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Integrated Apartment Management System

Feng-Ming Hu

INTEGRATED APARTMENT MANAGEMENT SYSTEM

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Computer Science

by

Feng-Ming Hu

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Approved by:

[redacted] 6/6/06

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Dr. David Turner

[redacted]

Dr. Ernesto Gomez

ABSTRACT

Integrated Apartment Management System (IAMS) is a web-based system that users can deal with all the complicated matters involved in apartment management and communication between tenants and repairmen. Traditionally, tenants have to contact managers of apartments first to ask for service for broken items. It usually takes a long time to negotiate among tenants, mangers and repairmen. Instead of wasting time in such a procedure, IAMS provides an efficient way so that tenants can make appointments with repairmen on-line and notify both managers and repairmen of the appointments through an email directly from IAMS. Tenants can also check their history of appointments, payments, and contracts online such as upcoming appointments. Repairmen can also check their own history of appointments, contracts, and upcoming appointments. If tenants or repairmen forget the details of the appointment, they can log in to this on-line system at any time to retrieve the necessary information. Additionally, the system emails the tenants, repairmen and managers information about appointments, including the date and time of the appointment, name of the tenant, name of the repairman, etc.

In addition to dealing with affairs between tenants and repairmen, the system provides powerful functions that not only give managers a clear picture about the status of the apartments, tenants, repairmen, appointments, payments, etc., but also gives them helpful information, including financial balance in a period of time, the number of times that items were broken and individual and overall ranking of repairmen. This complicated information is represented both by easy charts and detailed tables, by which a manager can evaluate every repairman and item precisely and easily. All this valuable information is stored in a highly reliable database system. The key feature is that managers who are not familiar with the database systems can backup and restore the database easily with by just one click, by using our easy database maintenance function.

This project is based on a web-based architecture, which provides a single point of entry to the Web system and can easily be accessed everywhere. This system is implemented by JSP and HTML. MySQL is used as the main database server and the web server is Tomcat.

ACKNOWLEDGMENTS

First of all, I deeply appreciate my graduate advisor, Dr. Keith Schubert, for his valuable advice and contributions to my project, especially since I started my project from scratch. Since I worked on my project, he inspired me a lot about the idea and details of the topic, Integrated Apartment Management System such as what should I notice and which functions would be useful. In addition, I broadened my vision to involve real cases and some abstract concepts. Therefore, I know how to apply methods and skills in many ways, not just in this project. I also would like to thank my two project committee professors, Dr. Turner and Dr. Gomez, for their supportive help and important advice during my job.

I would like to thank my parents, sincerely from my deep heart, who support me in all aspects. Whatever tough situation I met, they supported me without asking for anything and always encouraged me to overcome every obstacle and accomplish my dream.

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CHAPTER ONE

INTRODUCTION

For an apartment manager, it is most important to save time in dealing with all the complicated matters involved in apartment management and communication between tenants and repairman. However, most of apartment management software only focuses on the payment and accounting system, which means the manager still has to use lots of energy in communication between tenants and repairman, such as helping a tenant make an appointment with a repairman manually and then calling back to the tenant. From the perspective of the manager and tenant, both of them would expect to deal with everything immediately and correctly by a reliable, easy-to-use, internet web-based apartment system. To managers of apartments, this system not only provides basic information of profits, costs and balance, but it also provides advanced analysis of the number of times that items break and their problems, and the overall rating of repairmen, by which managers can have a clear idea of what earns money and what costs.

1.1 Purpose

Computer systems and the internet have become easy and useful tools in management. As more and more complicated procedures and communication involved in apartment management develops, every apartment manager wants an easy and user-friendly solution based on the internet. The need for a complete apartment management packages led to the design of the internet based management system, providing a comprehensive tool to apartment managers. Therefore, I would like to develop an apartment management system, which includes several important functions and can easily be used.

Compared to the stand alone application software, this system is web-based and so can be accessed through whole internet. It is indubitable that security is an important issue in this project. Without solid secure protection, someone could access the database and retrieve confidential and sensitive information such as personal profiles. In this point, the system uses two ways to protect data from risk, a firewall system and the technology of secure Sockets Layer (SSL).

According to the goals of the project, the web-based apartment management system will allow tenants and repairmen access their own information about appointments, contracts and the history of payments any time and any where, just by few clicks. Even to make, modify, cancel appointments, tenant can also finish it by just few clicks without long term of negotiation. To managers, they can save precious time on communication between tenants and repairman. Furthermore, by knowing what kinds of problems frequently happened during particular time periods, they can hire repairmen flexibly, depending on which season or period of time. Managers also can evaluate every repairman by information of overall ranking of repairmen and their history of appointments. All data is stored in MySQL database.

1.2 Project Products

This project includes the following products:

- Implementation: a web-based application system implemented by programming language JSP (Java Server Page), HTML, Tomcat web server, and MySQL database.
- System documentation: This documentation describes the design, architecture, specifications, implementation, and testing reports of IAMS.

1.3 Assumptions

The assumptions regarding the project were described by the following:

- Each tenant can rent one apartment at most.
- Each tenant can make an appointment with one repairman for one problem each time.
- Each tenant may have more than one payment records.
- Each item belongs to exact one space.
- The end date of a contract is calculated by its start date and period.

1.4 Limitations

During the time of developing this project, a number of limitations were noted. These limitations are presented by the following:

- Each apartment can only be rented by at most one tenant at the same time.
- Each appointment must include exact one space, one item and one problem.
- Payment records can only be queried and deleted after created.
- Appointments can only be modified by the tenant.

- Expenses can only be modified by managers.
- A member's password can only be modified by himself/herself.
- Every user's login name should be unique.

CHAPTER TWO

SYSTEM ARCHITECTURE

The purpose of the project is to achieve reliability and intuitiveness. IAMS is a web application based on a web server, a database server, and the internet. Apartment managers, tenants, and repairmen access their information of appointments, contracts, and payments through the web application via HTTPS. This web application can manage all the information by accessing MySQL database. Another function of the web application is to send a notification email through SMTP protocol. Due to security concern, all users can only access the web application under HTTPS protocol.

To ensure the web application is reliable and standardized, we use Tomcat web server, MySQL database server, and Google SMTP server. Microsoft Internet Explore is recommended to use as default browser. The system architecture of IAMS is shown in figure 1.

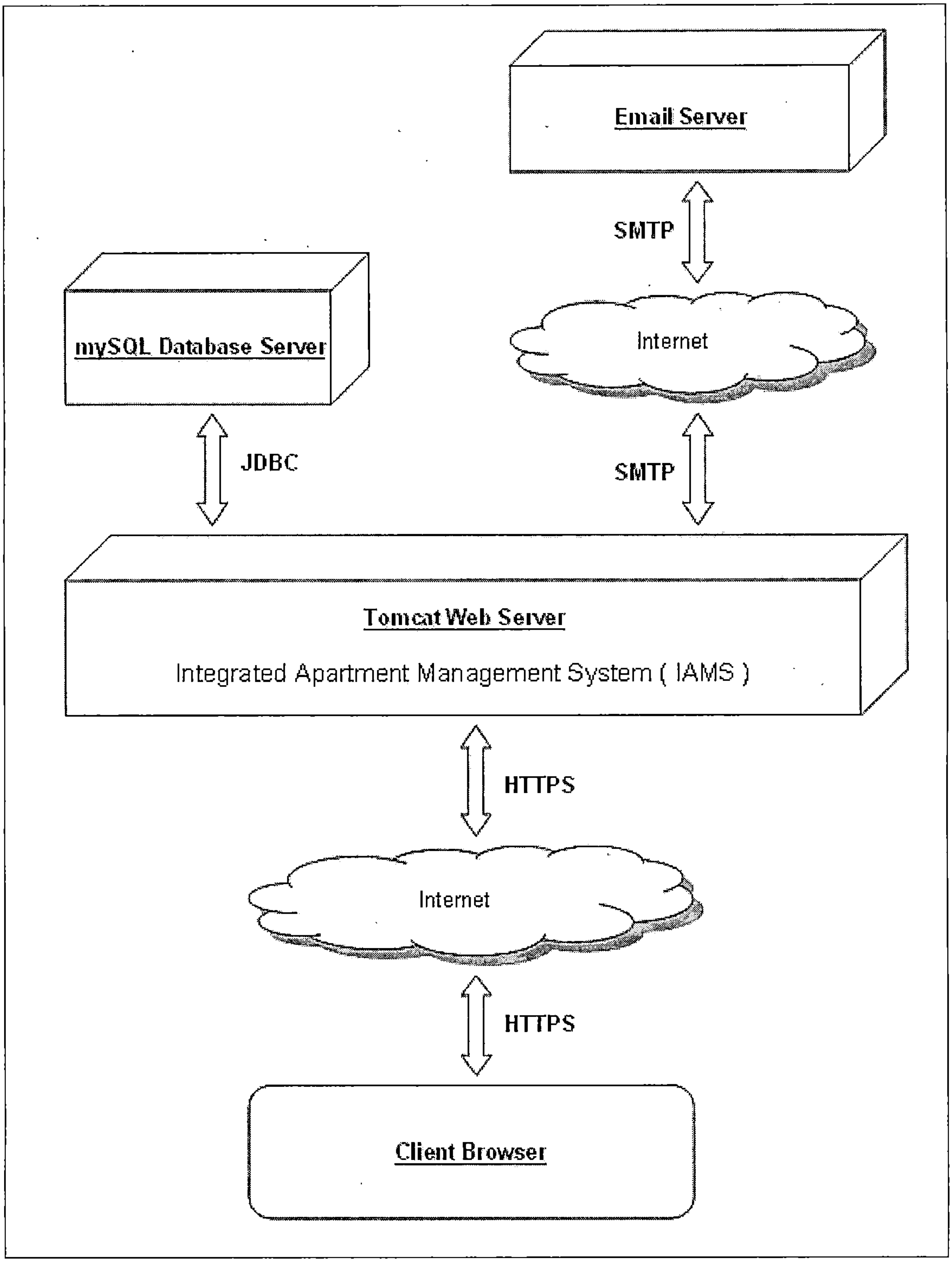


Figure 1. System Architecture Diagram

2.1 System Interfaces

Because of advantages of independent and modularized, IAMS adopts a three tiers distributed architecture, which makes web developers easy to debug, flexile to program, less coupling among objects, and easy to maintain. The first tier is implemented by HTML CSS, and JSP. The second tier is a web JSP/Servlet container that handles all requests from a client's browser and connects to the third tier where MySQL database and the SMTP server are located. Tomcat web server is adopted as the web server, which is used to perform web pages for end users.

2.2 Hardware Interfaces

IAMS trusts the underlying operation system (Microsoft Windows, Linux, UNIX, FreeBSD … etc) to control the hardware interfaces so that it does not implement any hardware interface or operation system. Because IAMS is a completely web-based software system, the system is independent from hardware system.

2.3 Software Interfaces

The reasons why I choose particular software interfaces used in this project are:

- Languages: JAVA/JSP/JavaScript/HTML/CSS.

- Platform (JAVA 2 Platform, Standard Edition): Java Platform, Standard Edition (J2SE) offers a complete environment for application development and deployment on desktops and servers. It is an embedded and runtime platform that provides plenty of powerful features for developing all kinds of Java applications.
- J2SE Runtime Environment (JRE 5.0 Update 6): The JRE allows end-users to run Java applications and it is included in J2SE Development Kit 5.0 Update 6(JDK 1.5.0.06), which is a development environment for building java applications, applets, and components using the Java programming language.
- Operation system (Microsoft Windows XP professional with Service Pack 2): Microsoft Windows is the most famous and widely used operation system in the world. It is important that apartment managers, who are not familiar with computer systems, can also use computers. The probability that apartment managers know how to use Microsoft Windows is higher than the probability that they know how to use other operation systems. Because IAMS is independent

from hardware system and operation system, the integrated apartment management system can be executed in any hardware system and operation system.

- Web Server/Container (Apache Tomcat 5.5.17 Web Server): Tomcat web server is a Java based Web application container involved in running servlets and Java Server Pages (JSP). After a servlet was loaded into Java Virtual Machine (JVM), JVM will generate an instance of the class that belongs to the servlet. After the servlet was initialized, JVM will transfer a request to this servlet. All Procedures how JSP works are quite similar as how servlet does. The different is JSP will be transformed into a servlet by JSP engine first.
- Database Server (MySQL Serve 5.0.18): MySQL is an open sourced and popular database in the world. Many famous websites and organizations use it as their database server such as NASA, YAHOO, Wikipedia ... etc. Therefore, it is confident to use such a reliable and famous database in the project.

- Java Database Connector (JDBC): MySQL provides connectivity for those applications developed in the Java programming language via a JDBC driver, which is called MySQL Connector/J. The one that we used in this project is MySQL Connector/J 3.1.12.
- Development Tool (JDK 1.5.0.06 and Macromedia Dreamweaver 8): There are two development tools used in this project, JDK 1.5.0.06 and Macromedia Dreamweaver 8. The former is mentioned in the second point of this section. The latter is also an industry-leading web development tool, enabling users to efficiently design and develop websites and applications.
- Chart package (JfreeChart 1.0.1): JfreeChart is a free Java class library for generating various charts.
- Email package (JavaMail 1.3.3): Javamail is a package of abstract APIs that model a mail system, which provides a platform and protocol independent framework to build Java technology based email client applications, including sending and receiving emails. It is necessary to

install JavaBeans Activation Framework (JAF) before using Javamail, because Javamail uses JAF to encapsulate messages of emails.

CHAPTER THREE

DATABASE DESIGN

This chapter introduces the fundamental part of the project. It is important that every function of IAMS is involved with database. Therefore, once the database has been installed, the rest of the project can be started. All responses to a client's requests are presented by web pages, which are collaboratively performed by HTML, CSS, JSP, and Java Scripts.

3.1 Database Analysis

There are various functions that we have to consider in issues of apartment management. In this project, there are three different members, apartment managers, tenants, and repairmen. Tenants can make an appointment and record payment report. Apartment managers can manage apartments, items, space, and problems. According to user demands mentioned above, all data are categorized and stored in ten tables: the apartment table, the appointment table, the manager table, the tenant table, the repairman table, the payment table, the space table, the item table, the problem table, and the vacation table. All data are stored in MySQL database and can be only accessed by JSP program. The table of apartment, appointment, tenant, and payment are interconnected by tenant number. The table of appointment, repairman, and vacation are interconnected by repairman number. The table of appointment, space, item, and problem are correlated by space name, item number, and problem name respectively. Manager table is independent because it is only used for querying a manager's username and password.

3.2 Entity - Relationship Model

All relations among entities of IAMS are showed in Figure 2. In order to have a clear picture of the ER diagram, the explanations of properties which might be ambiguous are described below.

For the entity apartment: A manager may have several apartments that is denoted as Aid and each Aid may also include several units of apartments, which is denoted as Anum. Therefore, both of Aid and Anum are the composite primary keys. Aname is the apartment's name of the apartment. Atype means the type of the unit of the apartment such as studio, one-bed room, two-bed room with one bath room... etc. Gnum represents the garage number of the unit of the apartment.

For the entity tenant: Tid is the login name of the tenant, which should be unique among all tenants' records.

Tssn means the last four digits of a tenant. Bday is the birthday of a tenant, which follows the format YYYY-MM-DD. Cphone and Hphone represent the number of the tenant's cell phone and home phone. The Tsdate is the start date of the tenant's contract and it is easy to know that Tlength is the length of the contract. Apartment managers do not have to input the end date of the contract, because this information will be automatically calculated by the system and be stored into the database.

For the entity repairman: Rid is the login name of the repairman, which should be unique among all repairmen's records. Rssn is the last four digits of a repairman. Bday is the birthday of a repairman, which follows the format YYYY-MM-DD. Cphone and Hphone represent the number of the repairman's cell phone and home phone. The property Rsdate is the start date of the repairman's contract and it is easy to know that Rlength is the length of the contract. Apartment managers do not have to input the end date of the contract, because this information will be automatically calculated by the system and be stored in the database.

For the entity manager: Id is the login name of the manager, which should be unique among all managers' records. Cphone and Hphone represent the number of the managers' cell phone and home phone.

For the entity appointment: Appnum is the appointment number automatically generated by the system. The property pcomment is used to describe the item that should be fixed. Rating means the rating of the repairman involved in the appointment. Tenant can evaluate the repairman by rating or writing a description about the repairman.

The relation between the entity of tenant and the entity of appointment: Adate is denoted as the date that a tenant would like to make an appointment with a repairman. Rdate represents then date that the tenant makes the appointment.

For the entity space: Sname means a space such as living room, bath room, kitchen ... etc.

For the entity item: Iname represents an item's name such as heater, wall, door bell ... etc.

For the entity problem: Pname is the name of a problem such as broken, leaking, stuck ... etc.

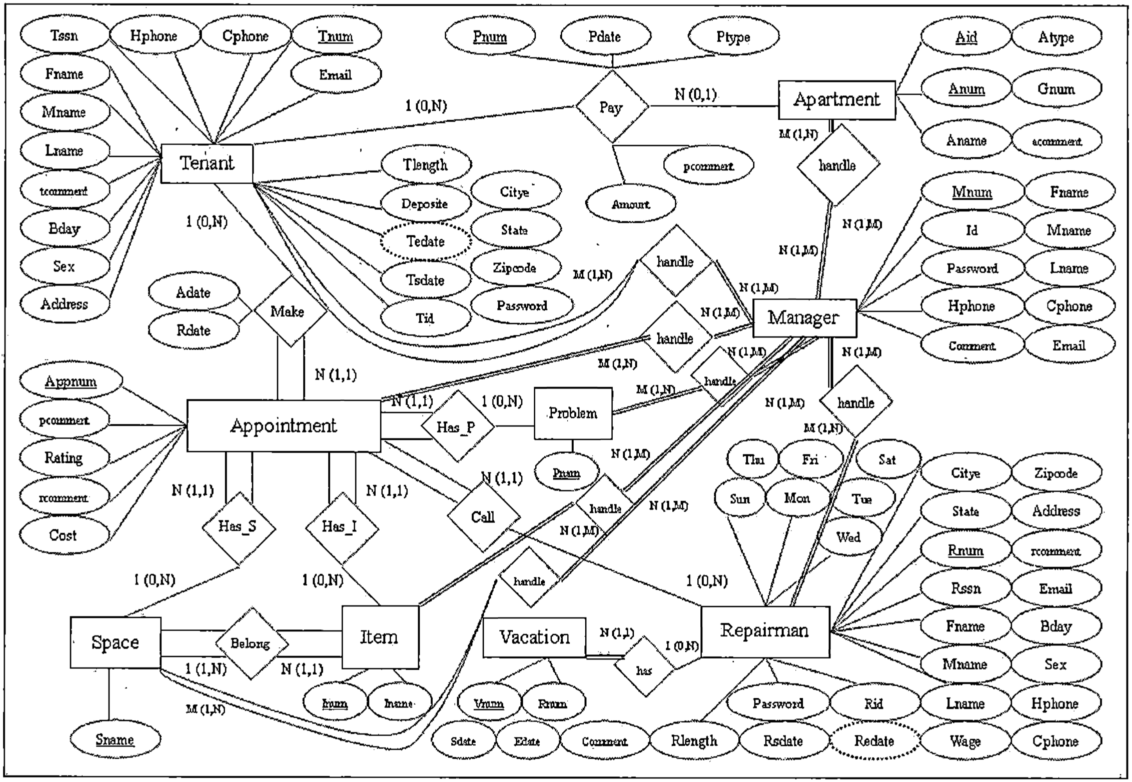


Figure 2. Entity - Relationship Diagram

3.3 Relational Schema

The ER diagram showed above will be mapped into the following relational schema. Relational tables practically implement logical schema. Relational tables of this project are showed by the following: (The underlined fields in each table indicate the primary keys of the table).

Apartment

Aid	Anum	Tnum	Anum	Atype	Gnum	Acomment

Tenant

Tnum	Tssn	Tid	Password	Fname	Mname	Lname
Bday	Sex	Address	City	State	Zipcode	Hphone
Cphone	Email	Tcomment	Tsdate	Tedate	Tlength	Deposit

Repairman

Rnum	Rssn	Rid	Password	Fname	Mname	Lname
Bday	Sex	Address	City	State	Zipcode	Hphone
Cphone	Email	Rcomment	Rsdate	Redate	Rlength	Wage
Sun	Mon	Tue	Wed	Thu	Fri	Sat

Manager

Mnum	Id	Password	Fname	Mname	Lname	Hphone	Cphon
Email	Tcomment						

Appointment

Appnum	Tnum	Rnum	Sname	Inum	Pname	Pcomment
Rdate	Adate	Rating	Rcomment	Cost		

Payment

Pnum	Tnum	Pdate	Ptype	Amount	Aid	Anum	Pcomment

Item

Inum	Sname	Iname

Space

Sname

Problem

Pname

Vacation

Vnum	Rnum	Sdate	Edate	Comment

Figure 3. Relational Schema

3.4 Data Type of Schema Tables

After introducing the conceptual level and the logical level, the detailed data in each table is given below. The structures of tables includes Column name, data type, null or non-null keys (Not Null), auto increment (Auto Inc), primary key (PRI), foreign key (FOR) Unique (UNI), and default value.

Table 1. The Structure of Apartment Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Aid	Varchar(10)	Yes		PRI	
Anum	Varchar(10)	Yes		PRI	
Tnum	Integer			FOR	Null
Aname	Varchar(45)				Null
Atype	Varchar(45)	Yes			
Gnum	Varchar(5)				Null
Acomment	Varchar(300)				Null

Table 2. The Structure of Tenant Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Tnum	Integer	Yes	Yes	PRI	
Tssn	Int(4)	Yes			
Tid	Varchar(20)	Yes		UNI	
Password	Varchar(20)	Yes			
Fname	Varchar(45)	Yes			
Mname	Varchar(45)				Null
Lname	Varchar(45)	Yes			
Bday	Date	Yes			
Sex	Varchar(6)	Yes			
Address	Varchar(80)	Yes			
City	Varchar(30)	Yes			
State	Char(2)	Yes			
Zipcode	Varchar(6)	Yes			
Hphone	Varchar(10)				Null
Cphone	Varchar(10)				Null
Email	Varchar(60)	Yes			
Tcomment	Varchar(300)				Null
Tsdate	Date	Yes			
Tedate	Date				
Tlength	Integer	Yes			0
Deposit	Integer	Yes			0

Table 3. The Structure of Repairman Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Rnum	Integer	Yes	Yes	PRI	
Rssn	Int(4)	Yes			
Rid	Varchar(20)	Yes		UNI	
Password	Varchar(20)	Yes			
Fname	Varchar(45)	Yes			
Mname	Varchar(45)				Null
Lname	Varchar(45)	Yes			
Bday	Date	Yes			
Sex	Varchar(6)	Yes			
Address	Varchar(80)	Yes			
City	Varchar(30)	Yes			
State	Char(2)	Yes			
Zipcode	Varchar(6)	Yes			
Hphone	Varchar(10)				Null
Cphone	Varchar(10)				Null
Email	Varchar(60)	Yes			
Tcomment	Varchar(300)				Null
Tsdate	Date	Yes			
Tedate	Date				
Tlength	Integer	Yes			0
Wage	Integer	Yes			0
Sun	Varchar(5)	Yes			0
Mon	Varchar(5)	Yes			0
Tue	Varchar(5)	Yes			0
Wed	Varchar(5)	Yes			0
Thu	Varchar(5)	Yes			0
Fri	Varchar(5)	Yes			0
Sat	Varchar(5)	Yes			0

Table 4. The Structure of Manager Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Mnum	Integer	Yes	Yes	PRI	
Id	Varchar(20)	Yes		UNI	
Password	Varchar(20)	Yes			
Fname	Varchar(45)	Yes			
Mname	Varchar(45)				Null
Lname	Varchar(45)	Yes			
Hphone	Varchar(10)				Null
Cphone	Varchar(10)				Null
Email	Varchar(60)	Yes			
Comment	Varchar(300)				Null

Table 5. The Structure of Appointment Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Appnum	Integer	Yes	Yes	PRI	
Tnum	Integer	Yes		FOR	
Rnum	Integer	Yes		FOR	
Sname	Varchar(45)	Yes		FOR	
Inum	Integer	Yes		FOR	
Pname	Varchar(45)	Yes		FOR	
Pcomment	Varchar(300)				Null
Rdate	Datetime	Yes			
Adate	Date	Yes			
Rating	Integer				Null
Rcomment	Varchar(300)				Null
Cost	Integer	Yes			0

Table 6. The Structure of Payment Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Pnum	Integer	Yes	Yes	PRI	
Tnum	Integer	Yes		FOR	
Pdate	Datetime	Yes			
Ptype	Varchar(45)	Yes			
Amount	Integer	Yes			
Aid	Varchar(10)	Yes			
Anum	Varchar(10)	Yes			
Pcomment	Varchar(300)				Null

Table 7. The Structure of Item Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Inum	Integer	Yes	Yes	PRI	
Sname	Varchar(45)	Yes		FOR	
Iname	Varchar(45)	Yes			

Table 8. The Structure of Space Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Sname	Varchar(45)	Yes		PRI	

Table 9. The Structure of Problem Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Pname	Varchar(45)	Yes		PRI	

Table 10. The Structure of Vacation Table

Column Name	Data Type	Not Null	Auto Inc	Key	Default
Vnum	Integer	Yes	Yes	PRI	
Rnum	Integer	Yes		FOR	
Sdate	Date	Yes			
Edate	Date	Yes			
Comment	Varchar(300)				Null

CHAPTER FOUR

PROJECT IMPLEMENTATION

According to different demands of the prospected members, IAMS performs various functions for three different types of users. Each user has his permission to access data in IAMS. In order to keep away from illegal and invalid users, each function will check the membership before it starts the service. User should log out the system before leaving to avoid stealing personal information by hackers.

4.1 System Components

There are various functions that we have to consider for the issue of apartment managements. This project focuses on nine systems, the tenant system, the payment system, the repairman system, the appointment system, the apartment system, the profile system, the database maintenance system, the repair system, the email system, and the information analysis system. All components of the project are presented by the following figure.

