered readable area for which cost structures vary significantly.

2.3.3 Use of NFC and QR code Identification in an Electronic Ticket System for Public Transport

To maximize the function of mobile phones, this system enable users to acquire electronic public transport ticket using their phone. There is no need of having smart cards, which benefits the passenger and no need for transport companies to install smartcard readers, or to support personnel with mobile ticketing system. Many new technologies offer a very appropriate and cheap functionality for the identification of stations and defining electronic ticket in a form of QR code. All operation that include checkpoint identification and tickets verification can be done using the system. The use of camera on any mobile/smart phone to read QR codes or NFC facilities to read RFID tags is very suitable for transferring small amount of data from the environment or so-called physical world to electronic devices. Developed applications allow simple and fast registration of passengers with the central ticketing system of a company which can be done by using mobile or wireless connections. Figure 2.3 below show the typical flow of the system.

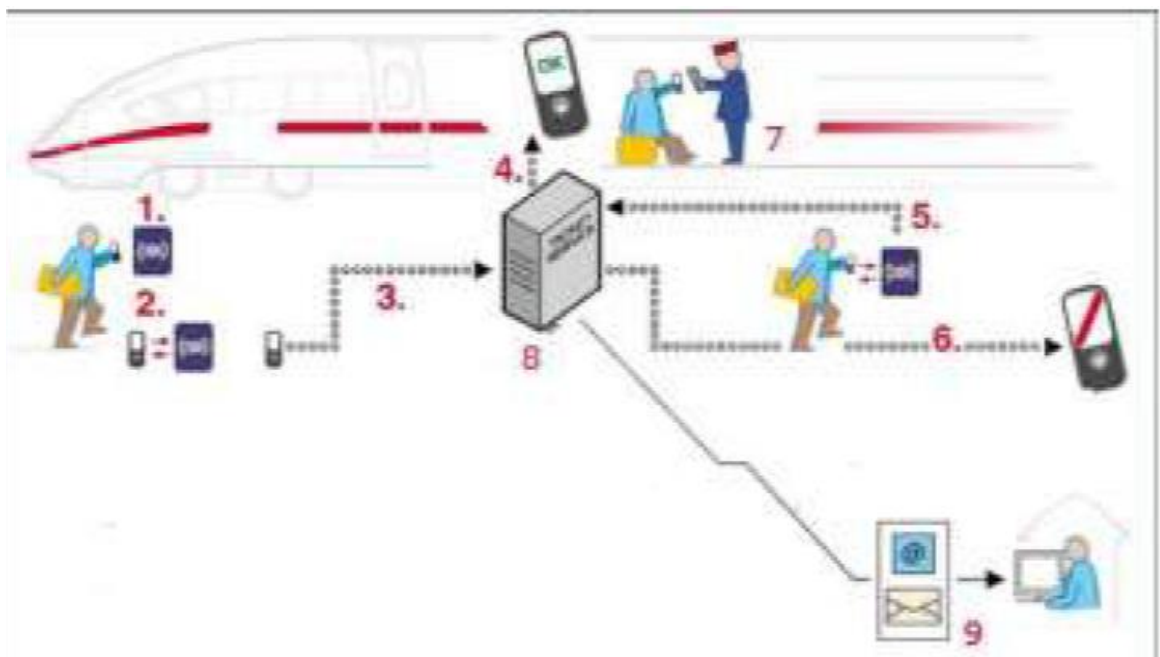


Figure 2.3 The Typical Flow of The System. (Finžgar, & Trebar, 2011)

This system offer many possible solutions of future electronic systems, although there would be some additional problems to solve. The main concern explored is about having a very large database that able to support server operations which handle simultaneous requests for check-in/check-out, how to deal with data security and integrity checks, etc.

2.3.4 QR Codes Applied to Architecture Data and Teaching

The system allow increased access to all type of information and digital contents. It is especially useful for information based on the user's language and for the users with audio or visual impairments. The increased accessibility of the system will lead to a more satisfying user experience. Figure 2.3 show the work cycle using QR codes.

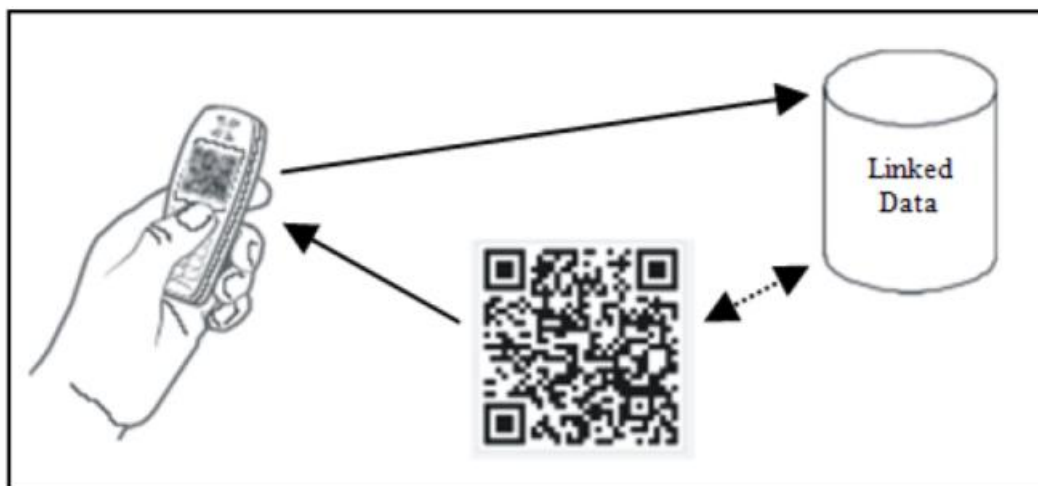


Figure 2.4 The Work Cycle Using QR Codes. (Fonseca, & Puig, 2011)

A weakness of the proposal is the introduction of dynamic screens to display the QR codes because it would raise the budget for implementation of the system. This weakness can be overcome by choosing the mode of static codes and SMS communication between the service and the end-user.

2.3.5 Application of Quick Response (QR) Codes in Mobile Tagging System for Retrieving Information about Genetically Modified Food

With the wide availability of camera phone and increasing awareness of toward genetically modified food (GMF) products, the system has the potential to change the existing way of retrieving shopping information and advertising. Nonetheless, the major challenge of implementing this system is the need of collaboration across various parties in the supply chain and government agencies as well. Thus, it is important to ensure the system will grow to incorporate more sophisticate functions and introducing attractive revenue stream to the participants of the system. In terms of academic and research, this application of mobile tagging technology in the genetically modified food, which is an emerging trend, especially in developing country. It a foundation for future development to improve more comprehensive application and solution in application area of genetically modified food tagging, which is much neglected in the computer science study. Figure 2.5 below show the comparison between 2D barcode and other automatic identification technologies.