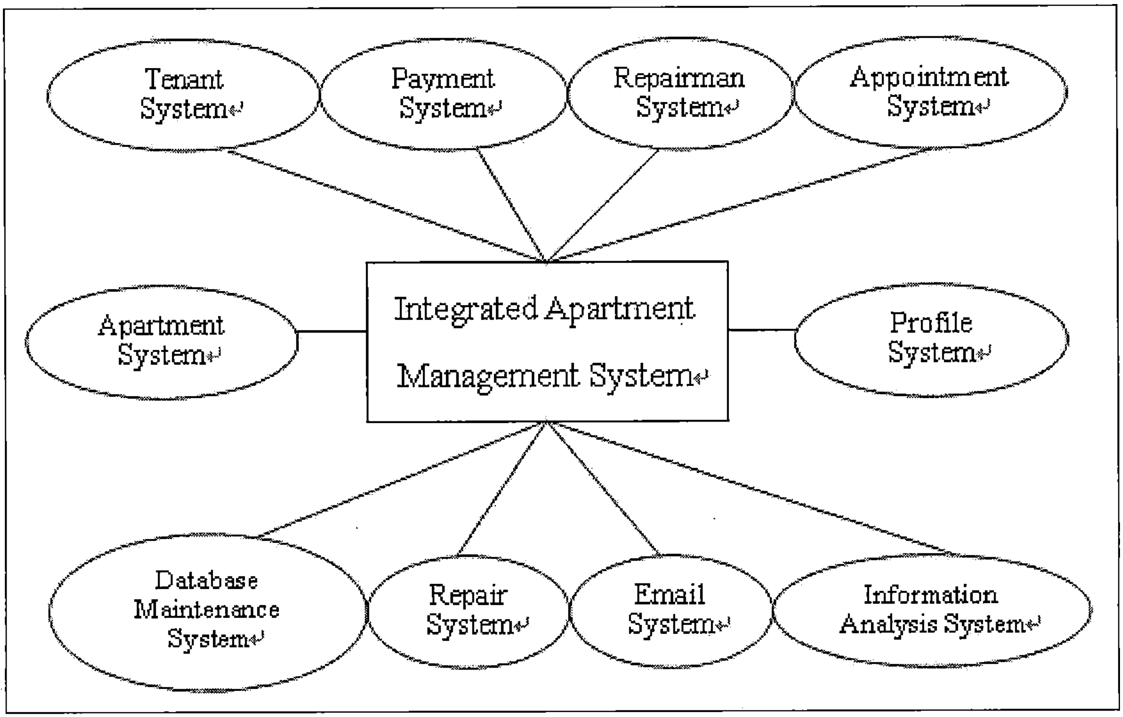


Figure 4. System Components Diagram

The following figure is the use case diagram of IAMS.

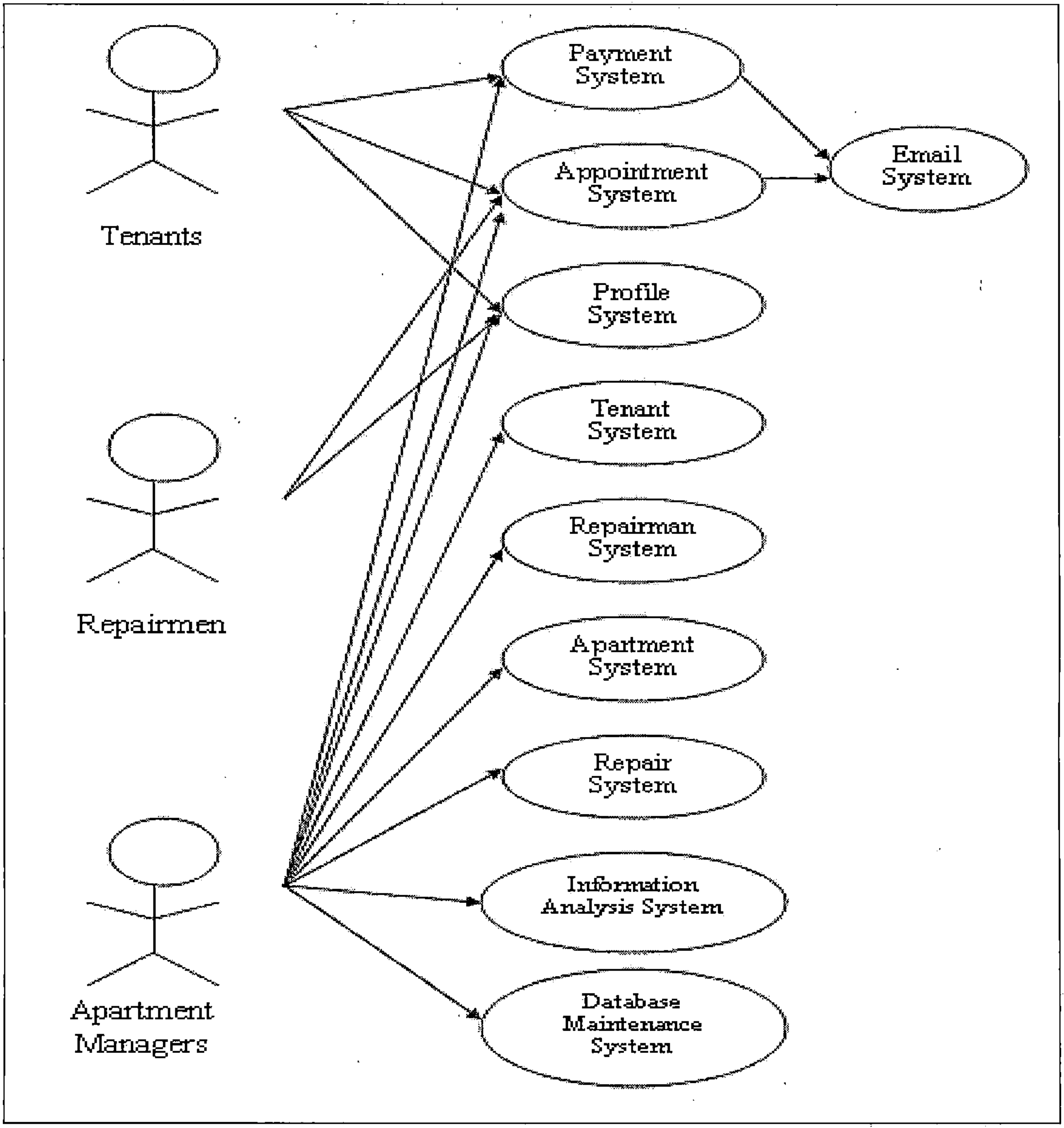


Figure 5. Use Case Diagram

4.2 User Interface Design

The project intends to provide a user-friendly interface so that even though those people who are not familiar with computer and network system can also use it easily. According to the demands for three different types of users, different interfaces will be performed on a browser. There are two types of user interfaces which will be discussed below.

Static user interfaces: The interfaces only show static data or images on a web site, regardless of verifying membership. In general, these websites only provide information in words or simple images for people.

Dynamic user interfaces: the interfaces will be generated dynamically by JSP. The interfaces will be displayed in a proper way depending on input requests and data

4.3 Graphic User Interface for Publics

4.3.1 Home Page

Figure 6 is the starting point for all people who are going to access this web application. Because of security reasons, the system only supports HTTPS connectivity and will redirect all connectivity from HTTP to HTTPS automatically. So, users will be asked for accepting a certificate issued by IAMS before entering the home page. Therefore, the user will see a pop-up dialogue that asks for accepting a certificate. At the beginning of running this page, the program will clear all variables to avoid affecting results. A user starts his work by provide username, password, and select the membership that he belongs to. After a user pushed the button "Login", the JSP program will check if the username exists in database. If the username is found in the database, the system will check if the provided password is correct or not. After providing correct username and password, the page will be redirected to the main page of the membership, which the user belongs to. Otherwise, the system will send user to the login failure page. When a situation that people forget their password happens, the user can apply a temporary password which is randomly and automatically generated by the system. Just clicks the link "(Forget your password?)" and provides the personal information for receiving a notification email, which includes a temporary password. This page will be mentioned again in the latter part.

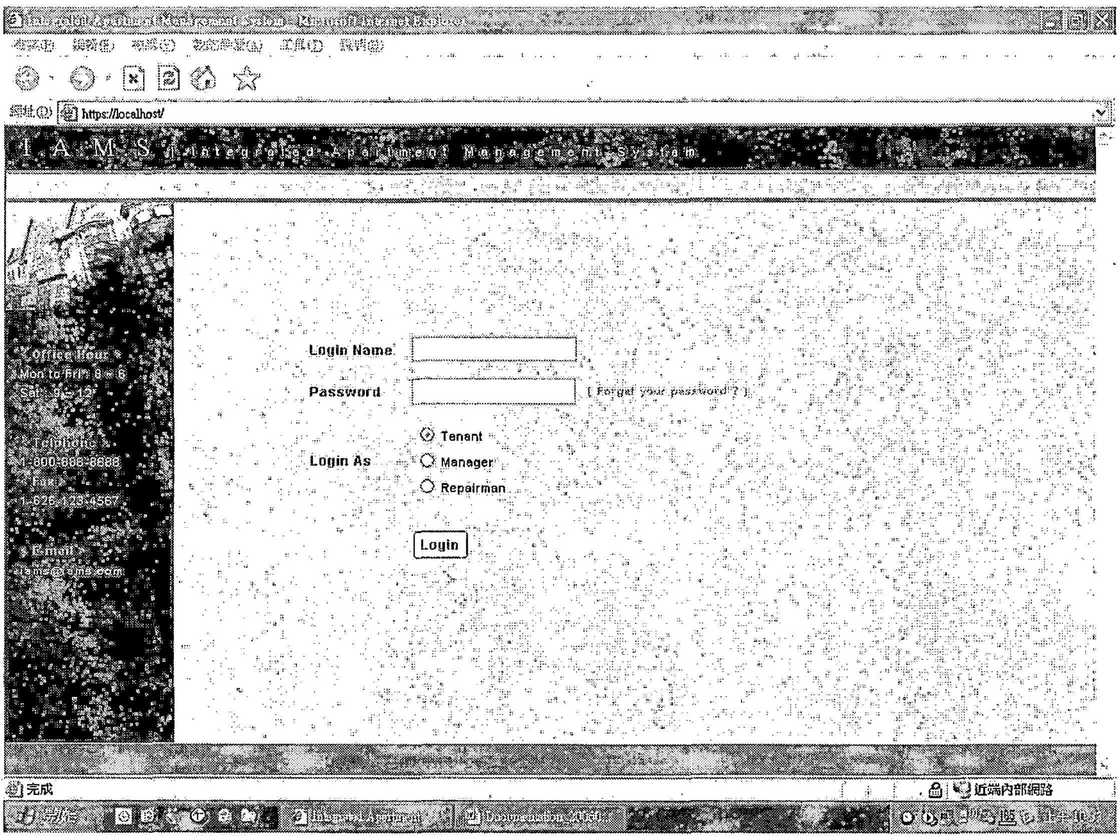
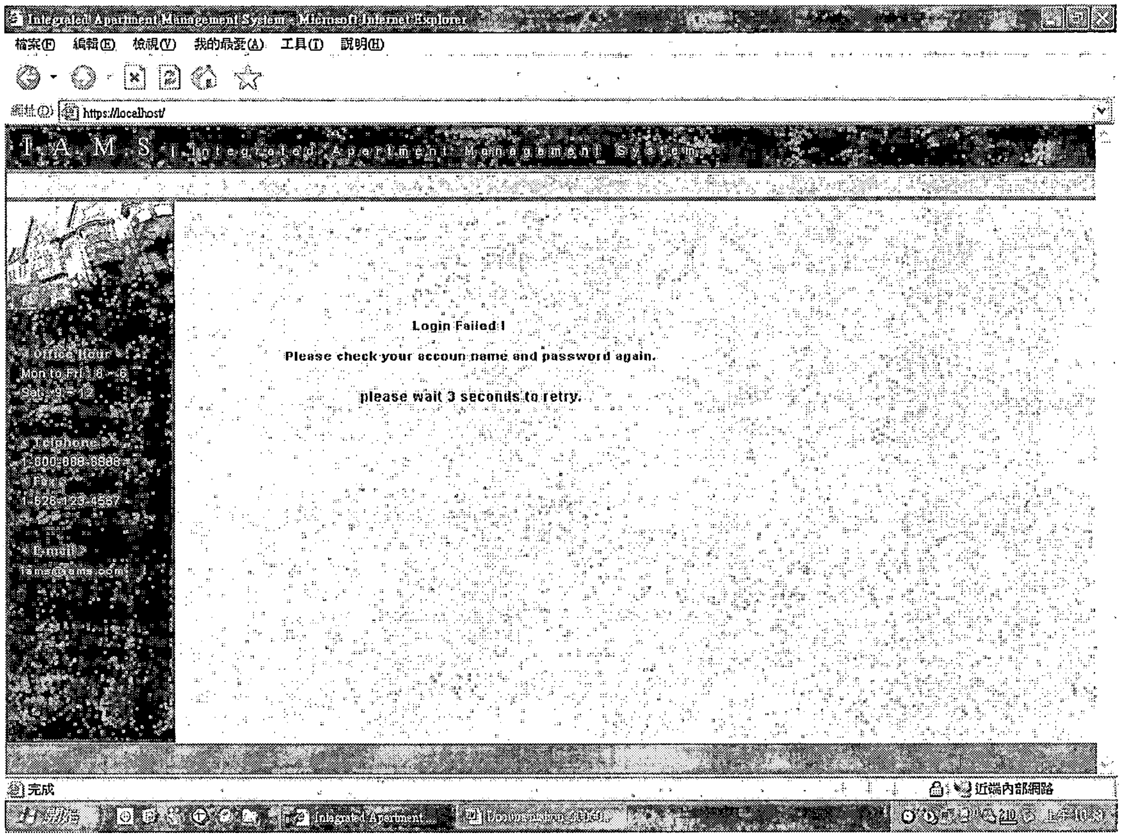


Figure 6. Home Page

This page will be showed if a user failure login IAMS (See Figure 7 below). There is a reason that will lead to such a result; login name, password, and membership not match correctly. If a user was sent to this page, he will be sent back to login page again after three seconds. The reason why we do so is to avoid hackers who try to attack the system by using massive passwords in a short time.


Integrated Apartment Management System - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/
I. A. M. S Integrated Apartment Management System
Office Hour
Mon to Fri 8 ~ 6
Sat 9 ~ 12
Telphone
1-800-888-8888
Fax
1-626-123-4567
E-mail
iams@iams.com
完成
近端內部網路

Login Failed !

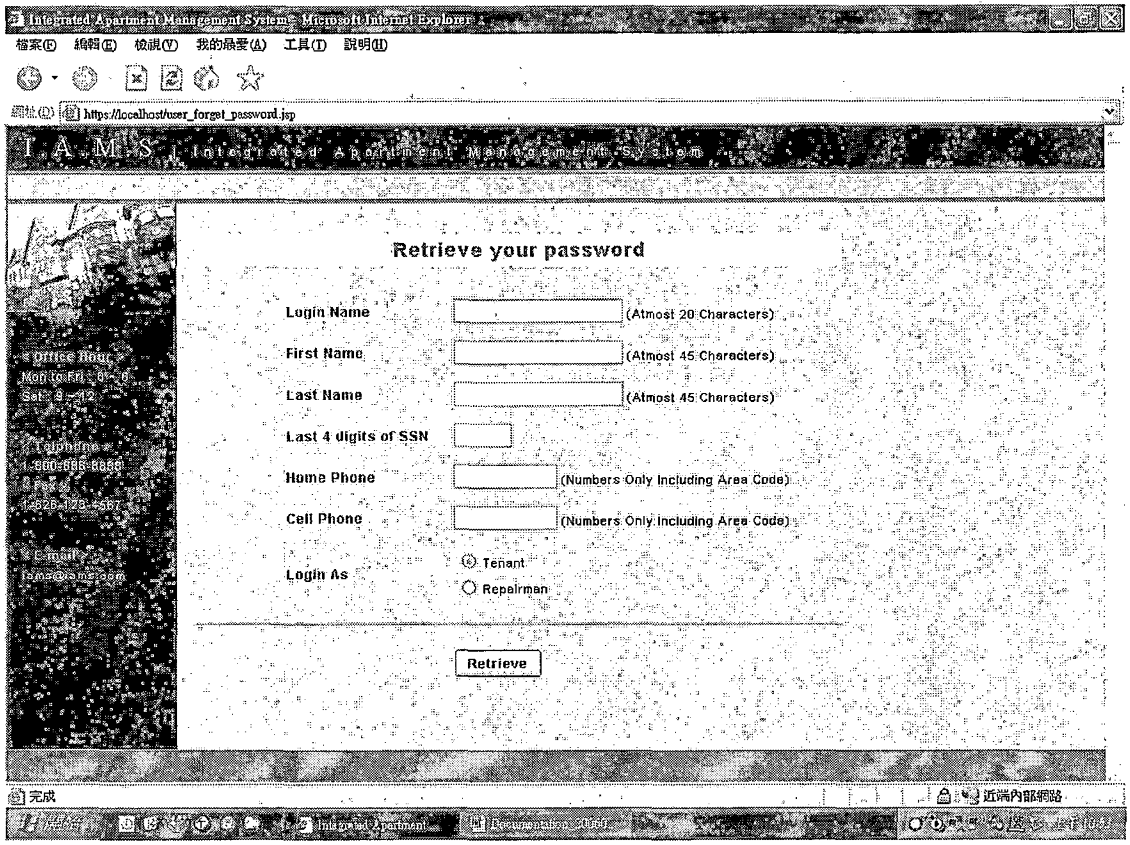
Please check your accoun name and password again.

please wait 3 seconds to retry.

Figure 7. Login Failed Page

4.3.2 Password Retrieve Page

In this page, the users who forget their password can apply for a temporary password randomly and automatically generated by the system. By filling the personal information that they provided when signed the contract with the apartment manager; the system will verify the information. If the provided information is correct, the system will randomly generate eight digits password and store in the database and send a notification email to the user.



Integrated Apartment Management System - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_forget_password.jsp
I. A. M. S. | Integrated Apartment Management System
< Office Hour >
Mon to Fri 8 ~ 6
Sat 9 ~ 12
< Telphone >
1-800-666-8666
< Fax >
1-626-123-4567
< E-mail >
iams@iams.com
完成
近端內部網路
Integrated Apartment
Documentation

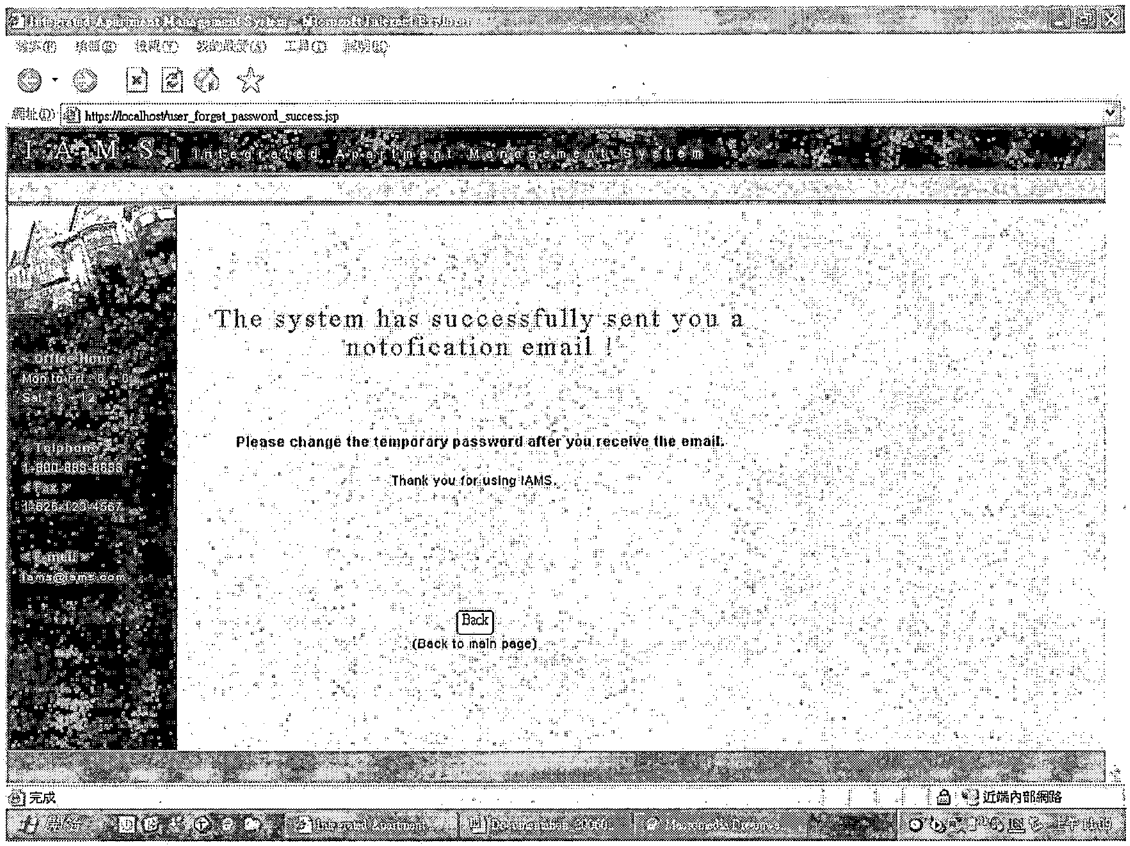
Retrieve your password

Login Name		(Atmost 20 Characters)
First Name		(Atmost 45 Characters)
Last Name		(Atmost 45 Characters)
Last 4 digits of SSN		
Home Phone		(Numbers Only Including Area Code)
Cell Phone		(Numbers Only Including Area Code)
Login As	● Tenant ○ Repairman	

Retrieve

Figure 8. Password Retrieve Page

If the user provides the correct information which is successfully validated by the system, the user will see the page that shows a successfully retrieve the password and notices him to receive the email. The page is showed in Figure 9 below.



https://localhost/user_forget_password_success.jsp

The system has successfully sent you a notofication email !

Please change the temporary password after you receive the email.

Thank you for using IAMS.

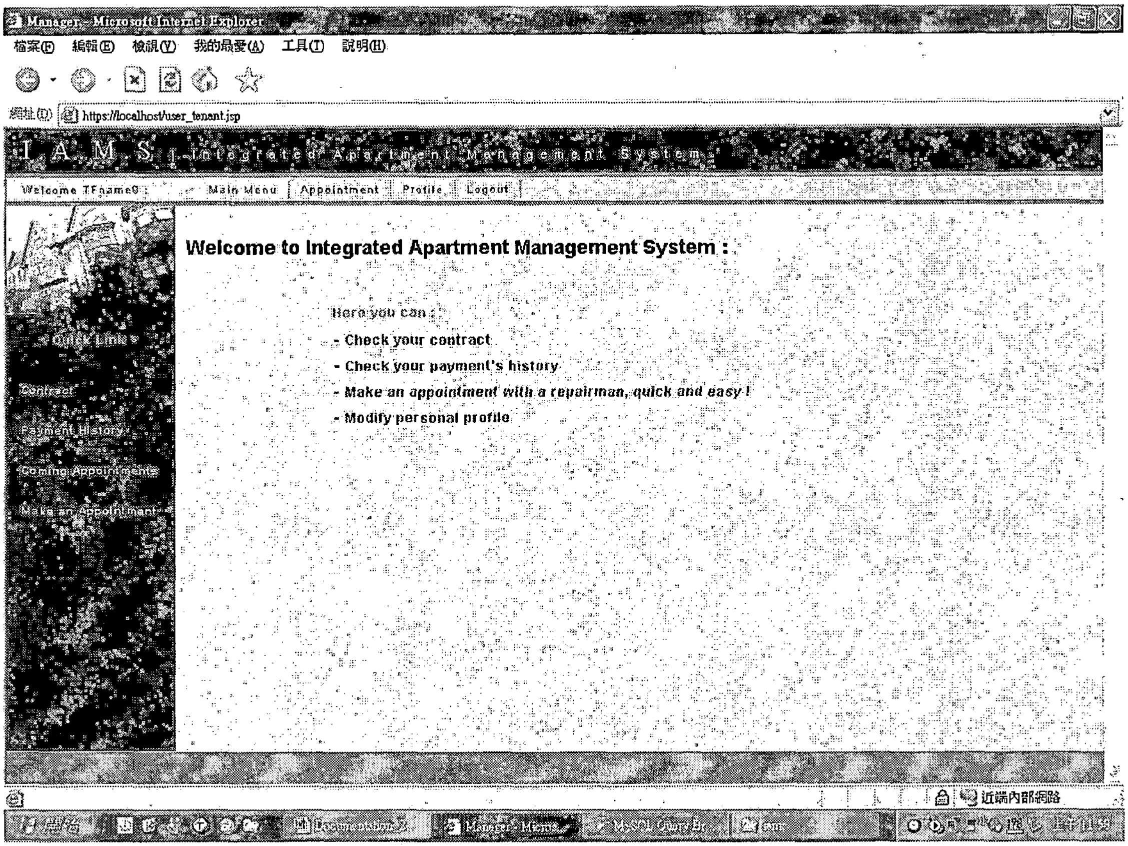
(Back to main page)

Figure 9. Successfully Retrieve Page

4.4 Graphic User Interface for Tenants

4.4.1 Tenant Main Page

This is the main page for a tenant. There are two sections in this page, the navigator bar on the top section and quick links on the left section. Both of them would be dynamically displayed different functions. The user's first name will appear on the left side of the navigator bar. A tenant can check his contract's status, payment records, and upcoming appointments. And the tenant also can make an appointment. There are four major functions for a tenant, main menu, appointment, profile, and Logout. If users want to back to the main menu, main menu is the function that they need. If a tenant not only wants to make an appointment, but he also would like to query records of appointments and to rate a repairman in a particular case, appointment function is the one. The profile function enables a user update his information so that IAMS can contact with the user correctly. It is important that users always update their valid emails so that the users can correctly receive the notification email from IAMS. The logout function is used for the user, who wants to leave this system. In order to protect a user's information from stolen by other people, it is highly recommended to logout the system before leaving. After the user logout the system, the system will clear all relative data so that other people can not browser any page that the previous user saw before.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_tenant.jsp
I. A. M. S. | Integrated Apartment Management System
Welcome TFname0 :
Main Menu
Appointment
Profile
Logout
Quick Links
Contract
Payment History
Coming Appointments
Make an Appointment
近端內部網路

Welcome to Integrated Apartment Management System :

Here you can :

- Check your contract
- Check your payment's history
- Make an appointment with a repairman, quick and easy !
- Modify personal profile

Figure 10. Tenant Main Page

4.4.2 Make an Appointment Page

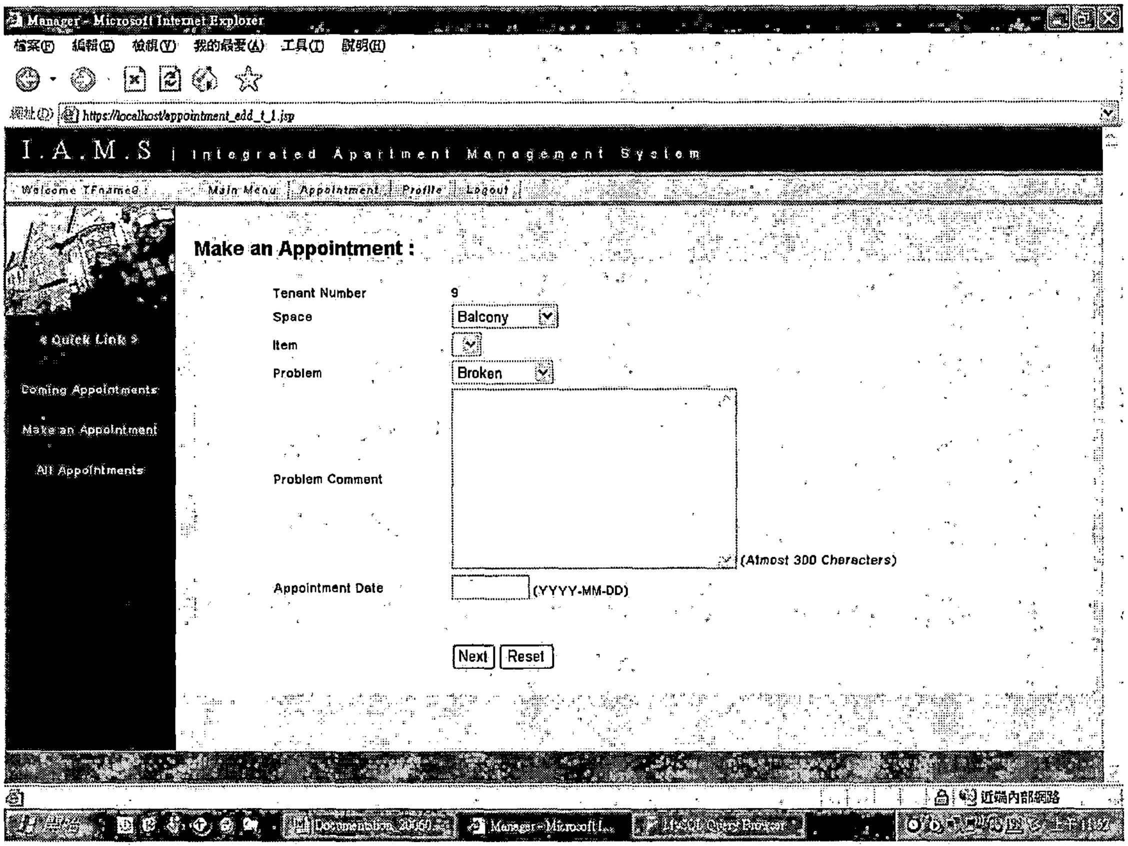
A user can only make an appointment for one item of a perspective problem each time. If a user asks for fixing many items, he can make an appointment for each item respectively.

The tenant number of the user will be displayed on the page. When the user visits the appointment page, the system will automatically show his tenant number on the page so that the user does not have to input his information. There are two benefits to do so. First, the tenant can save time. Second, it is an effective method to avoid mistyping the tenant number.

After the tenant number was successfully verified, the next step is to choose a space, where the broken or malfunctioned item belongs to. The context of the item's menu will be automatically altered by the JSP program, depending on which space that the tenant chooses. Because of such a convenient design, the user will never choose the item, which does not exist in the space.

In order to describe a broken or malfunctioned item, the user can write down the situation of the broken item in the field problem comment.

Finally, input the date that the tenant want to make the appointment with a repairman and then press the button.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_add_t_1.jsp
I.A.M.S | Integrated Apartment Management System
Welcome TFname9 | Main Menu | Appointment | Profile | Logout
« Quick Link »
Coming Appointments
Make an Appointment
All Appointments
近端內部網路

Make an Appointment :

Tenant Number 9

Space Balcony

Item

Problem Broken

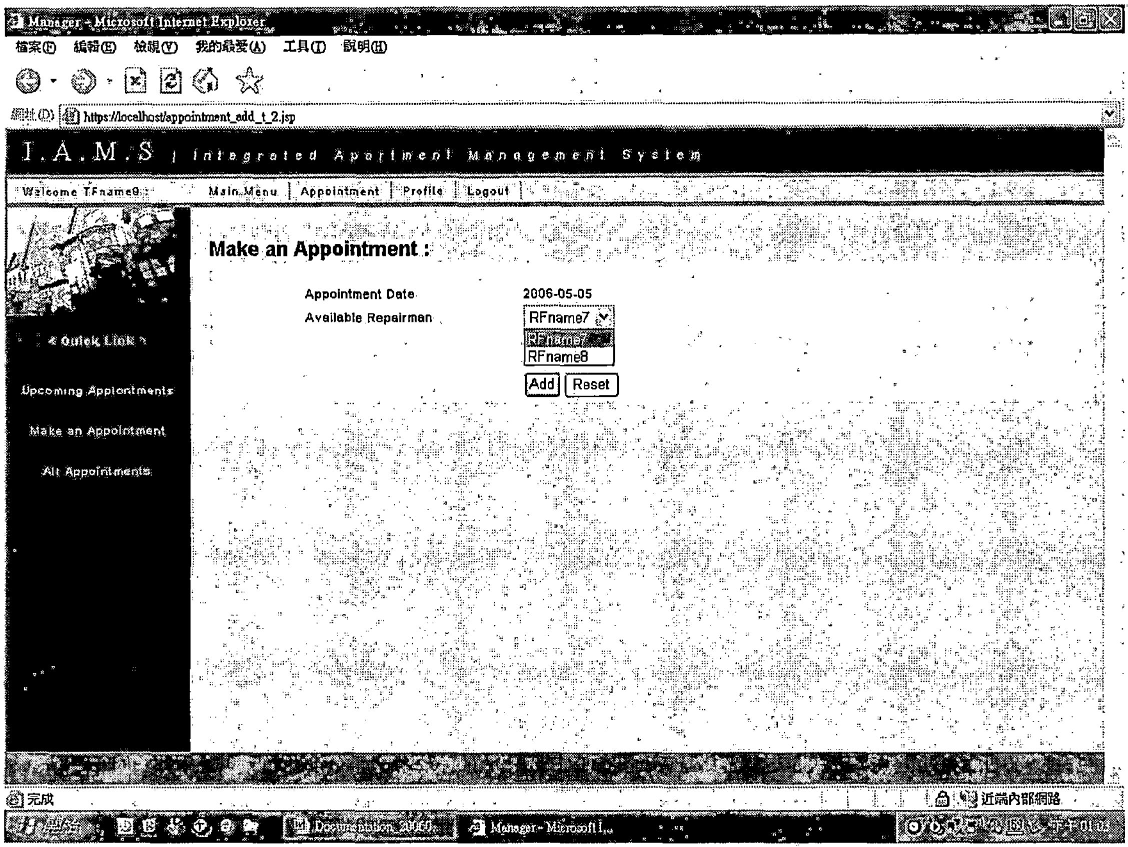
Problem Comment (Almost 300 Characters)

Appointment Date (YYYY-MM-DD)

Next Reset

Figure 11. Make an Appointment Page 1

After received the appointment date from the previous page, the system will list all available repairmen in the pull down menu. If there is no any available repairman in that day, the user will be forwarded to the previous page with a notification.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_add_t_2.jsp
I.A.M.S | Integrated Apartment Management System
Welcome TFname9 :
Main Menu | Appointment | Profile | Logout
< Quick Link >
Upcoming Applontments
Make an Appointment
All Appointments
完成
近端內部網路
Documentation_20060...
Manager - Microsoft I...

Make an Appointment :

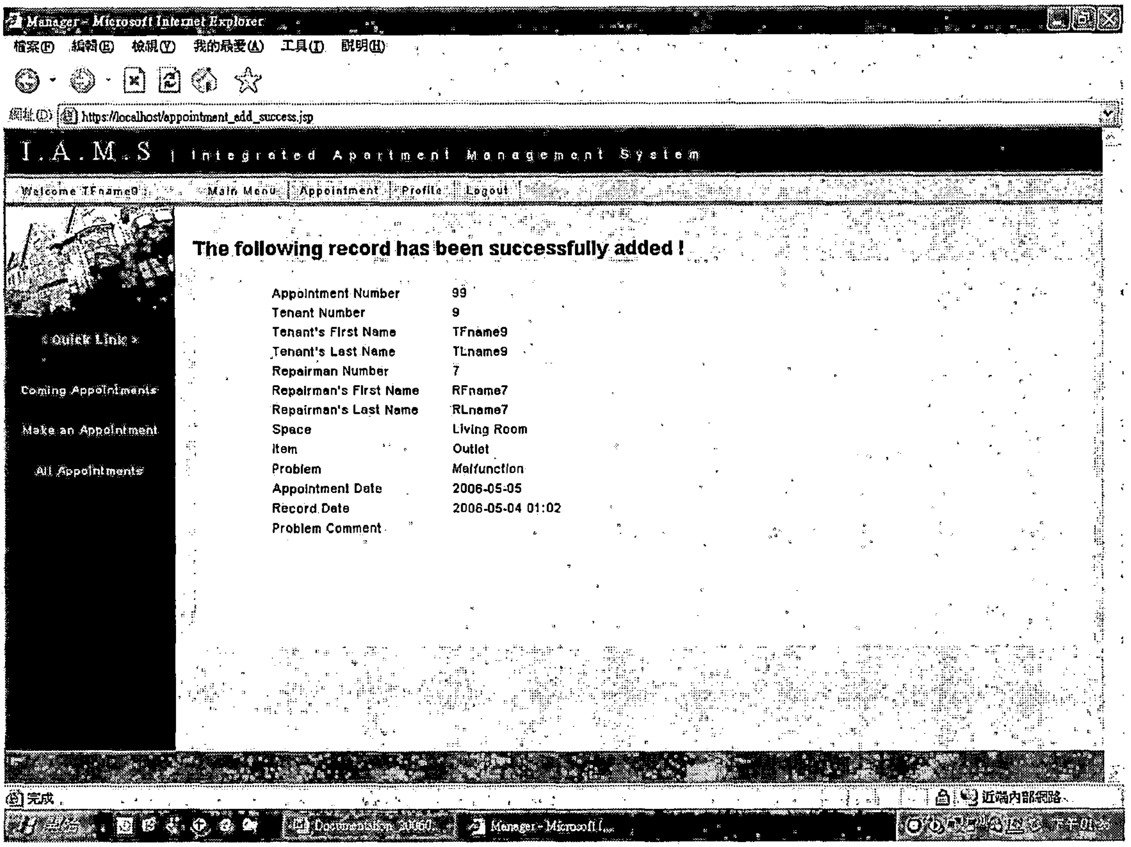
Appointment Date 2006-05-05

Available Repairman RFname7

RFname7
RFname8

Figure 12. Make an Appointment Page 2

After successfully proving the information, the user can make an appointment press add button.



Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_add_success.jsp
I.A.M.S | Integrated Apartment Management System
Welcome TFname9 | Main Menu | Appointment | Profile | Logout
< Quick Link >
Coming Appointments
Make an Appointment
All Appointments
完成
近端內部網路

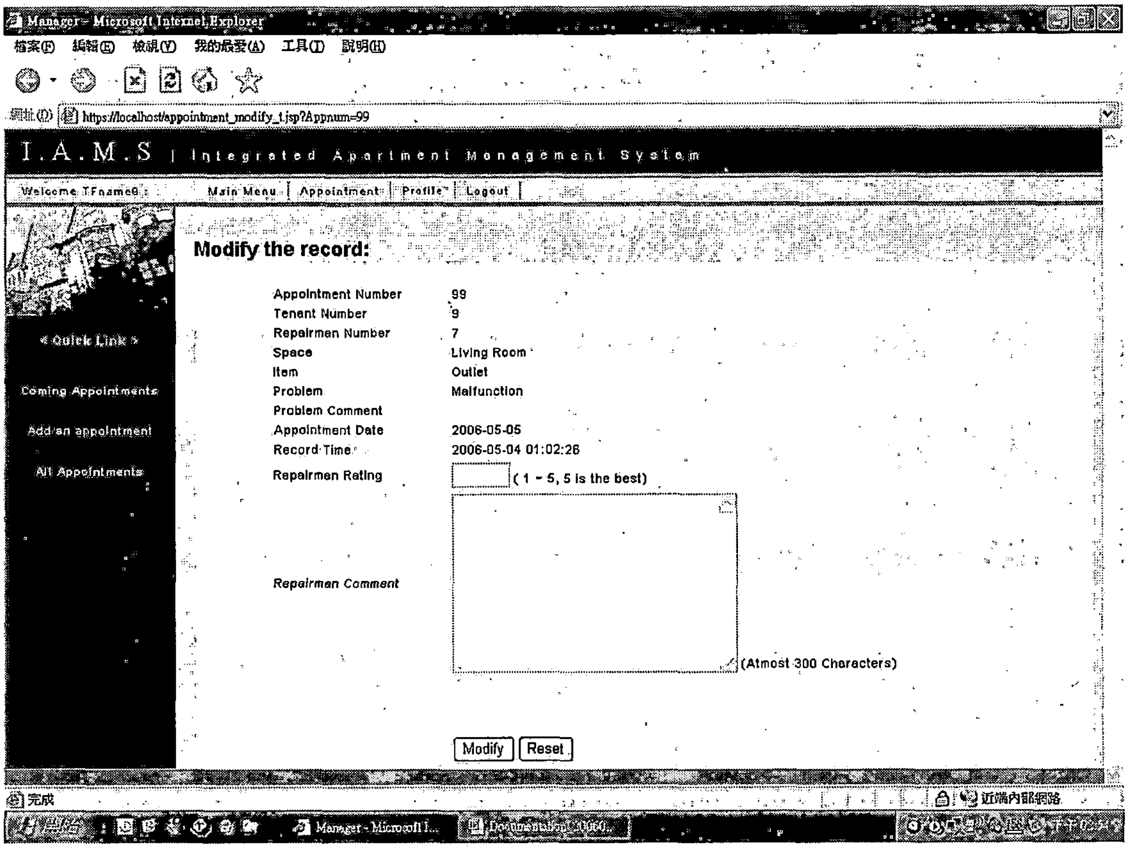
The following record has been successfully added !

Appointment Number	99
Tenant Number	9
Tenant's First Name	TFname9
Tenant's Last Name	TLname9
Repairman Number	7
Repairman's First Name	RFname7
Repairman's Last Name	RLname7
Space	Living Room
Item	Outlet
Problem	Malfunction
Appointment Date	2006-05-05
Record Date	2006-05-04 01:02
Problem Comment	

Figure 13. Successfully Make Page

4.4.3 Modify an Appointment Page

In this page, the system provides the function for the tenant to modify the rating and comments of the repairman. The range of rating is from points 1 to 5. The higher the number is, the better the evaluation. After clicking the modify button, the JSP program will collect the data from the form first and all necessary data are prepared for being updated. If any exception happened such as failure to connect to the database, the system will show an error message to the user.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_modify_t.jsp?Appnum=99
I.A.M.S | Integrated Apartment Management System
Welcome TFname6 : Main Menu | Appointment | Profile | Logout
« Quick Link »
Coming Appointments
Add an appointment
All Appointments
完成
近端內部網路

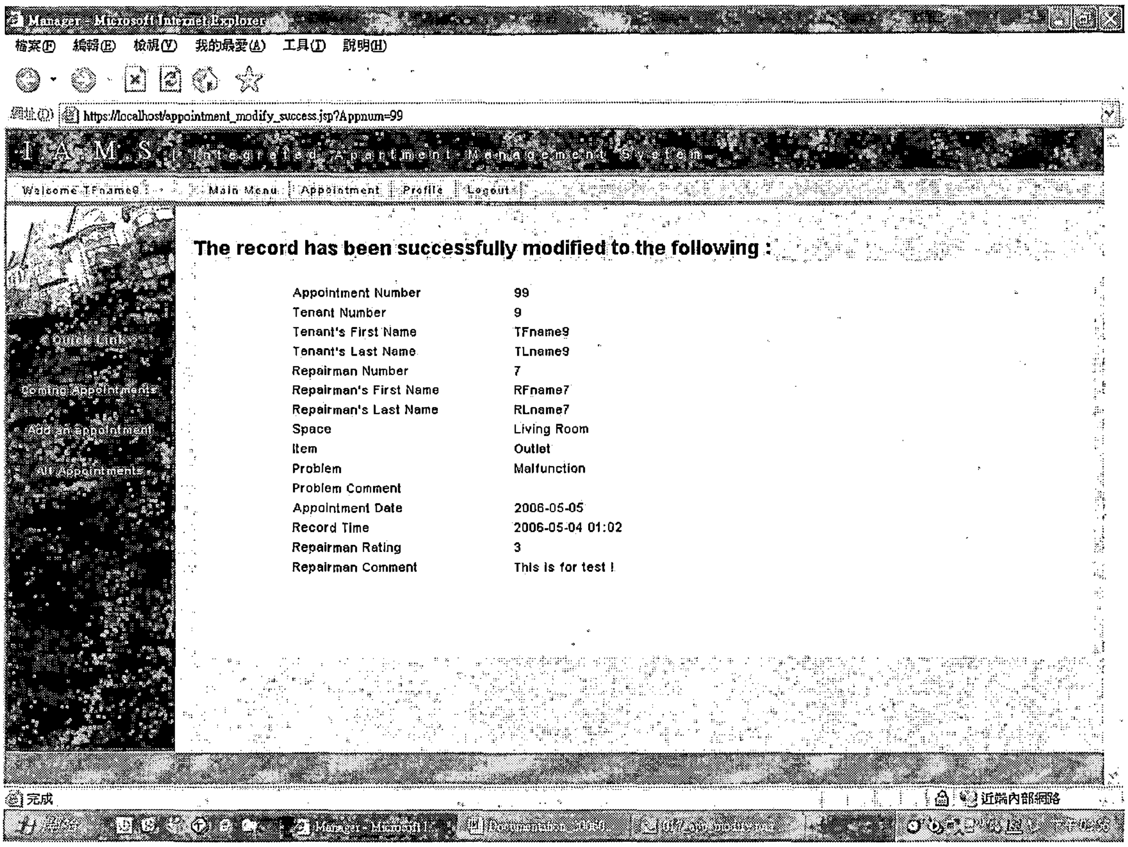
Modify the record:

Appointment Number	99
Tenant Number	9
Repairmen Number	7
Space	Living Room
Item	Outlet
Problem	Malfunction
Problem Comment	
Appointment Date	2006-05-05
Record Time	2006-05-04 01:02:26
Repairmen Rating	(1 - 5, 5 is the best)
Repairmen Comment	(Atmost 300 Characters)

Modify Reset

Figure 14. Modify an Appointment Page

The page shown in Figure 15 is the result after the user modifies the data successfully. The reason why the information is represented on the page again is in order to ensure nothing has been modified by accident. In this case, the rating of the repairman 9 is set to be 3 and then put a testing sentence in the field of repairman comment. Finally, the user can see the newest information showed on the page so that the tenant can ensure the information is correct.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_modify_success.jsp?Appnum=99
I A M S Integrated Appointment Management System
Welcome TFname9 ! Main Menu Appointment Profile Logout
Quick Link
Coming Appointments
Add an appointment
All Appointments
完成
近端內部網路

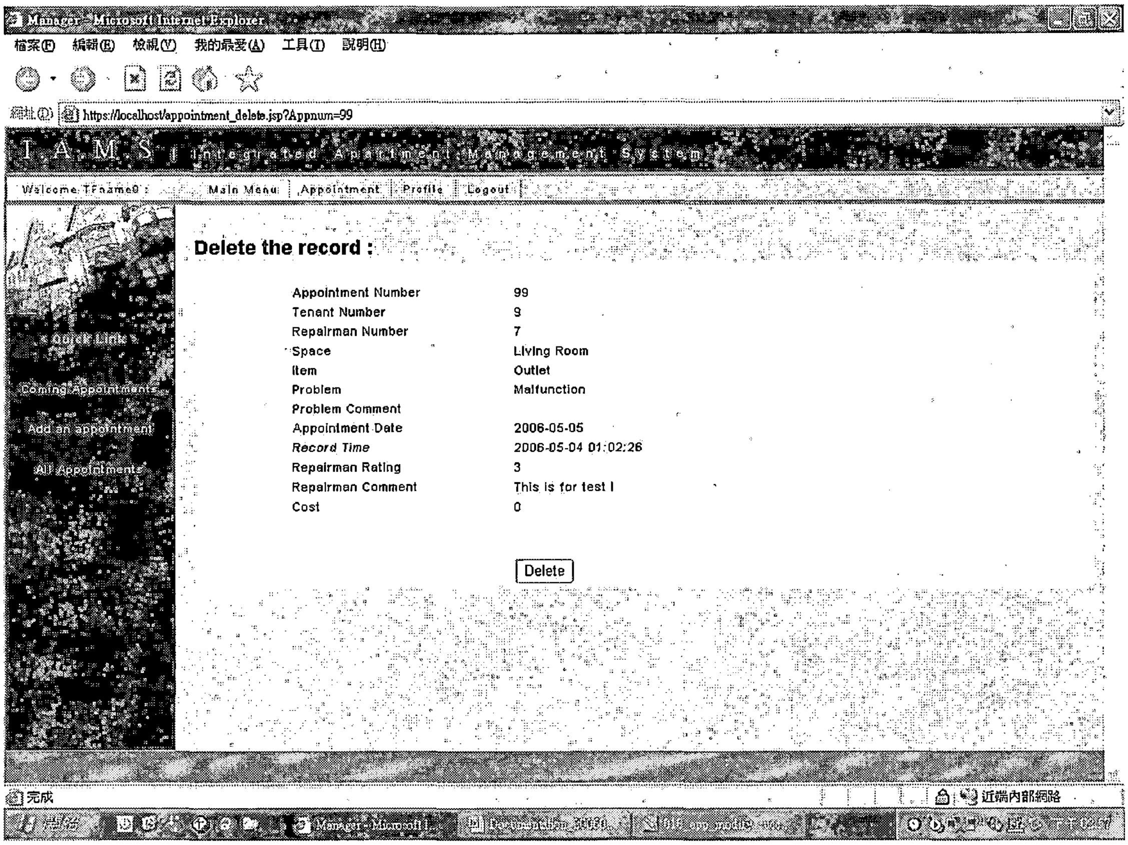
The record has been successfully modified to the following :

Appointment Number	99
Tenant Number	9
Tenant's First Name	TFname9
Tenant's Last Name	TLname9
Repairman Number	7
Repairman's First Name	RFname7
Repairman's Last Name	RLname7
Space	Living Room
Item	Outlet
Problem	Malfunction
Problem Comment	
Appointment Date	2006-05-05
Record Time	2006-05-04 01:02
Repairman Rating	3
Repairman Comment	This is for test !

Figure 15. Successfully Modify Page

4.4.4 Delete an Appointment Page

This pages shows the records of the appointment that the user want to delete.

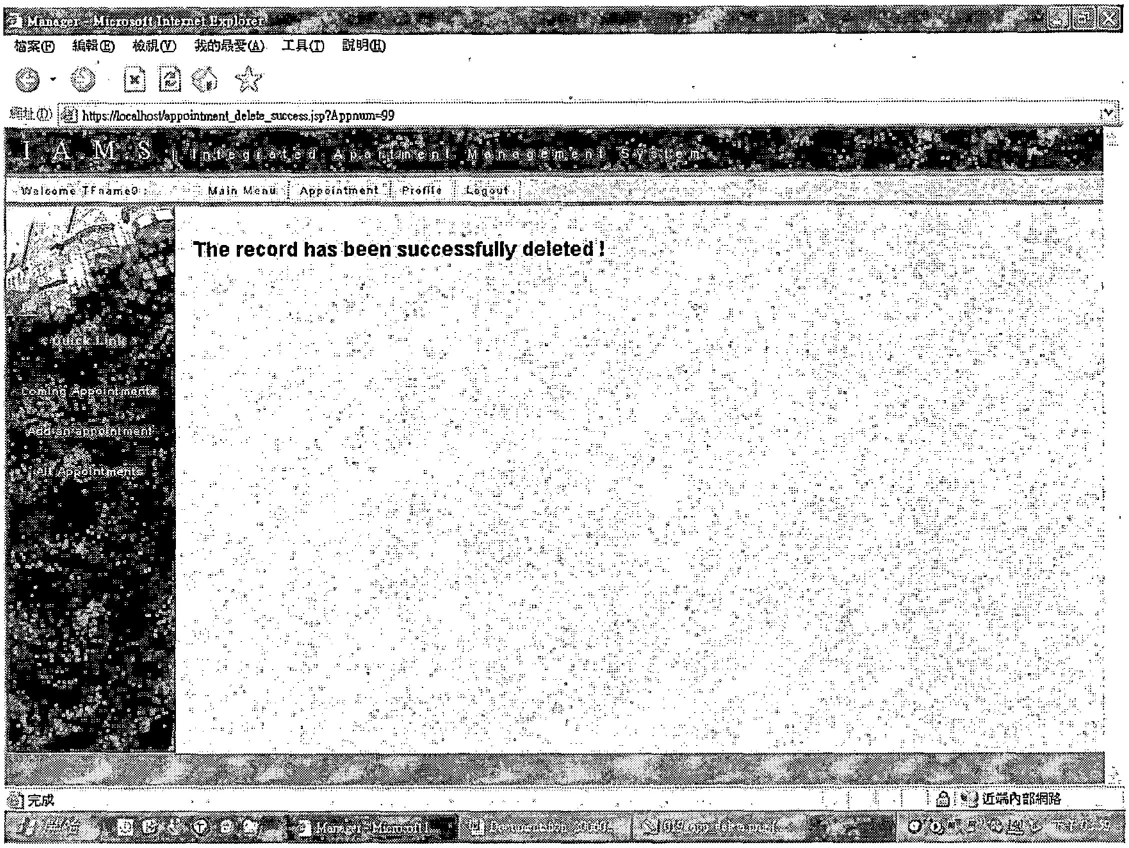

Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_delete.jsp?Appnum=99
I.A.M.S Integrated Apartment Management System
Welcome TFname0 : Main Menu | Appointment | Profile | Logout
< Quick Link >
Coming Appointments
Add an appointment
All Appointments
Delete
完成
近端內部網路

Delete the record :

Appointment Number	99
Tenant Number	9
Repairman Number	7
Space	Living Room
Item	Outlet
Problem	Malfunction
Problem Comment	
Appointment Date	2006-05-05
Record Time	2006-05-04 01:02:26
Repairman Rating	3
Repairman Comment	This is for test I
Cost	0

Figure 16. Delete an Appointment Page

After deleting the appointment, users will see the page which displays that the record has been successfully deleted. Otherwise, it will show an error message on the page.