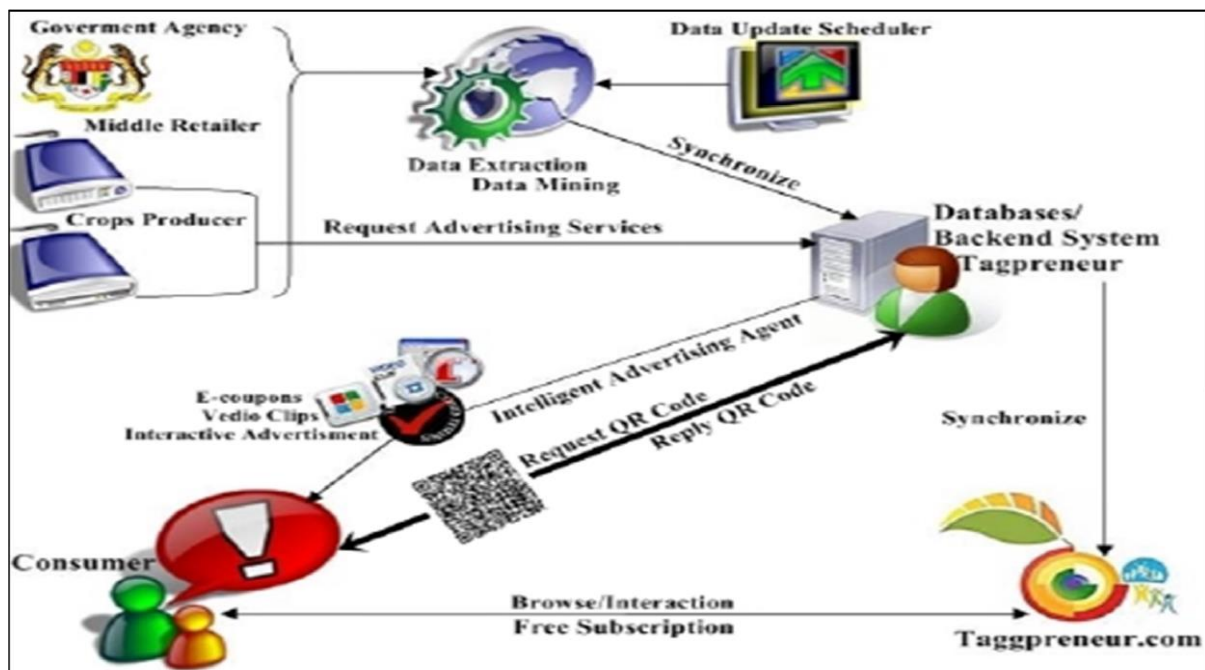


Figure 2.5 Comparison Between 2D Barcode and Other Automatic Identification Technologies

(Shiang-Yen, Foo, & Idrus, 2013)

2.4 Comparison between Existing System

Table 2.1 Comparison between existing system

System		Timber Tracking and Forest Management Using Radio Frequency Identification	RFID-based Tracking System Preventing Trees Extinction and Deforestation	Use of NFC and QR code Identification in an Electronic Ticket System for Public Transport	QR Codes Applied to Architecture Data and Teaching	Application of Quick Response (QR) Codes in Mobile Tagging System for Retrieving Information about Genetically Modified Food
Functionality	Public	-	-	✓	✓	✓
	Private	✓	✓	✓	✓	✓
Type of application	Mobile-based	✓	✓	✓	✓	✓
	Web-based	-	-	✓	-	-
Smart tag	RFID	✓	✓	-	-	-
	QR code	-	-	✓	✓	✓
Extra functionality	Touchscreen	-	-	✓	✓	✓
	Tracking system	✓	✓	✓	-	-
	Inventory and forest resource management	✓	-	-	-	-

	Interactive display	-	-	✓	✓	✓
Cost		High	High	Moderate	Moderate	Moderate

Based on table 2.1 above, there are some common functionalities of reviewed systems although the main objective is different. For the system that use RFID tag, the systems is mainly for private usage whereas systems that use QR code can be access for the public. These features are based on the environment of the technology used. Besides that, it focus more mobile-based application which make it easier move from one place to another.

The main concerns of the systems are cost which must be affordable and available to the public. Among the five reviewed system, two systems' cost is highly expensive due to the structure and scale of the system. The others are moderate due to the QR code technology which can be generated freely on the internet.

Implementation of smart tag in the reviewed system is varied based on their functionality. For tracking purpose, it is better to use RFID tag rather than QR code due to the range availability and sturdiness of the tag. The accuracy of data is better retrieved using RFID tag for critical purpose system. Nonetheless, the structure of this system more complicated and time consuming to deploy.

Based on the comparison table above, some of the extra functionalities are implemented in certain reviewed systems. For instance, the timber tracking and forest management RFID system has inventory and forest resource management to manage the information of the trees more efficiently.

2.5 Proposed System

The proposed system for this final year project is to create smart tree tag in national park using mobile application system. The function of this system is to create an interactive information interface that can be viewed by scanning the QR code on the mobile application. This proposed system is designed to fulfil the important fundamental functions based on functionalities available in existing reviewed system. The summaries of comparison between existing system and proposed system is shown in the Table 2.2 below.

Table 2.2: Comparison between the proposed system and existing systems

System		Timber Tracking and Forest Management Using Radio Frequency Identification	RFID-based Tracking System Preventing Trees Extinction and Deforestation	Use of NFC and QR code Identification in an Electronic Ticket System for Public Transport	QR Codes Applied to Architecture Data and Teaching	Application of Quick Response (QR) Codes in Mobile Tagging System for Retrieving Information about Genetically Modified Food	Proposed system
Functionality	Targeted user						
	Public	-	-	✓	✓	✓	✓
	Private	✓	✓	✓	✓	✓	-
Type of application	Mobile-based	✓	✓	✓	✓	✓	✓
	Web-based	-	-	✓	-	-	-
Smart tag	RFID	✓	✓	-	-	-	-
	QR code	-	-	✓	✓	✓	✓
	Touchscreen	-	-	✓	✓	✓	✓