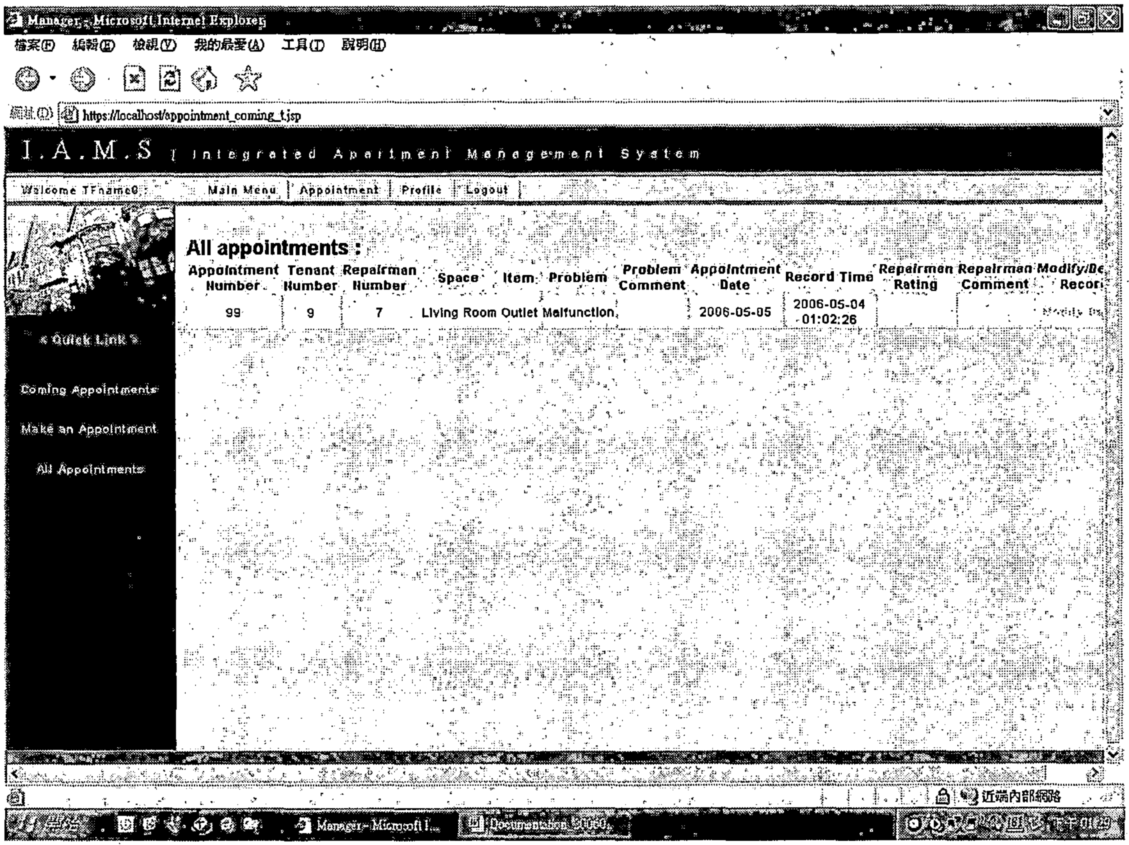

Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_delete_success.jsp?Appnum=99
I A M S Integrated Apartment Management System
Welcome TFname9
Main Menu
Appointment
Profile
Logout
« Quick Link »
Coming Appointments
Add an appointment
All Appointments
完成
近端內部網路

The record has been successfully deleted !

Figure 17. Successfully Deleted Page

4.4.5 Coming Appointments Page

Coming appointments is useful function both tenants and repairmen, which gives a tenant and repairman detail about the appointments, including appointment number, repairman number, space, the item, item's problem, appointment date and the time. Not only for query the information of the appointment, but also the tenant can modify or delete the appointment by clicking the link of modify and delete.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/appointment_coming_t.jsp
I.A.M.S | Integrated Apartment Management System
Welcome TFname0
Main Menu
Appointment
Profile
Logout
« Quick Link »
Coming Appointments
Make an Appointment
All Appointments

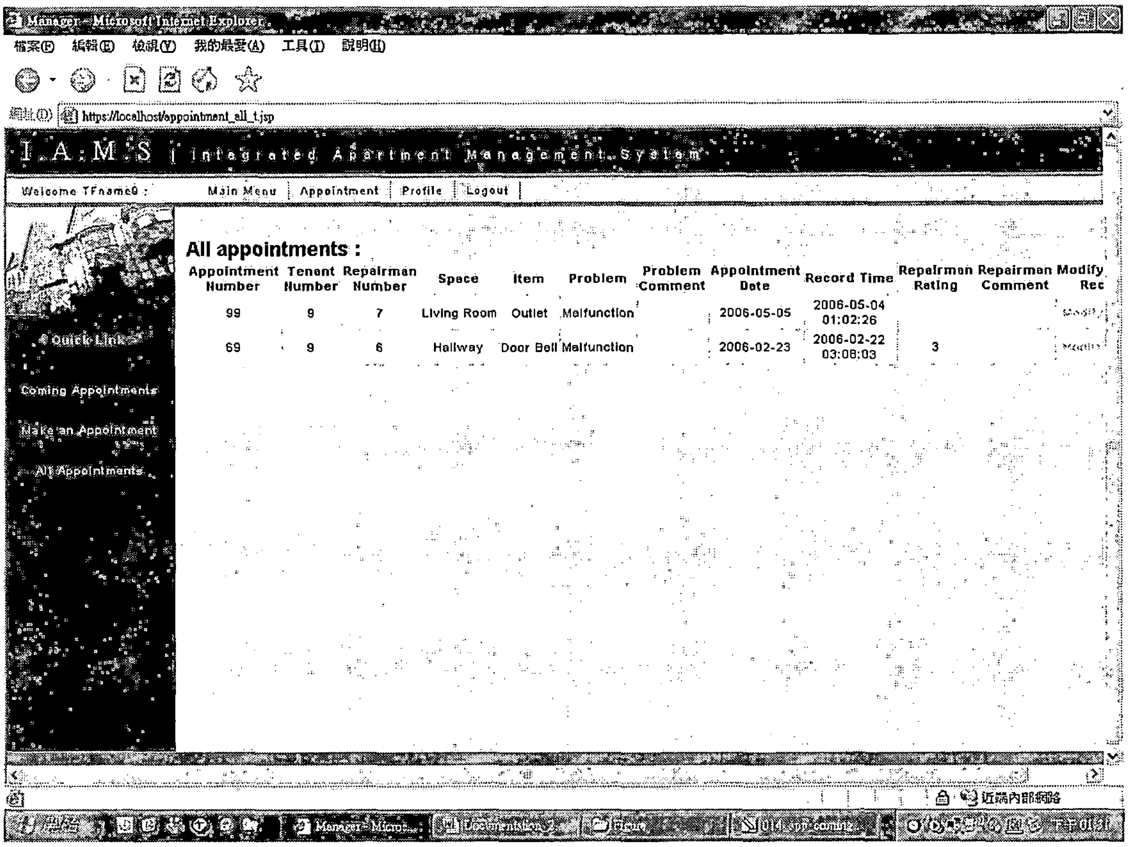
All appointments :

Appointment Number	Tenant Number	Repairman Number	Space	Item	Problem	Problem Comment	Appointment Date	Record Time	Repairmen Rating	Repairman Comment	Modify/De Recor
99	9	7	Living Room	Outlet	Malfunction		2006-05-05	2006-05-04 01:02:26			Modify De

Figure 18. Coming Appointments Page

4.4.6 All Appointments Page

This is the page where the tenant can check all appointment that he made. By this function, the tenant can find out history of appointments and give ratings to the repairman. This function allows tenant to give feedback of the appointment. The tenant can also delete the records if he made the wrong appointment incautiously.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/appointment_all_t.jsp
I.A.M.S | Integrated Apartment Management System
Welcome TFname9 :
Main Menu
Appointment
Profile
Logout
Quick Link
Coming Appointments
Make an Appointment
All Appointments
近端內部網路

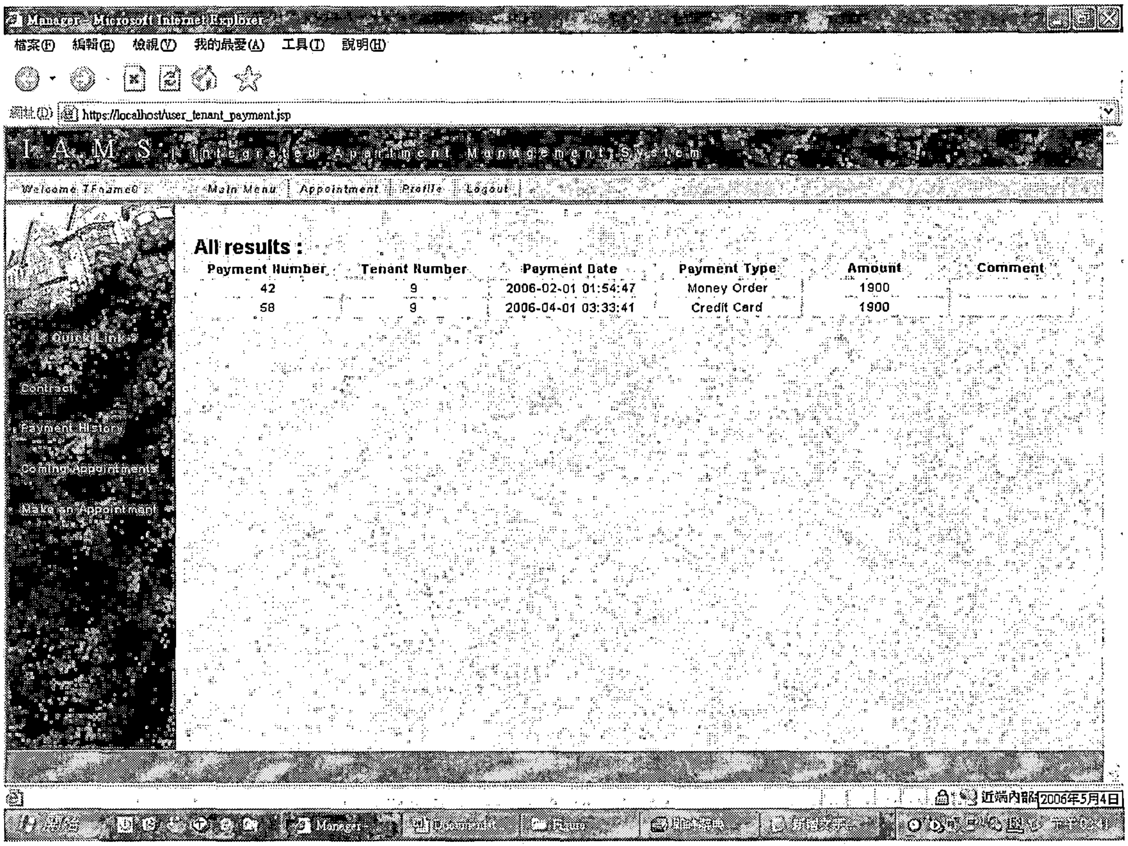
All appointments :

Appointment Number	Tenant Number	Repairman Number	Space	Item	Problem	Problem Comment	Appointment Date	Record Time	Repairman Rating	Repairman Comment	Modify Rec
99	9	7	Living Room	Outlet	Malfunction		2006-05-05	2006-05-04 01:02:26			Modify
69	9	6	Hallway	Door Bell	Malfunction		2006-02-23	2006-02-22 03:08:03	3		Modify

Figure 19. All Appointments Page

4.4.7 Payment History Page

This page display history of payment. The system provides all detail information about the payment such as payment number, tenant number, paid date, payment type, the amount. If there is any other information or notes about the payment, it could be recorded in the field of comment. Because the record of payment information is confidential, the user is not allowed to modify it.



Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_tenant_payment.jsp
I. A. M. S. | Integrated Apartment Management System
Welcome TFname0 : Main Menu | Appointment | Profile | Logout
Quick Link
Contract
Payment History
Coming Appointments
Make an Appointment
近端內部網路
2006年5月4日

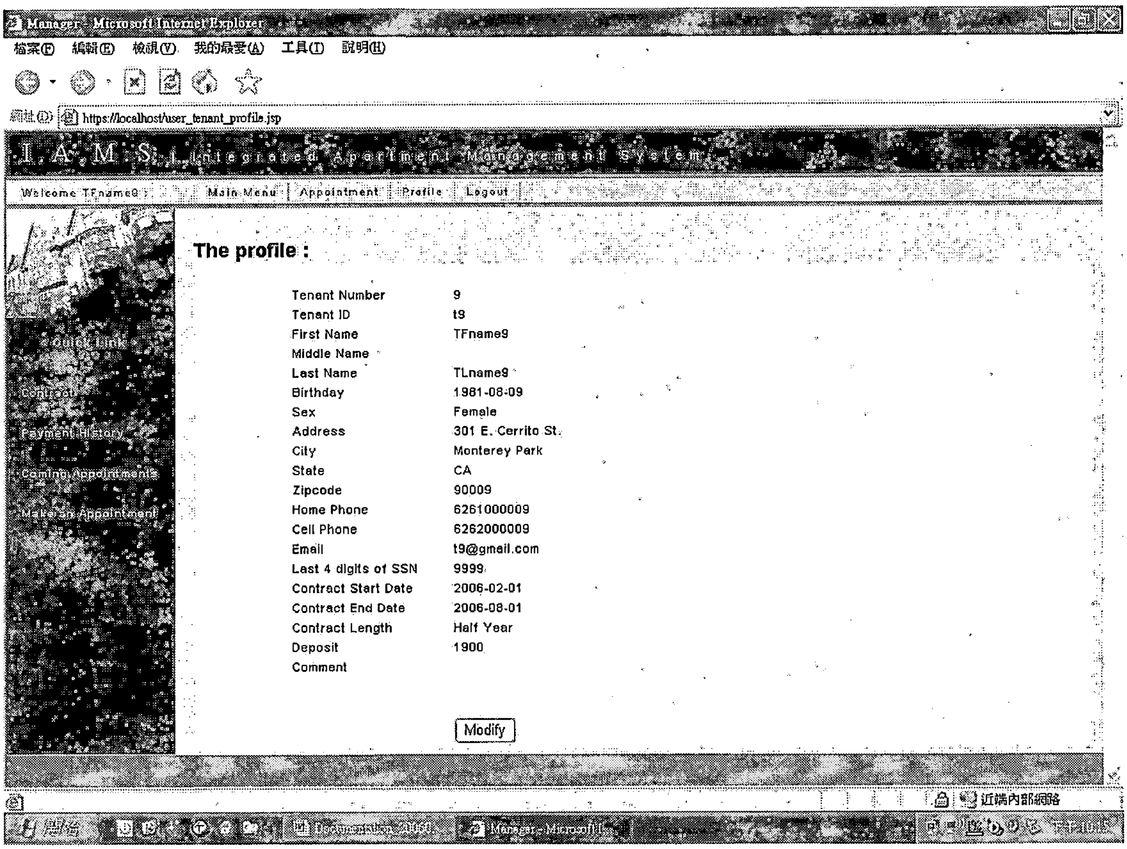
All results :

Payment Number	Tenant Number	Payment Date	Payment Type	Amount	Comment
42	9	2006-02-01 01:54:47	Money Order	1900	
58	9	2006-04-01 03:33:41	Credit Card	1900	

Figure 20. Payment History Page

4.4.8 Profile Page

The page shown in Figure 21 displays all information of the tenant. The page obtains the tenant’s number before the user sees this page, and then retrieves all data of the user from the database. The tenant can modify his information by clicking the modify button at the bottom of the page. Basically, the quick link of contract will lead to the profile page.

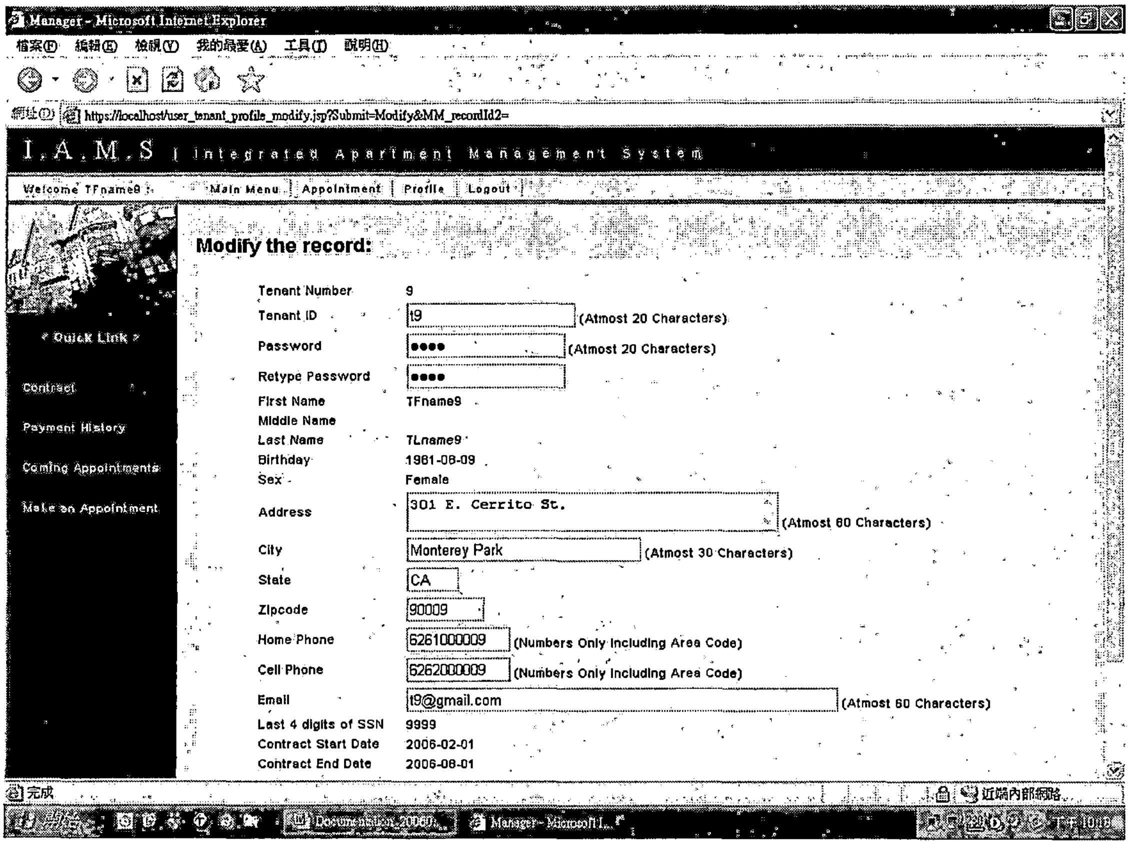

Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_tenant_profile.jsp
I. A. M. S. Integrated Apartment Management System
Welcome TFname9 ! Main Menu Appointment Profile Logout
Quick Link
Contract
Payment History
Coming Appointments
Make an Appointment
Modify
近端內部網路

The profile :

Tenant Number	9
Tenant ID	t9
First Name	TFname9
Middle Name	
Last Name	TLname9
Birthday	1981-08-09
Sex	Female
Address	301 E. Cerrito St.
City	Monterey Park
State	CA
Zipcode	90009
Home Phone	6261000009
Cell Phone	6262000009
Email	t9@gmail.com
Last 4 digits of SSN	9999
Contract Start Date	2006-02-01
Contract End Date	2006-08-01
Contract Length	Half Year
Deposit	1900
Comment	

Figure 21. Profile Page

The page shown in Figure 22 allows user to modify the personal information. The tenant can modify their id, password, address ... etc. Because each tenant's id represents a particular tenant in the system, the tenant's id should be unique and is not allowed to be duplicated. If the user changes his id to that is taken by others, the system will pup up a notice dialogue to the user. The password will not be displayed directly, because of protecting the password from a risk. Especially for the tenants who access this website in public, it is a necessary method to keep the password in secret. Any modification of the profile is required that the password between the field of password and that of retype password should be the same. In case some people mistype the password if the system does not double check it. All fields will be checked for the data format and type by Java Script after the tenant pushes the button modify.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_tenant_profile_modify.jsp?Submit=Modify&MM_recordId2=
I.A.M.S | Integrated Apartment Management System
Welcome TFname9 !
Main Menu | Appointment | Profile | Logout
Quick Link
Contract
Payment History
Coming Appointments
Make an Appointment
完成
近端內部網路

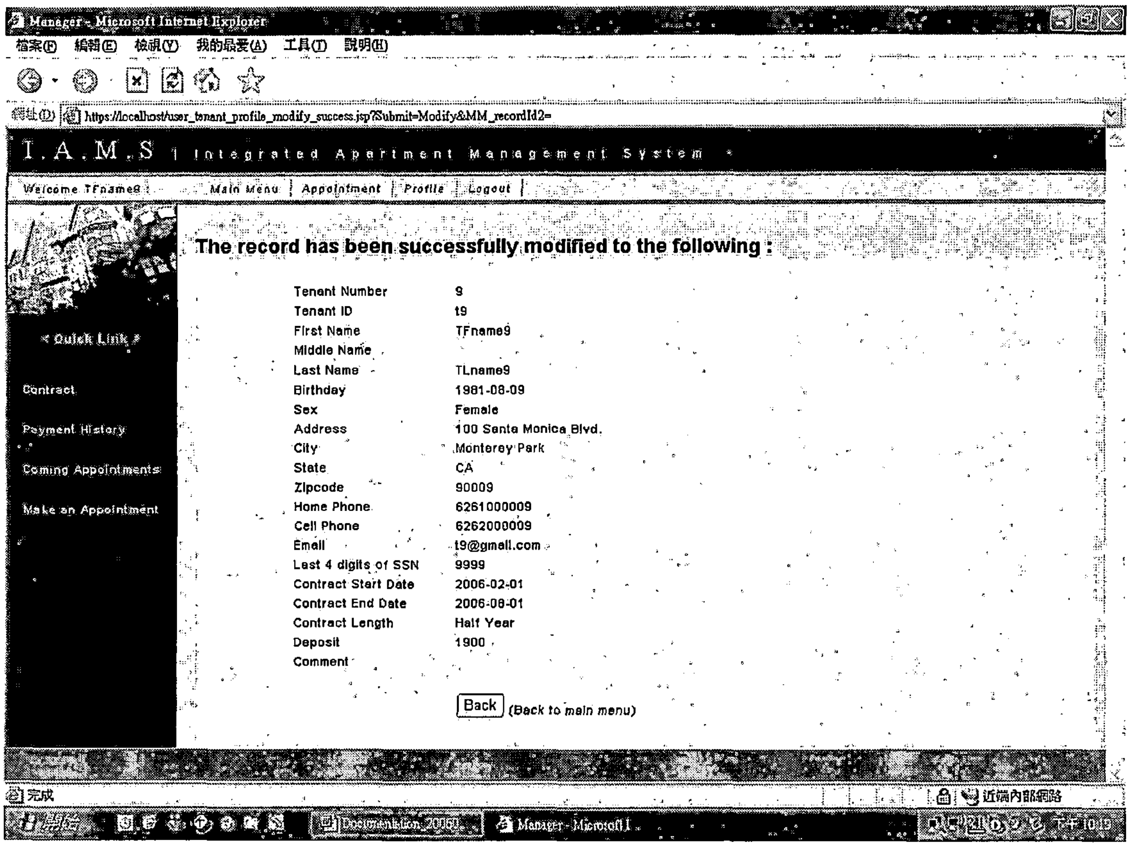
Modify the record:

Tenant Number	9	
Tenant ID	t9	(Atmost 20 Characters)
Password	●●●●	(Atmost 20 Characters)
Retype Password	●●●●	
First Name	TFname9	
Middle Name		
Last Name	TLname9	
Birthday	1981-08-09	
Sex	Female	
Address	301 E. Cerrito St.	(Atmost 60 Characters)
City	Monterey Park	(Atmost 30 Characters)
State	CA	
Zipcode	90009	
Home Phone	6261000009	(Numbers Only Including Area Code)
Cell Phone	6262000009	(Numbers Only Including Area Code)
Email	t9@gmail.com	(Atmost 60 Characters)
Last 4 digits of SSN	9999	
Contract Start Date	2006-02-01	
Contract End Date	2006-08-01	

Figure 22. Modify the Profile Page

The page shown in Figure 23 is similar to the page presented after modify an appointment. The function of these two pages is to notice the user that the record has been successfully modified.

Another reason is to ensure nothing has been modified by accident. In this case, the address of the repairman 9 is modified to a new one and everything is expected. Therefore, the record is completely and successfully updated.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_tenant_profile_modify_success.jsp?Submit=Modify&MM_recordId2=
I.A.M.S | Integrated Apartment Management System
Welcome TFname9
Main Menu | Appointment | Profile | Logout
« Quick Link »
Contract
Payment History
Coming Appointments
Make an Appointment
Back
(Back to main menu)
完成
近端內部網路

The record has been successfully modified to the following :

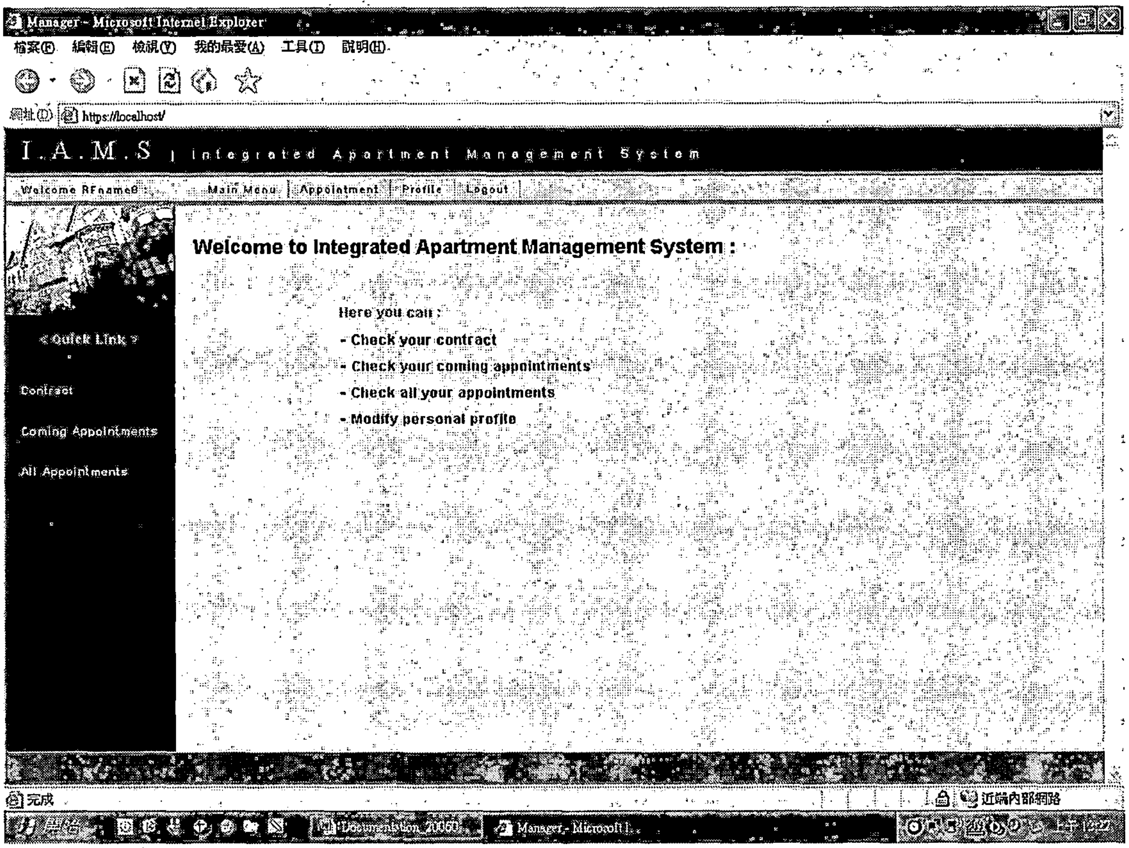
Tenant Number	9
Tenant ID	t9
First Name	TFname9
Middle Name	
Last Name	TLname9
Birthday	1981-08-09
Sex	Female
Address	100 Santa Monica Blvd.
City	Monterey Park
State	CA
Zipcode	90009
Home Phone	6261000009
Cell Phone	6262000009
Email	t9@gmail.com
Last 4 digits of SSN	9999
Contract Start Date	2006-02-01
Contract End Date	2006-08-01
Contract Length	Half Year
Deposit	1900
Comment	

Figure 23. Successfully Modify Page

4.5 Graphic User Interface for Repairman

4.5.1 Repairman Main Page

This is the main page for repairman. Basically, it is similar to the tenant's main page. The only thing different between the main page of the tenant and that of the repairman is the function of payment history, which does not appear in the section of quick links anymore. In this page, repairman can check his contract's status, coming appointments, all appointments, and his profile. The navigator bar here provides the same functions, which are also provided in the main page of tenant. Four major functions are main menu, appointment, profile, and Logout. Usually, it is supposed that repairman might have many appointments in the same day. The function of coming appointments can help repairman well organize all appointments. Compared to functions for a tenant, repairman can not make an appointment, modify or delete any appointments. He can only query appointments that he is involved in. The profile function enable repairman update his new information so that IAMS can contact with repairman correctly. It is important that always update to a valid email so that repairman can receive the notification email from IAMS such as a notification email of a new appointment, the cancellation of the appointment.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/
I.A.M.S | Integrated Apartment Management System
Welcome RFname0
Main Menu
Appointment
Profile
Logout
< Quick Link >
Contract
Coming Appointments
All Appointments
完成
近端內部網路

Welcome to Integrated Apartment Management System :

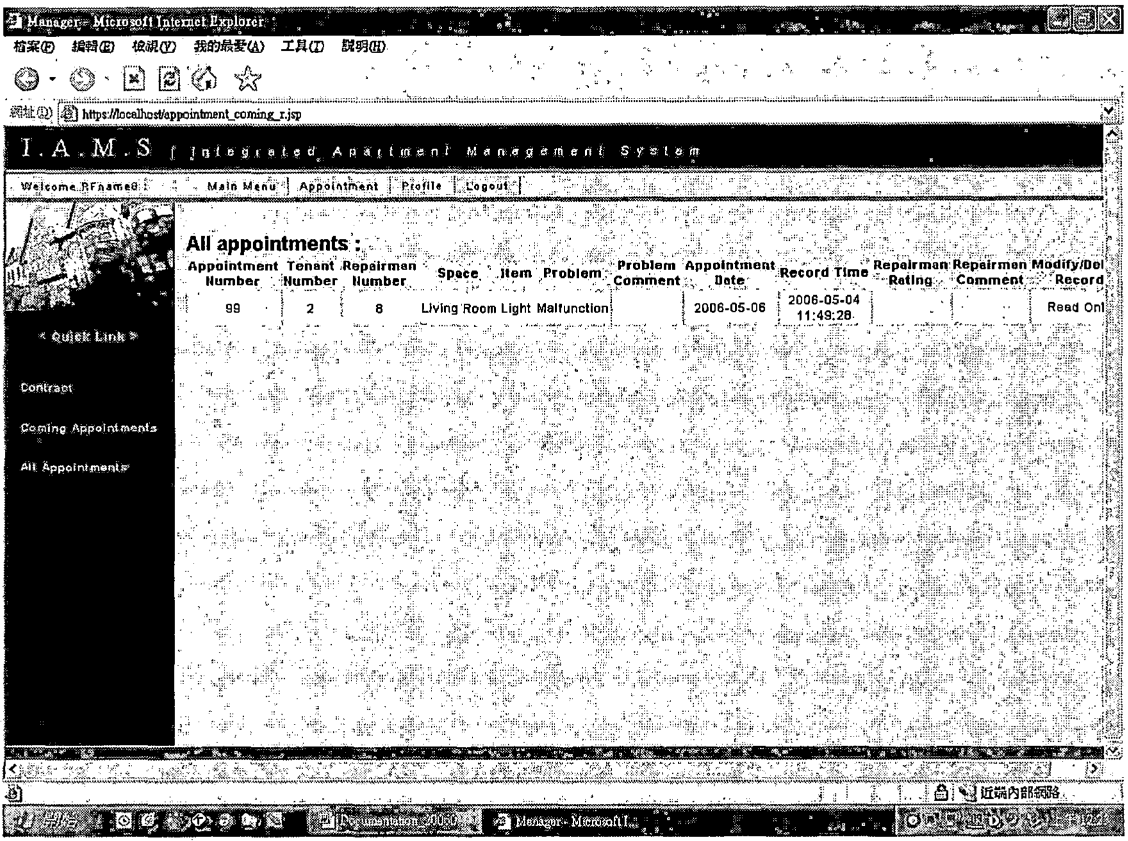
Here you can :

- Check your contract
- Check your coming appointments
- Check all your appointments
- Modify personal profile

Figure 24. Repairman Main Page

4.5.2 Coming Appointments Page

Coming appointments is a useful function to repairmen, offering the necessary information effectively. Usually, it is supposed to be that repairman might have many appointments in the same day. The function of coming appointments can help repairman well organize all appointments.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_coming_r.jsp
I.A.M.S [Integrated Apartment Management System
Welcome RFname8 !
Main Menu
Appointment
Profile
Logout
« Quick Link »
Contract
Coming Appointments
All Appointments
近端內部網路

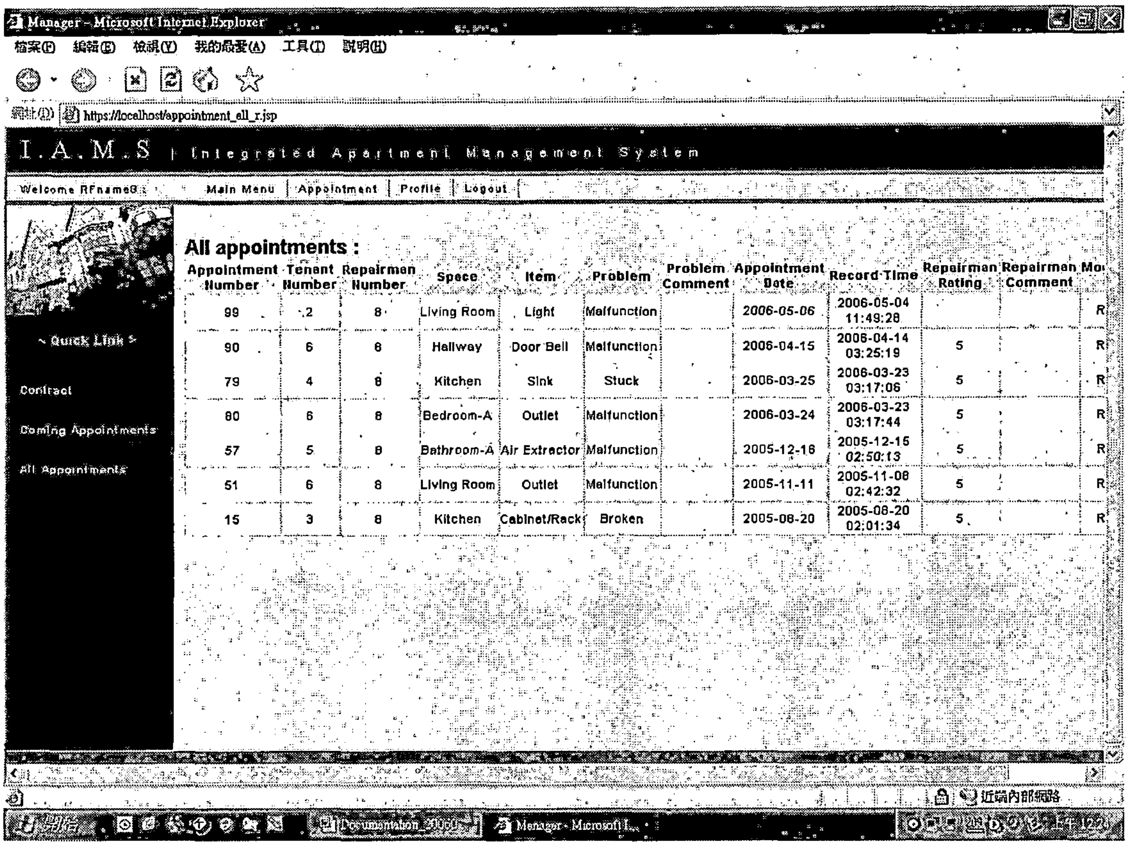
All appointments :

Appointment Number	Tenant Number	Repairman Number	Space	Item	Problem	Problem Comment	Appointment Date	Record Time	Repairman Rating	Repairmen Comment	Modify/Del Record
99	2	8	Living Room	Light	Malfunction		2006-05-06	2006-05-04 11:49:28			Read Onl

Figure 25. Coming Appointments Page

4.5.3 All Appointments Page

This is the page where repairman can check all appointment that he is involved in. By this function, repairman can find out every history of appointments and the rating that was given by the tenant.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/appointment_all_r.jsp
I.A.M.S | Integrated Apartment Management System
Welcome RFname8
Main Menu
Appointment
Profile
Logout
~ Quick Link ~
Contract
Coming Appointments
All Appointments
近端內部網路

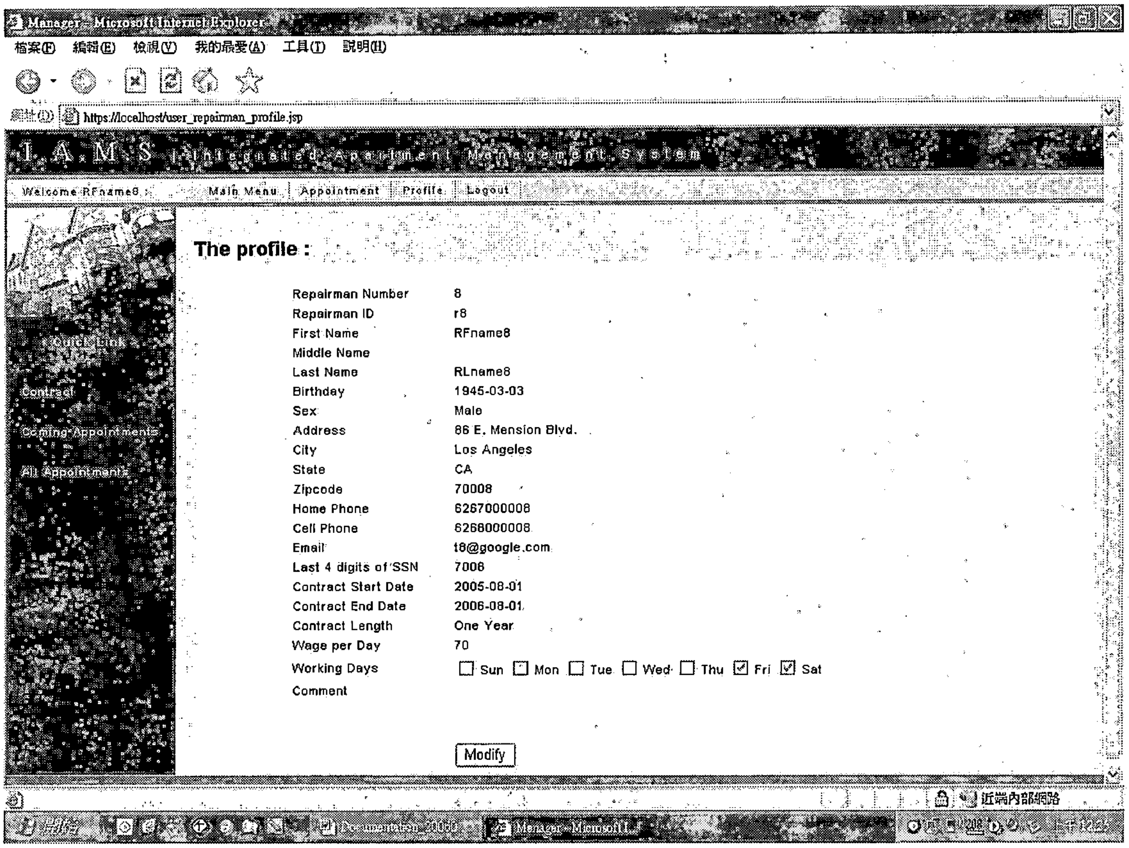
All appointments :

Appointment Number	Tenant Number	Repairman Number	Space	Item	Problem	Problem Comment	Appointment Date	Record Time	Repairman Rating	Repairman Comment	Mo
99	2	8	Living Room	Light	Malfunction		2006-05-06	2006-05-04 11:49:28			R
90	6	8	Hallway	Door Bell	Malfunction		2006-04-15	2006-04-14 03:25:19	5		R
79	4	8	Kitchen	Sink	Stuck		2006-03-25	2006-03-23 03:17:06	5		R
80	6	8	Bedroom-A	Outlet	Malfunction		2006-03-24	2006-03-23 03:17:44	5		R
57	5	8	Bathroom-A	Air Extractor	Malfunction		2005-12-16	2005-12-15 02:50:13	5		R
51	6	8	Living Room	Outlet	Malfunction		2005-11-11	2005-11-08 02:42:32	5		R
15	3	8	Kitchen	Cabinet/Rack	Broken		2005-08-20	2005-08-20 02:01:34	5		R

Figure 26. All Appointments Page

4.5.4 Profile Page

The page shown in Figure 27 displays all information of the repairman. The repairman can modify his information such as working days and phone numbers by clicking the modify button at the bottom of the page. The quick link of contract will lead to the profile page.

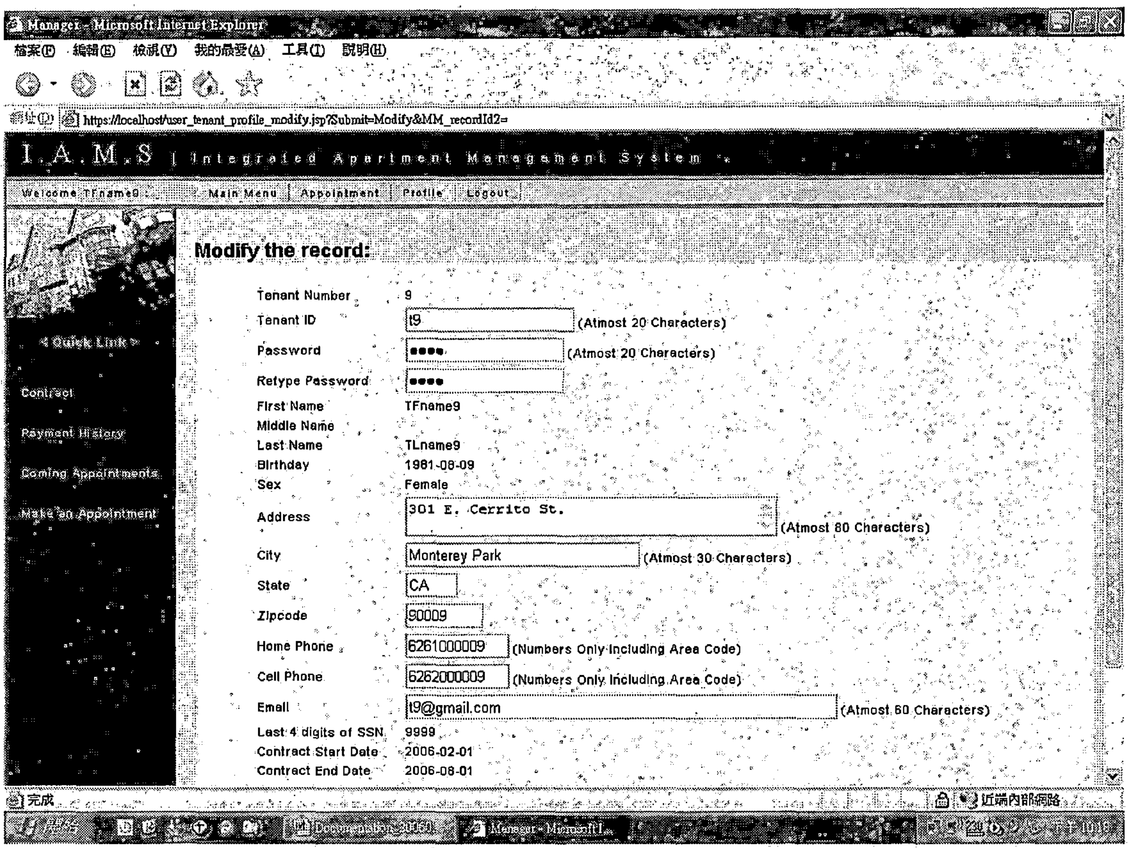

Manager - Microsoft Internet Explorer
https://localhost/user_repairman_profile.jsp
I.A.M.S Integrated Appointment Management System
Welcome RFname8 !
Main Menu
Appointment
Profile
Logout
Quick Link
Contract
Coming Appointments
All Appointments
Modify

The profile :

Repairman Number	8
Repairman ID	r8
First Name	RFname8
Middle Name	
Last Name	RLname8
Birthday	1945-03-03
Sex	Male
Address	86 E. Mension Blvd.
City	Los Angeles
State	CA
Zipcode	70008
Home Phone	6267000008
Cell Phone	6268000008
Email	t8@google.com
Last 4 digits of SSN	7008
Contract Start Date	2005-08-01
Contract End Date	2006-08-01
Contract Length	One Year
Wage per Day	70
Working Days	□ Sun □ Mon □ Tue □ Wed □ Thu ☑ Fri ☑ Sat
Comment	

Figure 27. Profile Page

The page shown in 28 allows user to modify the personal information. The repairman can modify their id, password, address ... etc. Because each repairman's id represents a particular repairman in the system, the repairman's id should be unique and is not allowed to be duplicated. If the user changes his id to the one that is used by others, the system will pup up a dialogue to notice the user and back to the same page. The password will not be displayed in the page directly, due to security reasons. And all fields will be checked for the data format and type by Java Script after the tenant pushes the modify button.

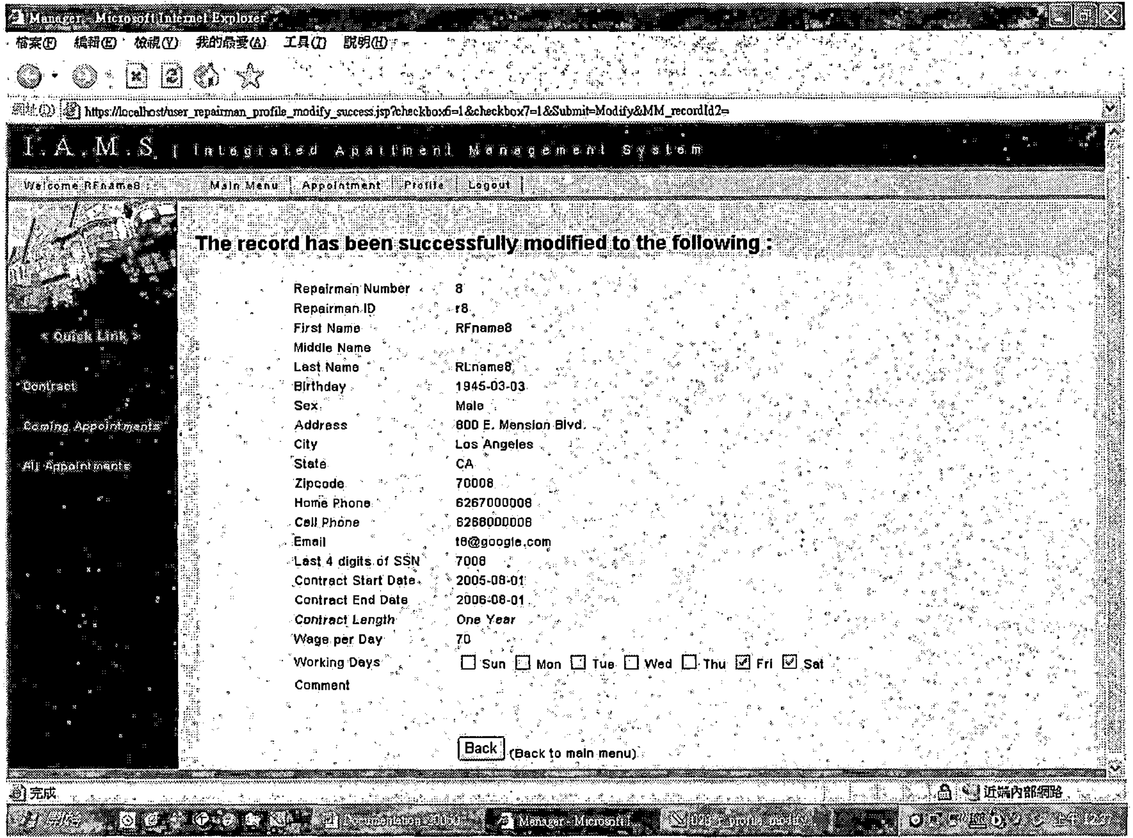

Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_tenant_profile_modify.jsp?Submit=Modify&MM_recordId2=
I.A.M.S | Integrated Apartment Management System
Welcome TFname9 : Main Menu | Appointment | Profile | Logout
< Quick Link >
Contract
Payment History
Coming Appointments
Make an Appointment
完成
近端內部網路

Modify the record:

Tenant Number	9	
Tenant ID	t9	(Atmost 20 Characters)
Password	●●●●	(Atmost 20 Characters)
Retype Password	●●●●	
First Name	TFname9	
Middle Name		
Last Name	TLname9	
Birthday	1981-08-09	
Sex	Female	
Address	301 E. Cerrito St.	(Atmost 80 Characters)
City	Monterey Park	(Atmost 30 Characters)
State	CA	
Zipcode	90009	
Home Phone	6261000009	(Numbers Only Including Area Code)
Cell Phone	6262000009	(Numbers Only Including Area Code)
Email	t9@gmail.com	(Atmost 60 Characters)
Last 4 digits of SSN	9999	
Contract Start Date	2006-02-01	
Contract End Date	2006-08-01	

Figure 28. Modify the Profile Page

The page shown in Figure 29 is a notice that the record has been successfully modified. Another reason is to ensure nothing has been modified by accident. In this case, the address is modified to a new one so that the record is completely and successfully modified.



Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/user_repairman_profile_modify_success.jsp?checkbox6=1&checkbox7=1&Submit=Modify&MM_recordId2=
I.A.M.S | Integrated Apartment Management System
Welcome RFname8 :
Main Menu | Appointment | Profile | Logout |
< Quick Link >
Contract
Coming Appointments
All Appointments
完成
近端內部網路

The record has been successfully modified to the following :

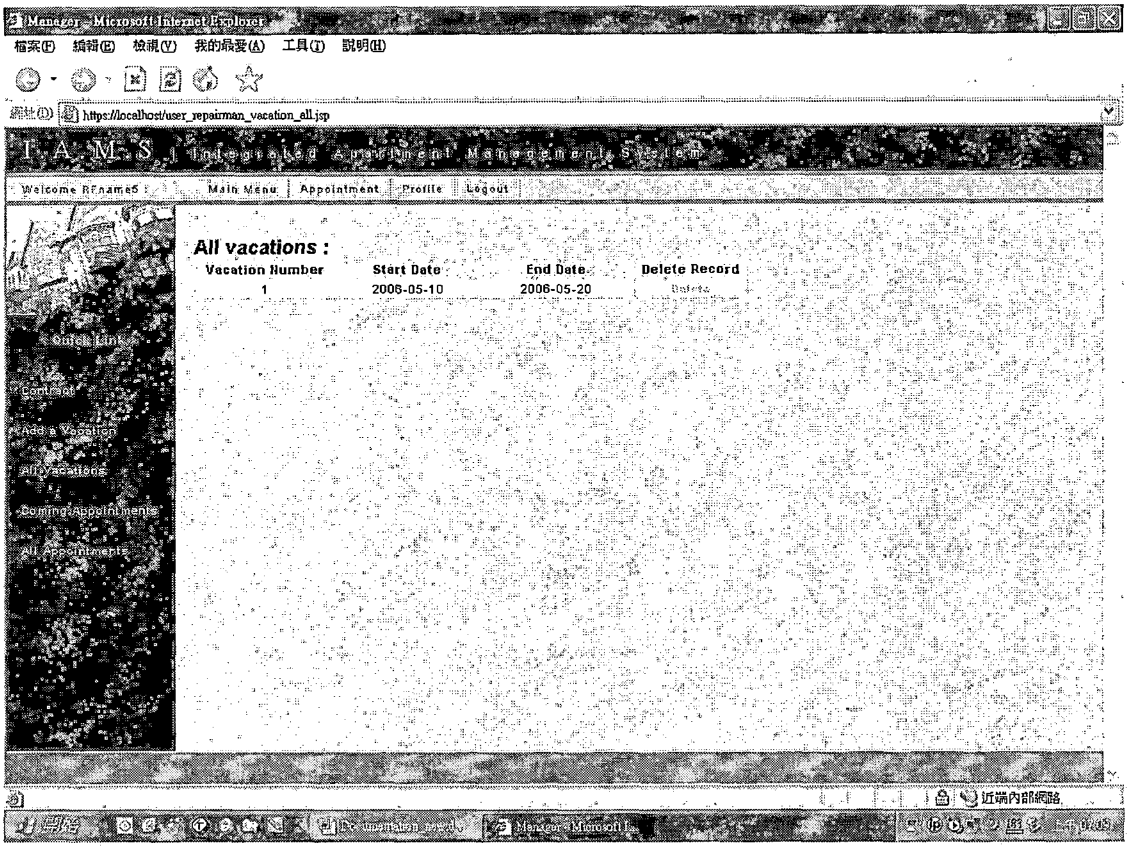
Repairman Number	8
Repairman ID	r8
First Name	RFname8
Middle Name	
Last Name	RLname8
Birthday	1945-03-03
Sex	Male
Address	800 E. Mension Blvd.
City	Los Angeles
State	CA
Zipcode	70008
Home Phone	6267000008
Cell Phone	6268000008
Email	t8@google.com
Last 4 digits of SSN	7008
Contract Start Date	2005-08-01
Contract End Date	2006-08-01
Contract Length	One Year
Wage per Day	70
Working Days	□ Sun □ Mon □ Tue □ Wed □ Thu ☑ Fri ☑ Sat
Comment	

Back (Back to main menu)

Figure 29. Successfully Modify Page

4.5.5 Vacation Page

The page displays all vacations of the repairman. This function provides a repairman to mark the days of a vacation so that tenants and managers will not make an appointment in those days. In this page, the repairman can delete his records of vacations.

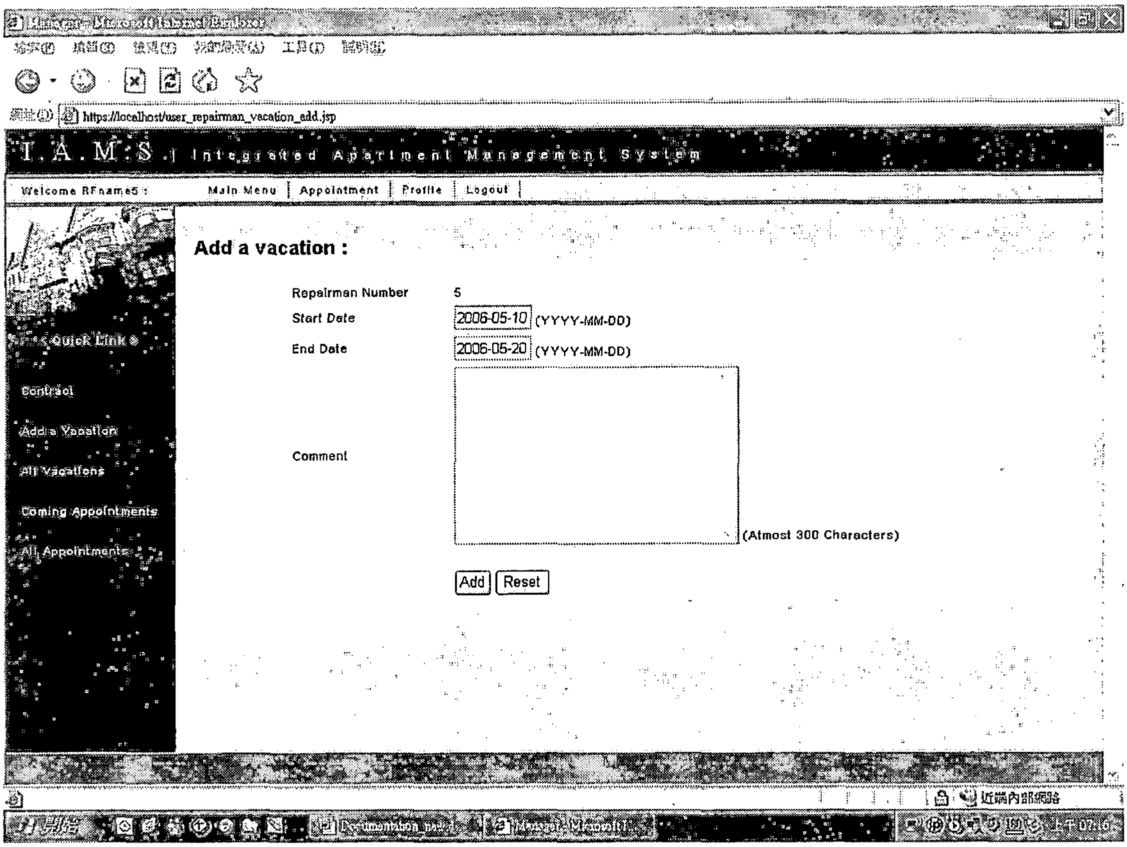

Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_repairman_vacation_all.jsp
I. A. M. S | Integrated Appointment Management System
Welcome RFname5
Main Menu
Appointment
Profile
Logout
Quick Link
Contract
Add a Vacation
All Vacations
Coming Appointments
All Appointments
近端內部網路

All vacations :

Vacation Number	Start Date	End Date	Delete Record
1	2006-05-10	2006-05-20	Delete

Figure 30. All Vacation Page

The following figure shows adding a vacation. In this page, a repairman can mark a period of time from a start date to an end date as the vacation. If an appointment's date is covered within one of those days, the appointment will be deleted and the system will notice tenants and the manager by an email automatically.


https://localhost/user_repairman_vacation_add.jsp
I.A.M.S | Integrated Apartment Management System
Welcome RFname5 :
Main Menu | Appointment | Profile | Logout |
Quick Link
Control
Add a Vacation
All Vacations
Coming Appointments
All Appointments
Add
Reset

Add a vacation :

Repairman Number 5

Start Date 2006-05-10 (YYYY-MM-DD)

End Date 2006-05-20 (YYYY-MM-DD)

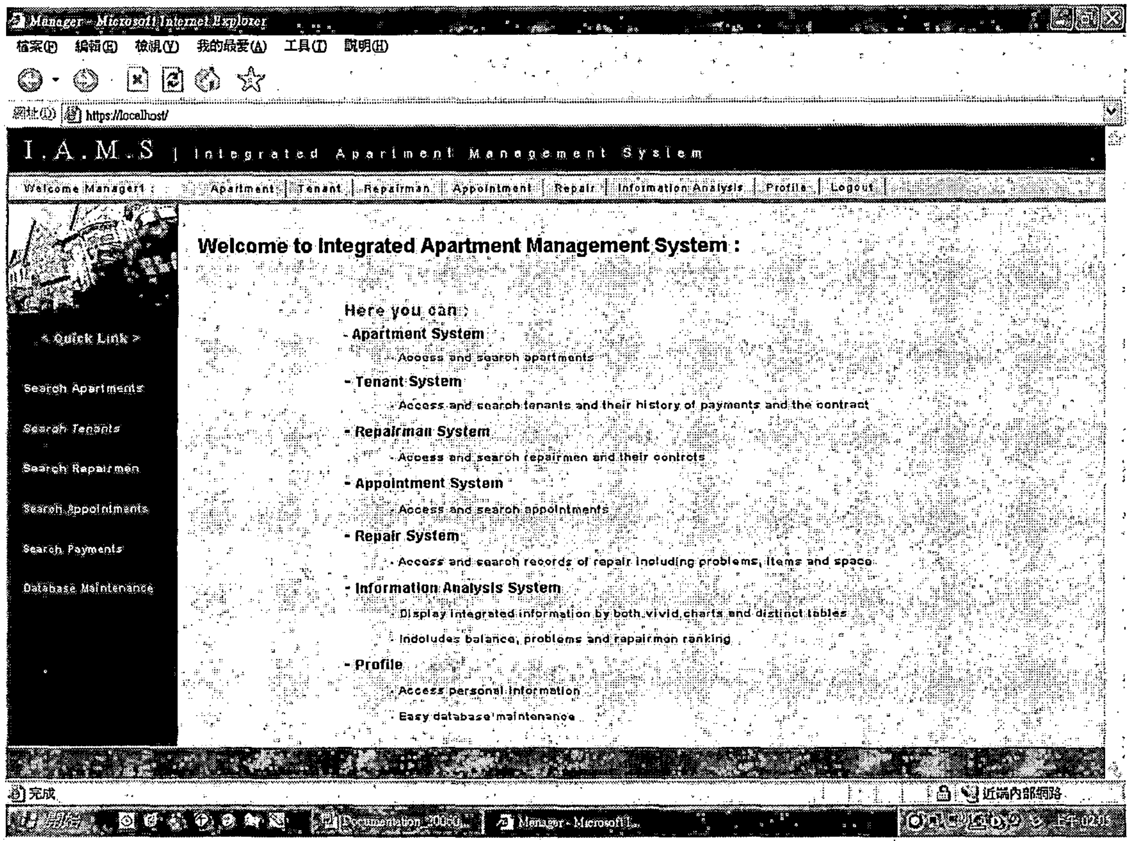
Comment (Atmost 300 Characters)

Figure 31. Add a Vacation Page

4.6 Graphic User Interface for Manager

4.6.1 Manager Main Page

This is the main page for a manager, where the manager can access all information of IAMS. There are also two sections in the page, the navigator bar on top and the left section of the page, which is the section used for providing quick links, same as what we mentioned before. There are eight main functions listed in the navigator bar, giving a manager a whole idea about the system. Appointment system, profile system and logout system are similar to interfaces of tenant and repairman. In addition, a manager can access and search data of apartments, tenants, repairmen, repair and information analysis, which will be discussed in detail respectively later.



Welcome to Integrated Apartment Management System :

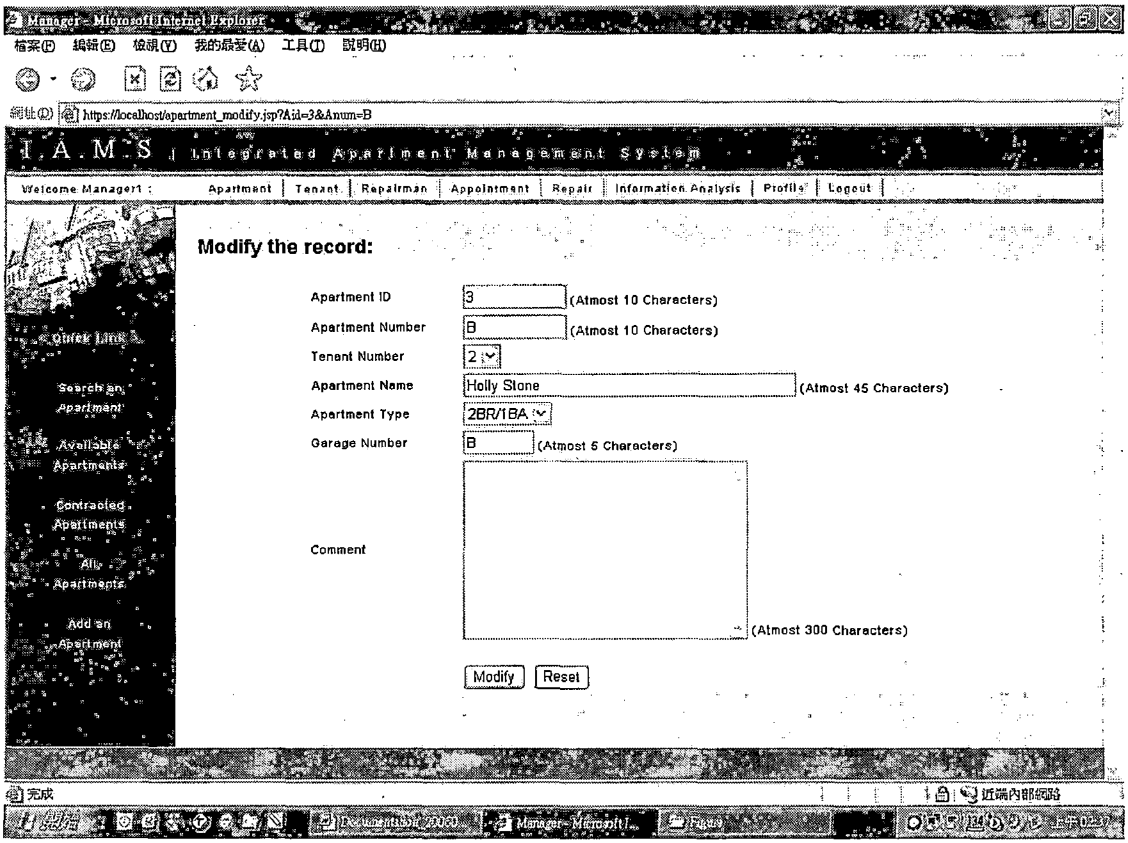
Here you can :

- Apartment System
  - Access and search apartments
- Tenant System
  - Access and search tenants and their history of payments and the contract
- Repairman System
  - Access and search repairmen and their contrcts
- Appointment System
  - Access and search appointments
- Repair System
  - Access and search records of repair including problems, items and space
- Information Analysis System
  - Display integrated information by both vivid charts and distinct tables
  - Indcludes balance, problems and repairmen ranking
- Profile
  - Access personal information
  - Easy database maintenance

Figure 32. Manager Main Page

4.6.2 Manage Apartment Page

The functions of add and modify an apartment will be discussed together, because the operation of these two functions are the same. When a manager wants to add or change the tenant of the apartment, the manager can easily select a tenant who is under contract from the pull down menu. The manager also can choose an apartment type in the same way. After pushing add or modify button, the data will be check by the Java Script for the data type first, and then access to the database. If everything is fine, the manager will see a confirmation page. Otherwise, it forward to a page, which shows the error message.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/apartment_modify.jsp?Aid=3&Anum=B
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout |
Quick Link
Search an Apartment
Available Apartments
Contracted Apartments
All Apartments
Add an Apartment
Modify
Reset
完成
近端內部網路
Manager - Microsoft I...

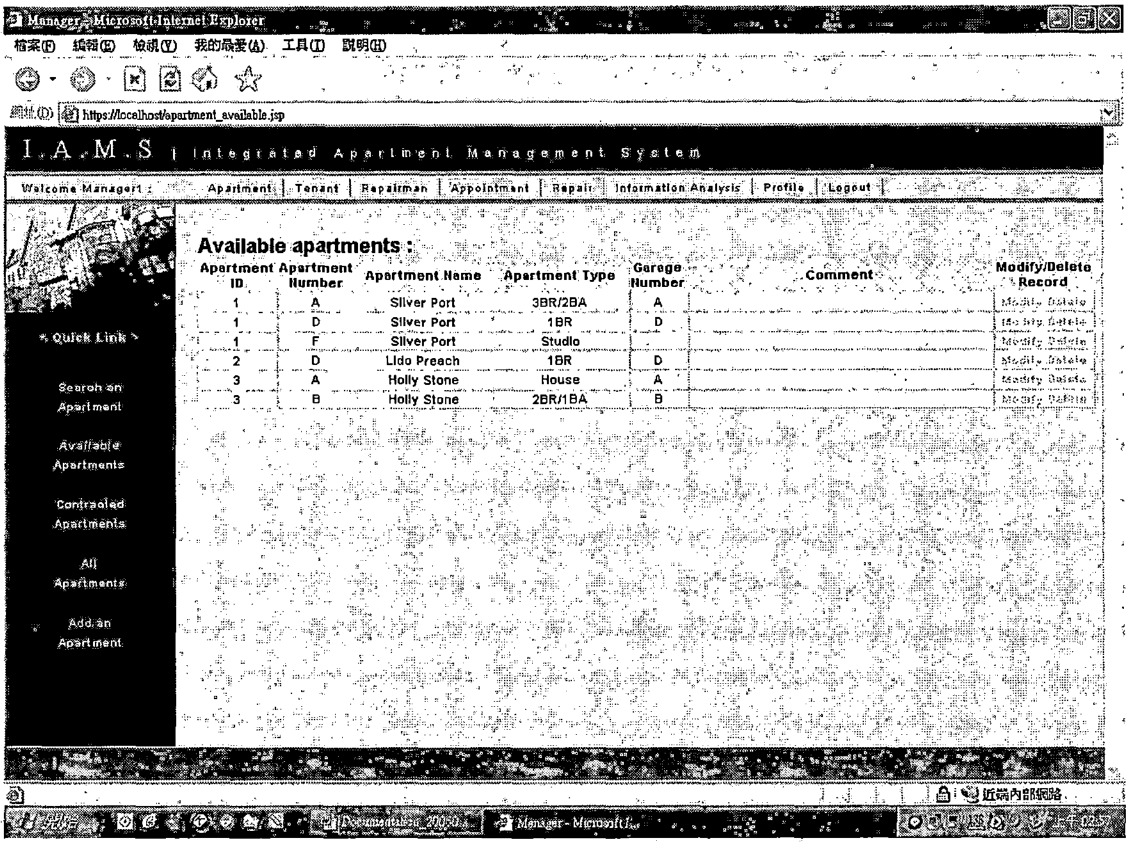
Modify the record:

Apartment ID	3	(Atmost 10 Characters)
Apartment Number	B	(Atmost 10 Characters)
Tenant Number	2	
Apartment Name	Holly Stone	(Atmost 45 Characters)
Apartment Type	2BR/1BA	
Garage Number	B	(Atmost 5 Characters)
Comment		(Atmost 300 Characters)

Figure 33. Modify Apartments Page

4.6.3 All Apartments Page

The functions of showing available, contracted and all apartments will be discussed together. These functions allow a new tenant to ask for any available or to find any contracted apartments. Every searched record could be modified or deleted through the link modify and delete listed in the right part of the table. Figure 34 is an example of showing available apartments.



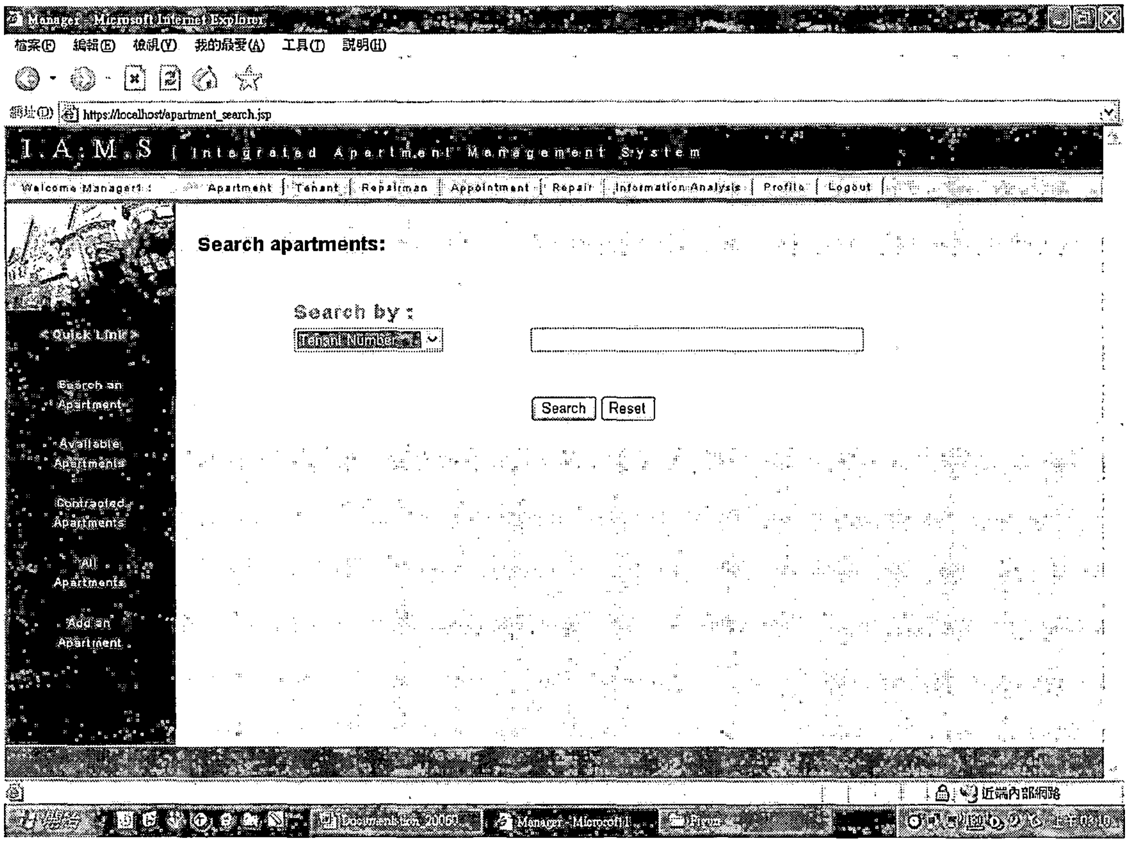
Available apartments :

Apartment ID	Apartment Number	Apartment Name	Apartment Type	Garage Number	Comment	Modify/Delete Record
1	A	Silver Port	3BR/2BA	A		Modify Delete
1	D	Silver Port	1BR	D		Modify Delete
1	F	Silver Port	Studio			Modify Delete
2	D	Lido Preach	1BR	D		Modify Delete
3	A	Holly Stone	House	A		Modify Delete
3	B	Holly Stone	2BR/1BA	B		Modify Delete

Figure 34. Available Apartments Page

4.6.4 Search an Apartment Page

In this page, a manager can search an apartment by apartment id, apartment number, apartment name, apartment type, tenant id, tenant's first name and tenant's last name. In order to perform searching by tenant's first name and tenant's last name, a skill of left joint is used for retrieving the tenant' name in SQL. The result will present on the page, if there exists any records for querying. Otherwise, it forward to a page, which shows no records exist.



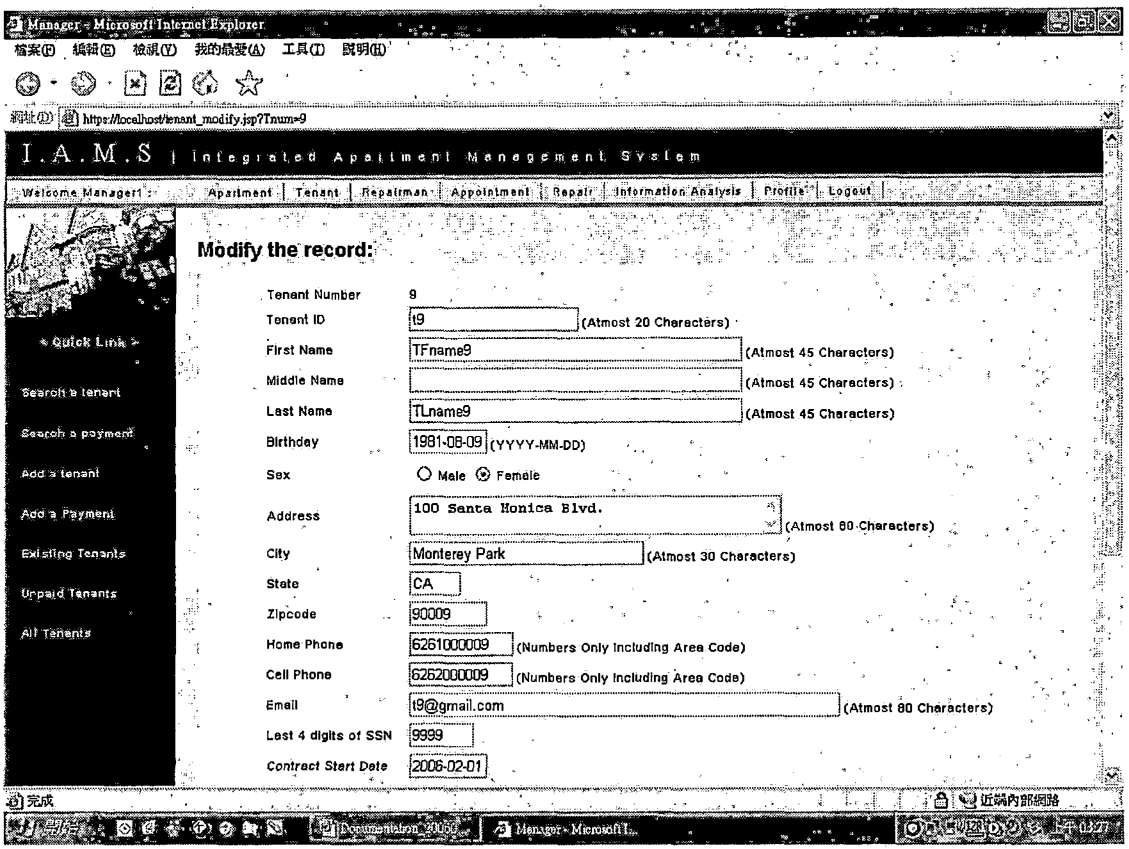
Search apartments:

Search by : Tenant Number

Figure 35. Search an Apartment Page

4.6.5 Manage Tenant Page

The functions of add and modify a tenant will be discussed together, because how to handle these two things are the same. When a new tenant move in or a tenant want to resign the contract, the manager can create or change information of the tenant here. When create a new account, it is not necessary to input the tenant number because the system will generate a one that no one is using now. If everything is going well, the manager will see a confirmation page. Otherwise, it forwards to an error message page. Figure 36 is an example of modifying the data of the tenant.



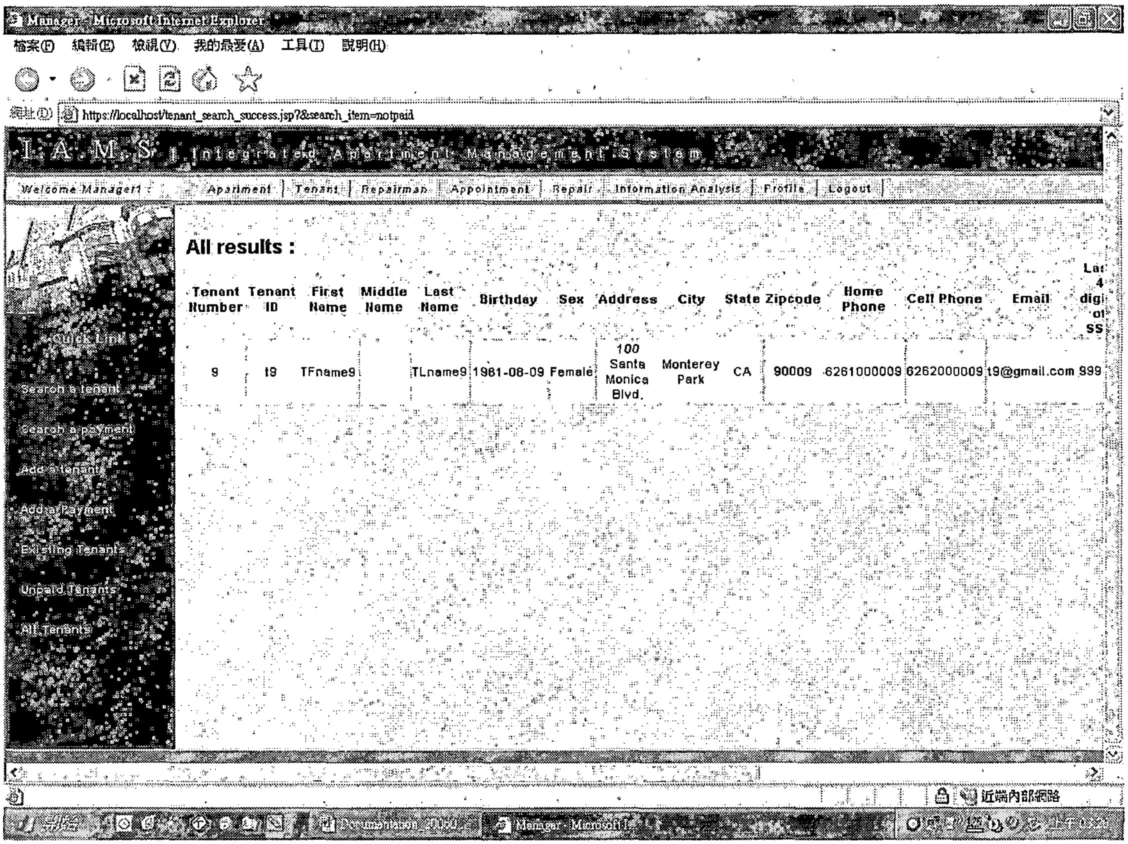
Modify the record:

Tenant Number	9	
Tenant ID	t9	(Atmost 20 Characters)
First Name	TFname9	(Atmost 45 Characters)
Middle Name		(Atmost 45 Characters)
Last Name	TLname9	(Atmost 45 Characters)
Birthday	1981-08-09	(YYYY-MM-DD)
Sex	○ Male ● Female	
Address	100 Santa Monica Blvd.	(Atmost 80 Characters)
City	Monterey Park	(Atmost 30 Characters)
State	CA	
Zipcode	90009	
Home Phone	6261000009	(Numbers Only Including Area Code)
Cell Phone	6262000009	(Numbers Only Including Area Code)
Email	t9@gmail.com	(Atmost 80 Characters)
Last 4 digits of SSN	9999	
Contract Start Date	2006-02-01	

Figure 36. Modify Tenants Page

4.6.6 All Tenants Page

The functions of showing existing, unpaid and all tenants will be discussed together here. A manager can easily know which tenant has not paid for his rent this month by the function of unpaid tenant. Figure 37 is an example of unpaid tenants.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/tenant_search_success.jsp?&search_item=notpaid
I. A. M. S. Integrated Apartment Management System
Welcome Manager1 : Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
Quick Link
Search a tenant
Search a payment
Add a tenant
Add a Payment
Existing Tenants
Unpaid Tenants
All Tenants
近端內部網路

All results :

Tenant Number	Tenant ID	First Name	Middle Name	Last Name	Birthday	Sex	Address	City	State	Zipcode	Home Phone	Cell Phone	Email	La: 4 digi of SS
9	t9	TFname9		TLname9	1981-08-09	Female	100 Santa Monica Blvd.	Monterey Park	CA	90009	6261000009	6262000009	t9@gmail.com	999

Figure 37. Unpaid Tenants Page

4.6.7 Search a Tenant Page

Similar to the search pages mention before, this page perform searching possible tenant according to the requirement. The result will present on the page, if there exists any records for querying. Otherwise, it forward to a page which shows no records exist.

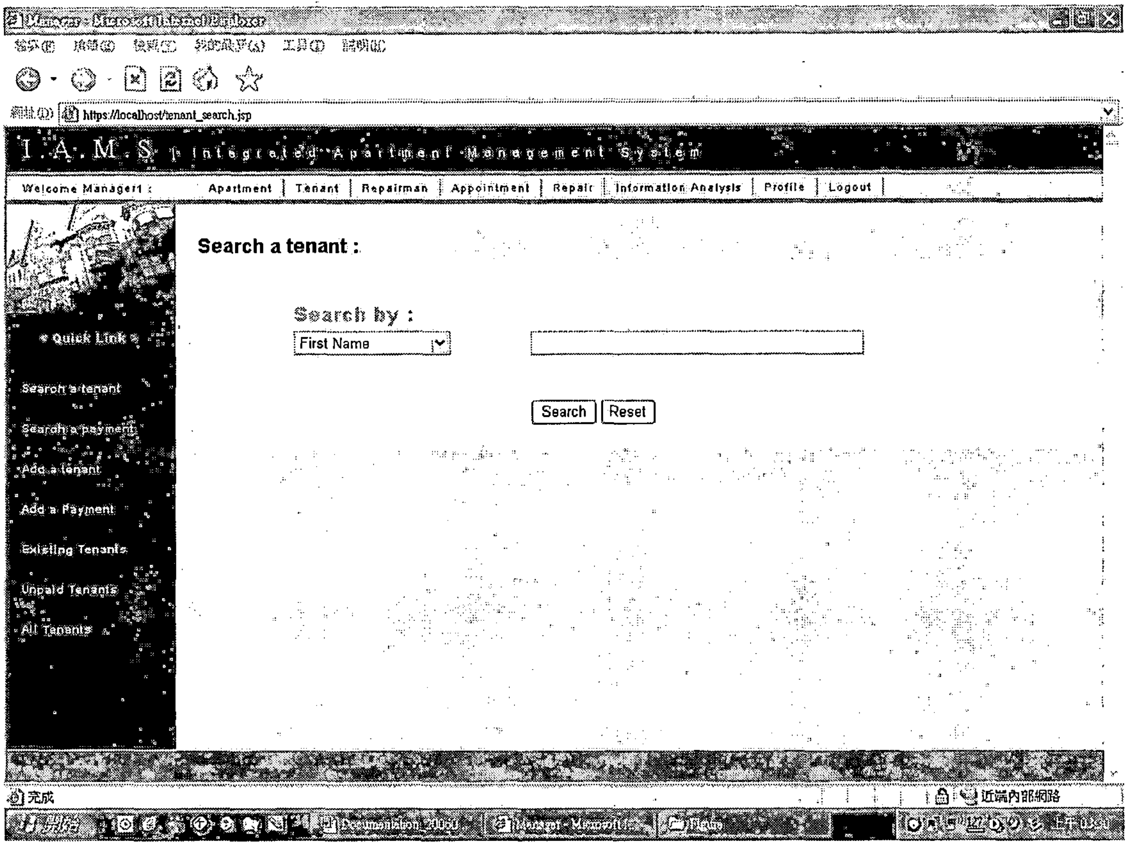
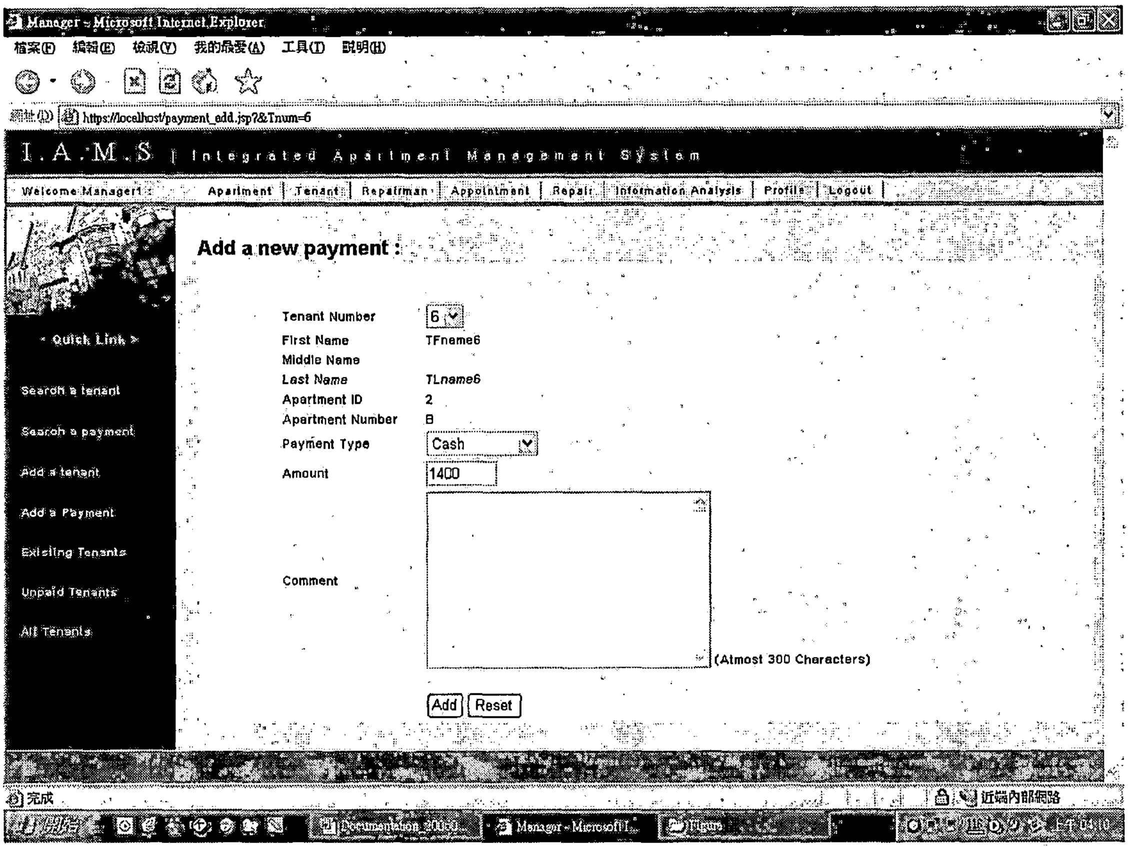


Figure 38. Search a Tenant Page

4.6.8 Manage a Payment Page

With these two functions, a manager can add or delete a payment by choosing an existing tenant from the list. The name, apartment id, apartment number and the amount will be automatically changed when the manager chooses a different tenant.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/payment_add.jsp?&Tnum=6
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 : Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
< Quick Link >
Search a tenant
Search a payment
Add a tenant
Add a Payment
Existing Tenants
Unpaid Tenants
All Tenants
Add
Reset
完成
近端內部網路

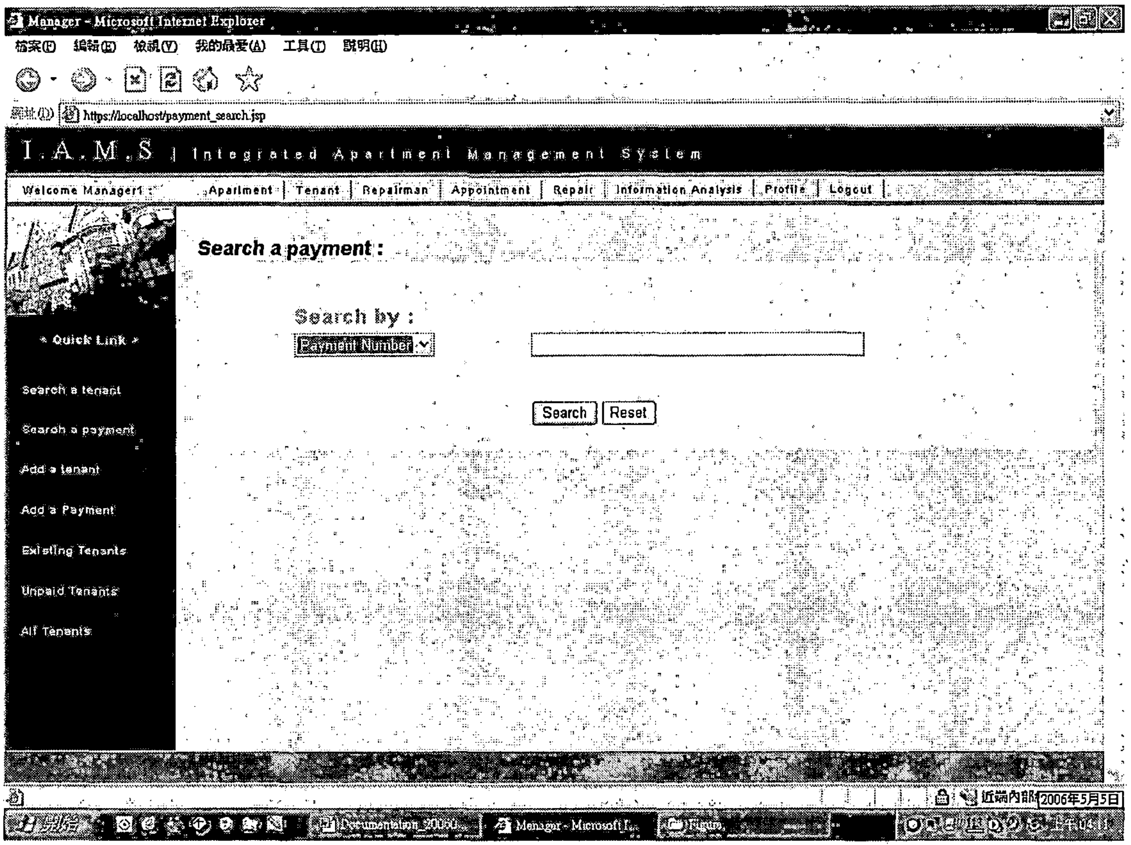
Add a new payment :

Tenant Number 6
First Name TFname6
Middle Name
Last Name TLname6
Apartment ID 2
Apartment Number 8
Payment Type Cash
Amount 1400
Comment
(Atmost 300 Characters)

Figure 39. Add a Payment Page

4.6.9 Search a Payment Page

Similar to the search pages mention before, this page provide searching payment function according to the requirement.



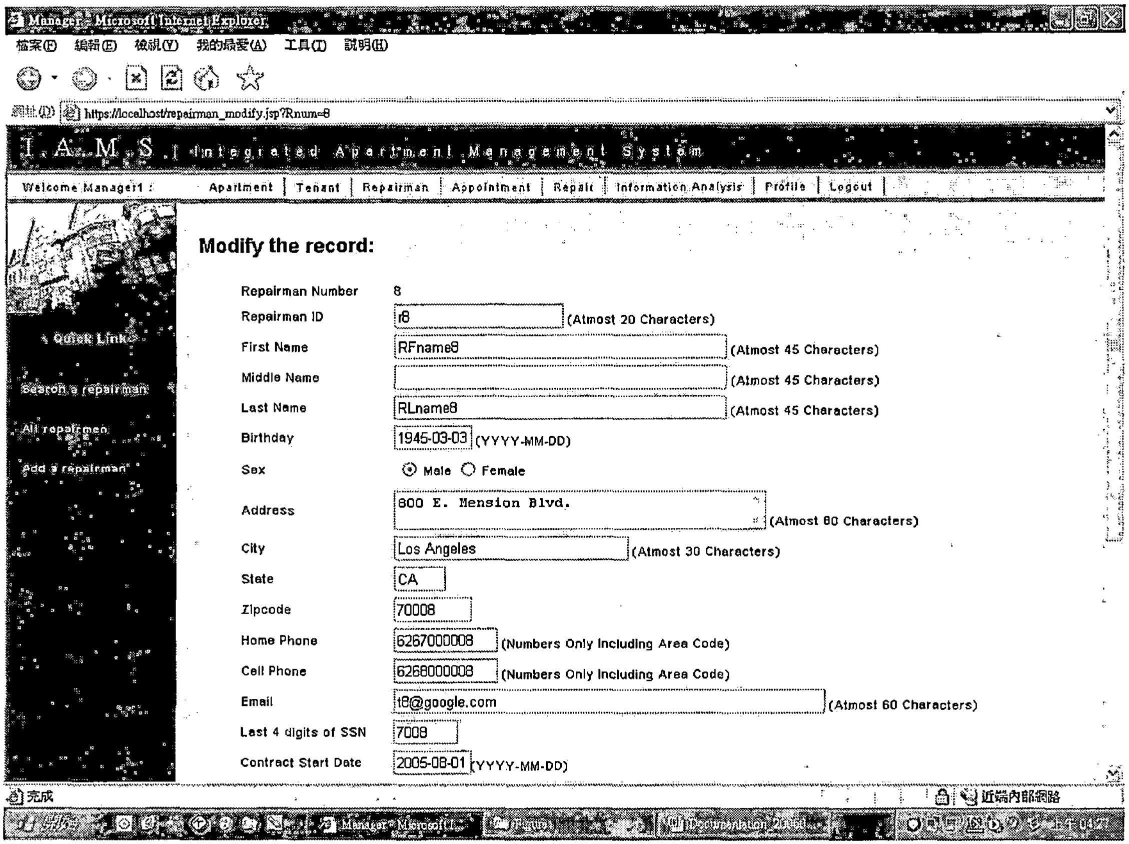
Search a payment :

Search by : Payment Number

Figure 40. Search a Payment Page

4.6.10 Manage Repairmen Page

The functions are same as add and modify a tenant function. The only different thing is one for tenant and the function here is for repairmen.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/repairman_modify.jsp?Rnum=8
I.A.M.S. Integrated Apartment Management System
Welcome Manager1 :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
Quick Links
Search a repairman
All repairmen
Add a repairman
完成
近端內部網路

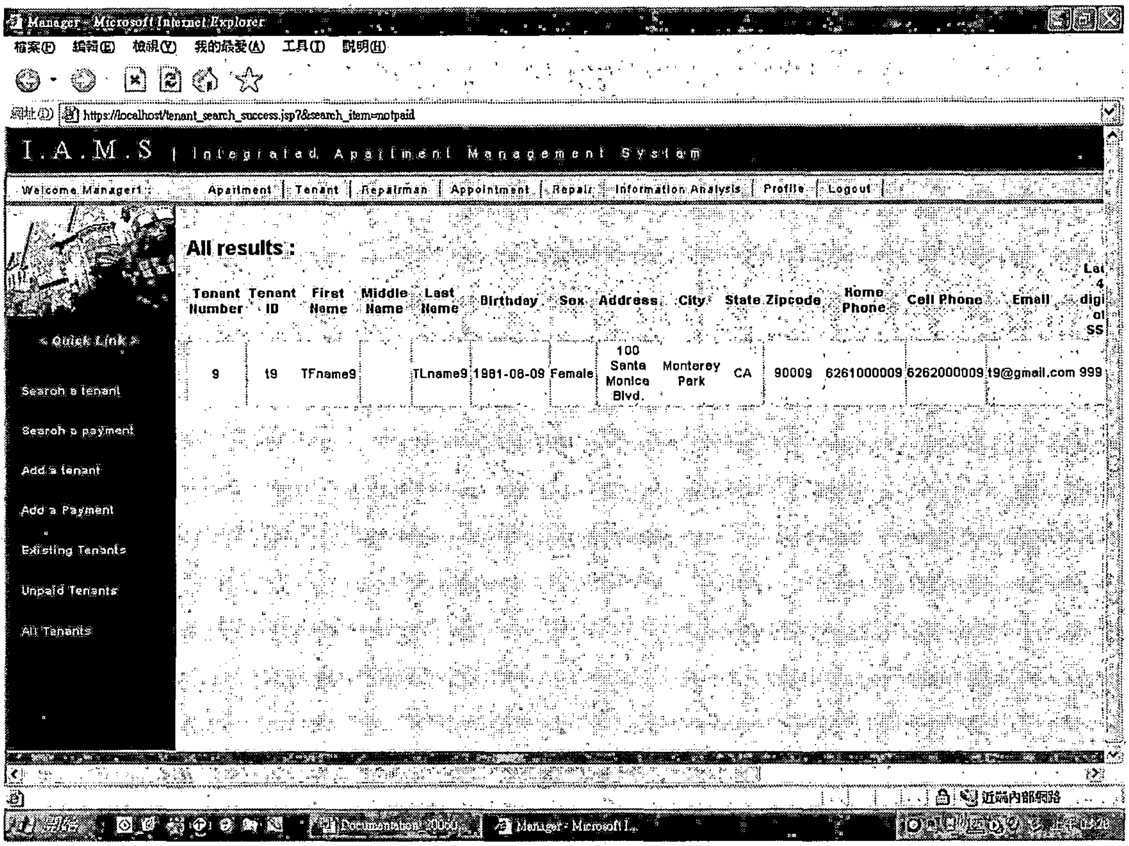
Modify the record:

Repairman Number	8	
Repairman ID	r8	(Atmost 20 Characters)
First Name	RFname8	(Atmost 45 Characters)
Middle Name		(Atmost 45 Characters)
Last Name	RLname8	(Atmost 45 Characters)
Birthday	1945-03-03	(YYYY-MM-DD)
Sex	● Male ○ Female	
Address	800 E. Mension Blvd.	(Atmost 60 Characters)
City	Los Angeles	(Atmost 30 Characters)
State	CA	
Zipcode	70008	
Home Phone	6267000008	(Numbers Only Including Area Code)
Cell Phone	6268000008	(Numbers Only Including Area Code)
Email	r8@google.com	(Atmost 60 Characters)
Last 4 digits of SSN	7008	
Contract Start Date	2005-08-01	(YYYY-MM-DD)

Figure 41. Modify Repairmen Page

4.6.11 All Repairmen Page

The function provides a manager idea about all repairmen by listing the date for each repairman.



All results :

Tenant Number	Tenant ID	First Name	Middle Name	Last Name	Birthday	Sex	Address	City	State	Zipcode	Home Phone	Cell Phone	Email	Lat 4 digi of SS
9	t9	TFname9		TLname9	1981-08-09	Female	100 Santa Monica Blvd.	Monterey Park	CA	90009	6261000009	6262000009	t9@gmail.com	999

Figure 42. All Repairmen Page

4.6.12 Search a Repairman Page

Similar to the search pages mention before, this page perform searching possible repairmen according to the requirement.

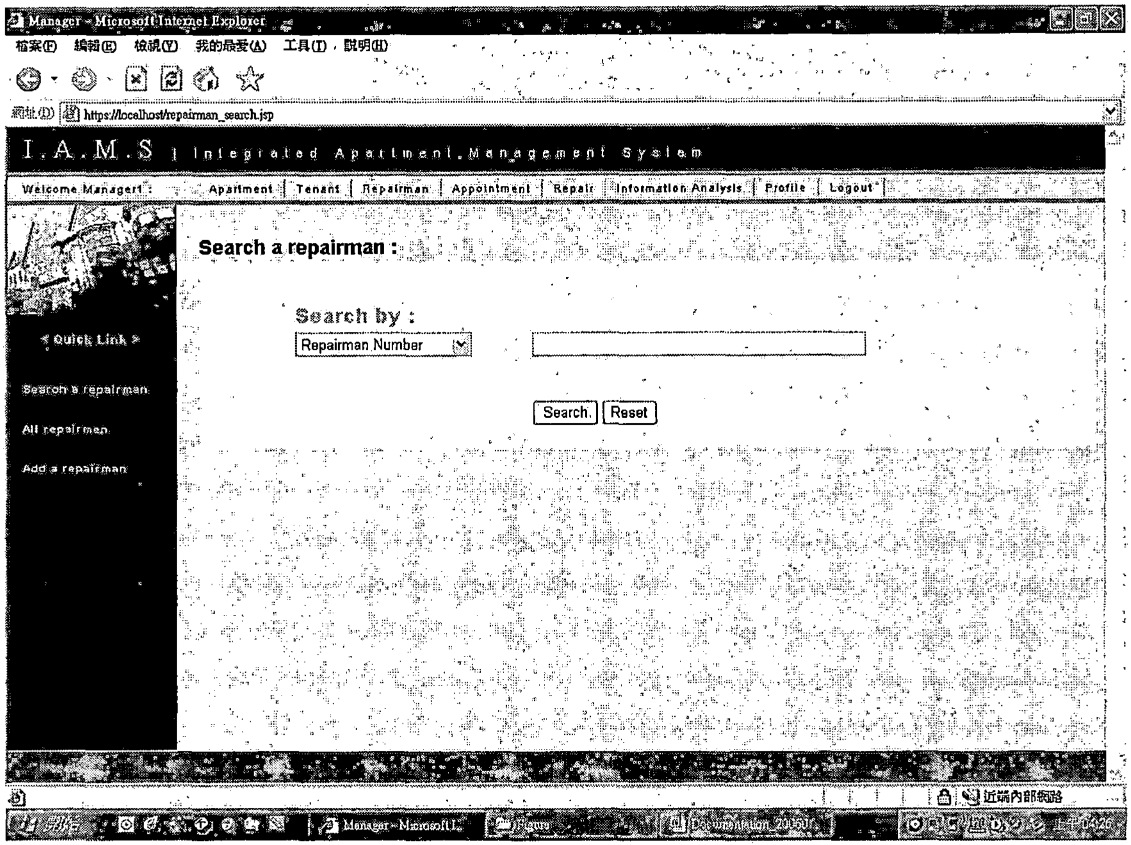
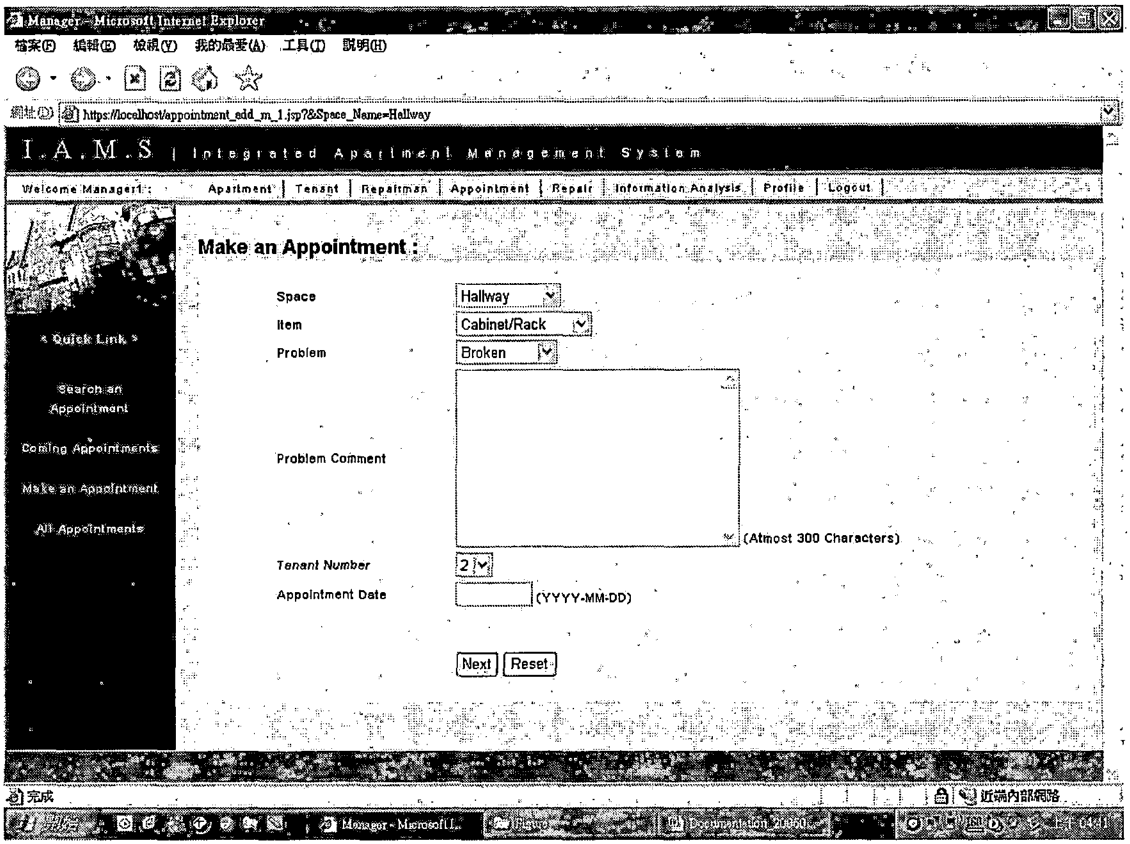

Manager - Microsoft Internet Explorer
https://localhost/repairman_search.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager! : Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
< Quick Link >
Search a repairman
All repairman
Add a repairman
Search a repairman :
Search by :
Repairman Number
Search
Reset

Figure 43. Search Repairman Page

4.6.13 Manage an Appointment Page

The function is the same as what we mentioned before. Appointments can either be made by tenants or managers. A tenant can only make appointments for himself, but a manager can make appointments for every tenant. The page is showed in Figure 44 below.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_add_m_1.jsp?&Space_Name=Hallway
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
« Quick Link »
Search an Appointment
Coming Appointments
Make an Appointment
All Appointments
完成
近端內部網路

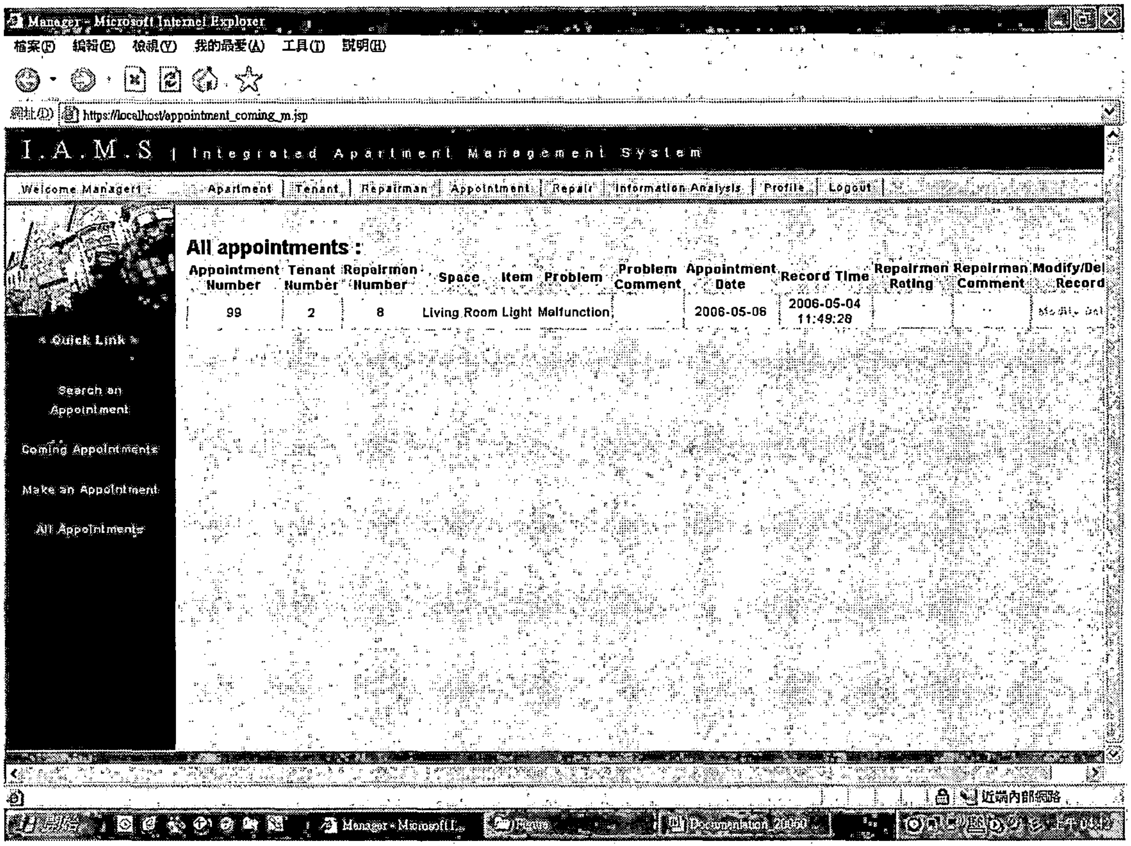
Make an Appointment :

Space: Hallway
Item: Cabinet/Rack
Problem: Broken
Problem Comment: (Atmost 300 Characters)
Tenant Number: 2
Appointment Date: (YYYY-MM-DD)

Figure 44. Make an Appointment Page

4.6.14 All Appointments Page

This function enables a manager know what are upcoming appointments so that he can have a clear idea what is going on recently.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_coming_m.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 : Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout |
« Quick Link »
Search an Appointment
Coming Appointments
Make an Appointment
All Appointments
近端內部網路
Manager - Microsoft I...
Documentation 20060...

All appointments :

Appointment Number	Tenant Number	Repairmen Number	Space	Item	Problem	Problem Comment	Appointment Date	Record Time	Repairmen Rating	Repairman Comment	Modify/Del Record
99	2	8	Living Room	Light	Malfunction		2006-05-06	2006-05-04 11:49:28			Modify Del

Figure 45. Coming Appointments Page

4.6.15 Search an Appointment Page

This function enables a manager to find a particular appointment by appointment number, tenant's name and number and repairman's name and number.

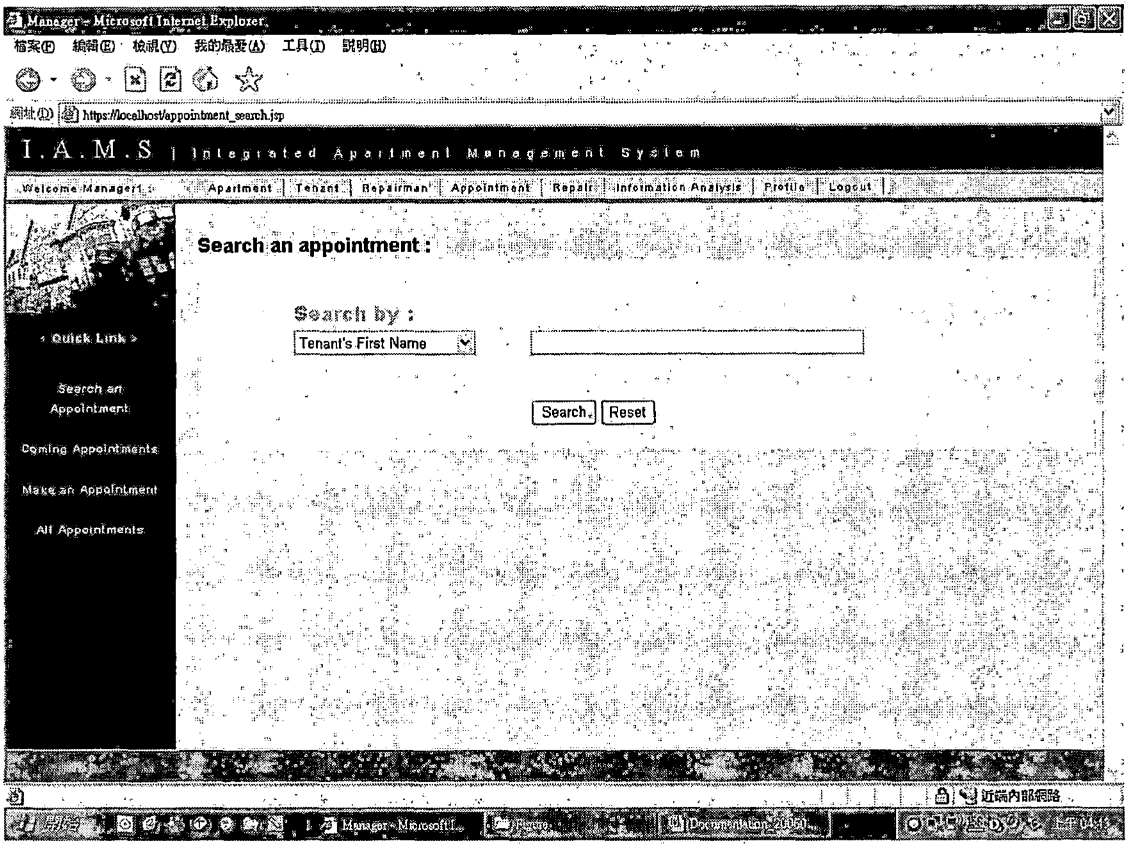
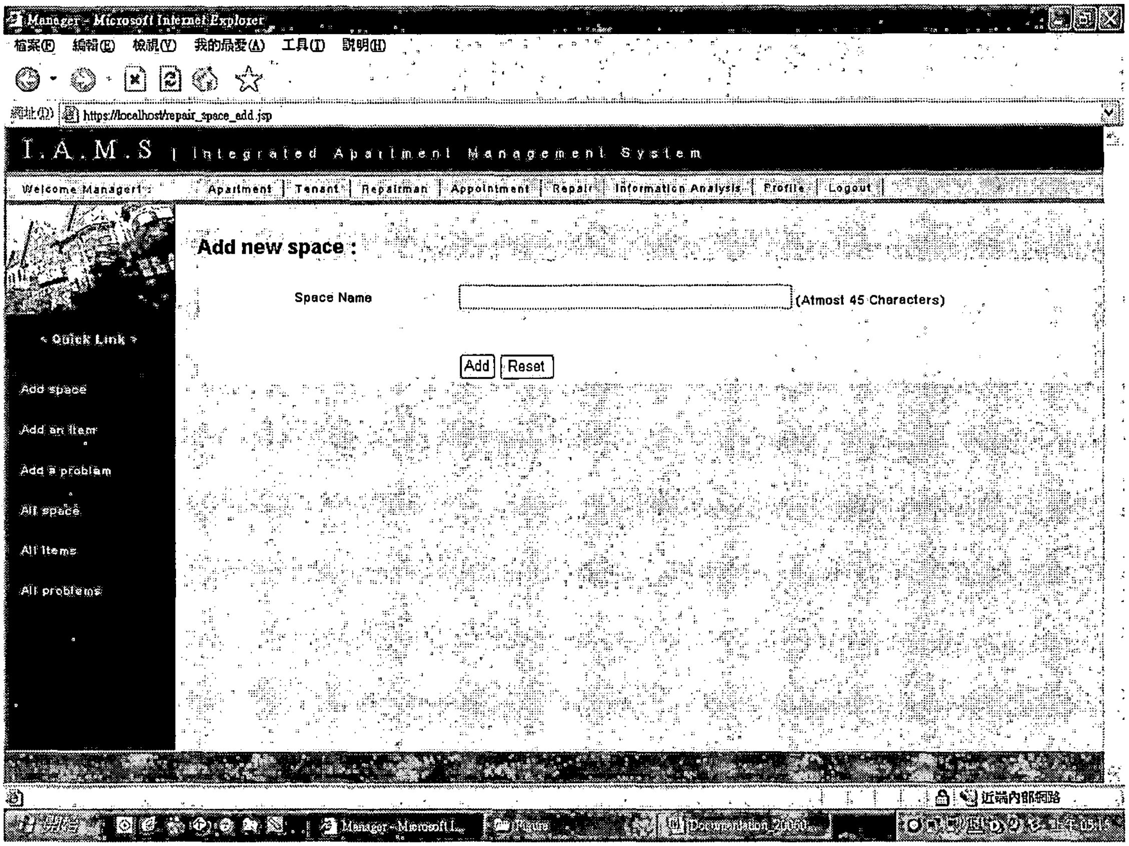

Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/appointment_search.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
< Quick Link >
Search an Appointment
Coming Appointments
Make an Appointment
All Appointments
Search an appointment :
Search by :
Tenant's First Name
Search
Reset
近端內部網路

Figure 46. Search an Appointments Page

4.6.16 Manage Repair Page

These two functions and three functions are discussed together, because how to handle these two functions to these three pages are the same. In order to make the system flexible to adapt to various situation, the space, item and problem are divided into three individual tables. There exist eight different spaces in the database.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/repair_space_add.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager!
Apartment
Tenant
Repairman
Appointment
Repair
Information Analysis
Profile
Logout
< Quick Link >
Add space
Add an item
Add a problem
All space
All items
All problems

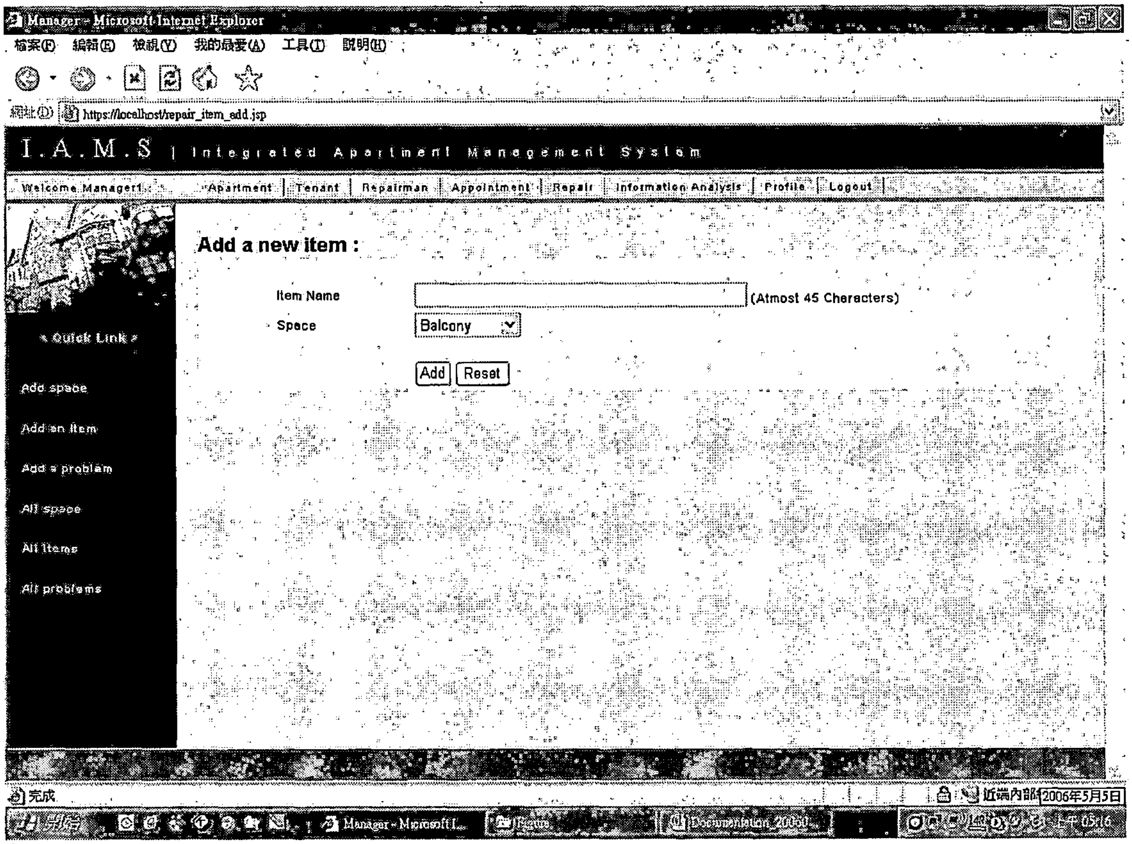
Add new space :

Space Name (Atmost 45 Characters)

Add Reset

Figure 47. Add Space Page

The next figure is about adding an item. Here is a point that each item has to belong to a space, where we added in the previous step. There exist many items, which belong to a space respectively. Therefore, a manager does not have to input all data from the scratch.



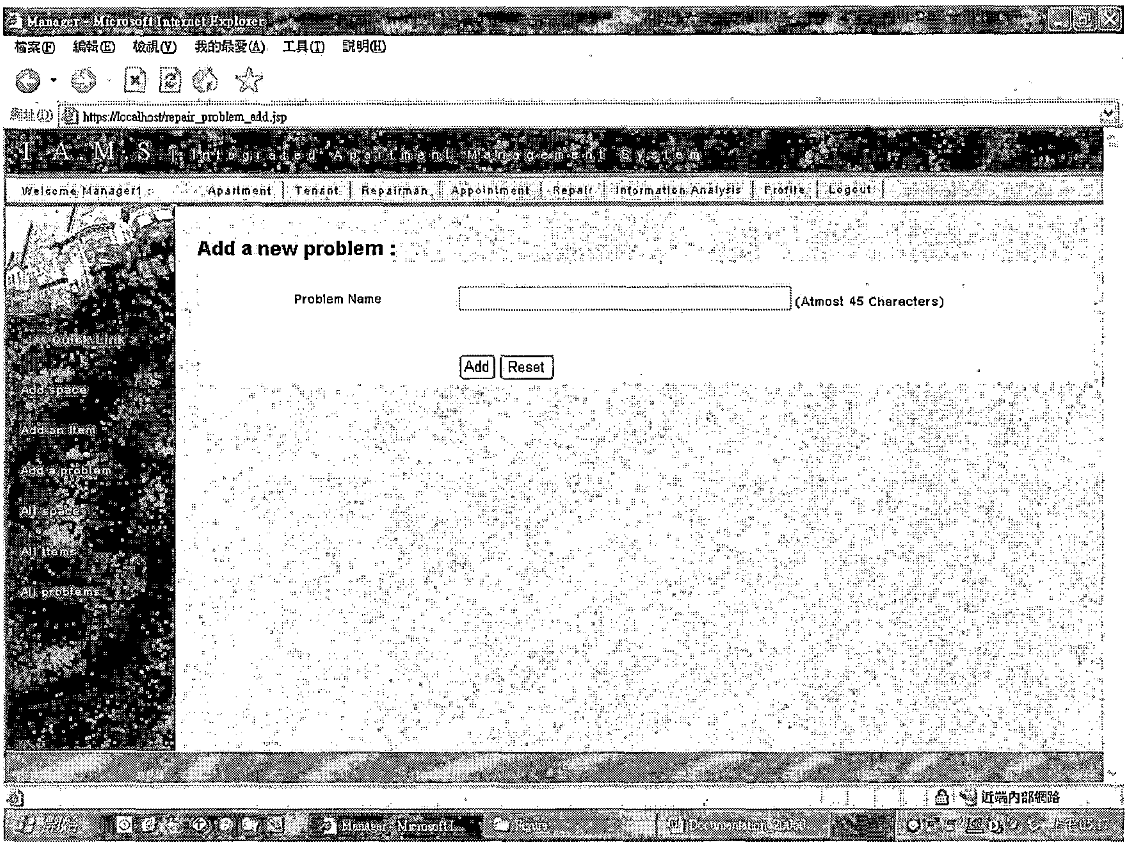
Add a new item :

Item Name (Atmost 45 Cherecters)

Space Balcony

Figure 48. Add an Item Page

The page, where a manager can add a new problem, is showed in Figure 49 below. There exist seven problems in the database such as broken, bugs, damaged, leaking, malfunction, stuck and other.

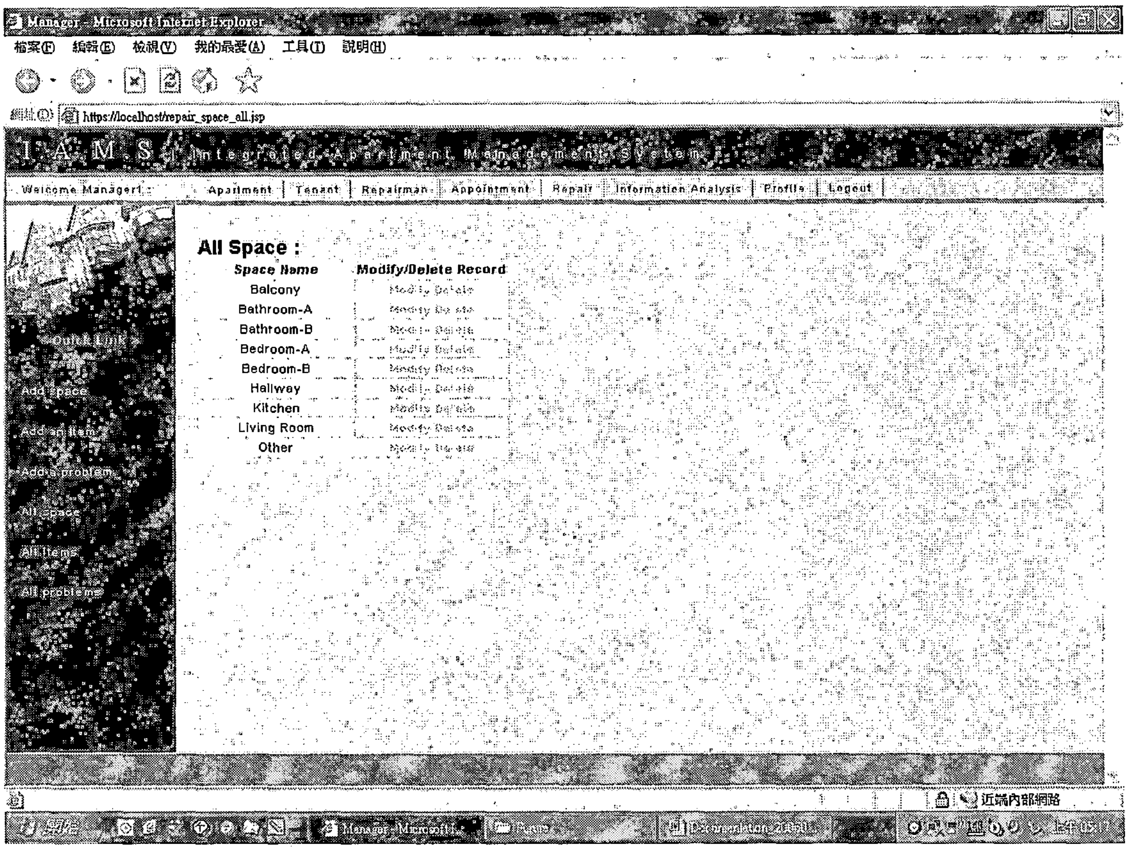


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/repair_problem_add.jsp
I A M S Integrated Apartment Management System
Welcome Manager1
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
Quick Link
Add space
Add an item
Add a problem
All spaces
All items
All problems
Add a new problem :
Problem Name
(Atmost 45 Characters)
Add
Reset
近端內部網路

Figure 49. Add a Problem Page

4.6.17 Search Repair Page

Managers can check the name of spaces, items and problems in these three pages respectively when they consider not to only just choose other every time, giving more detail categories of spaces, items and problems.

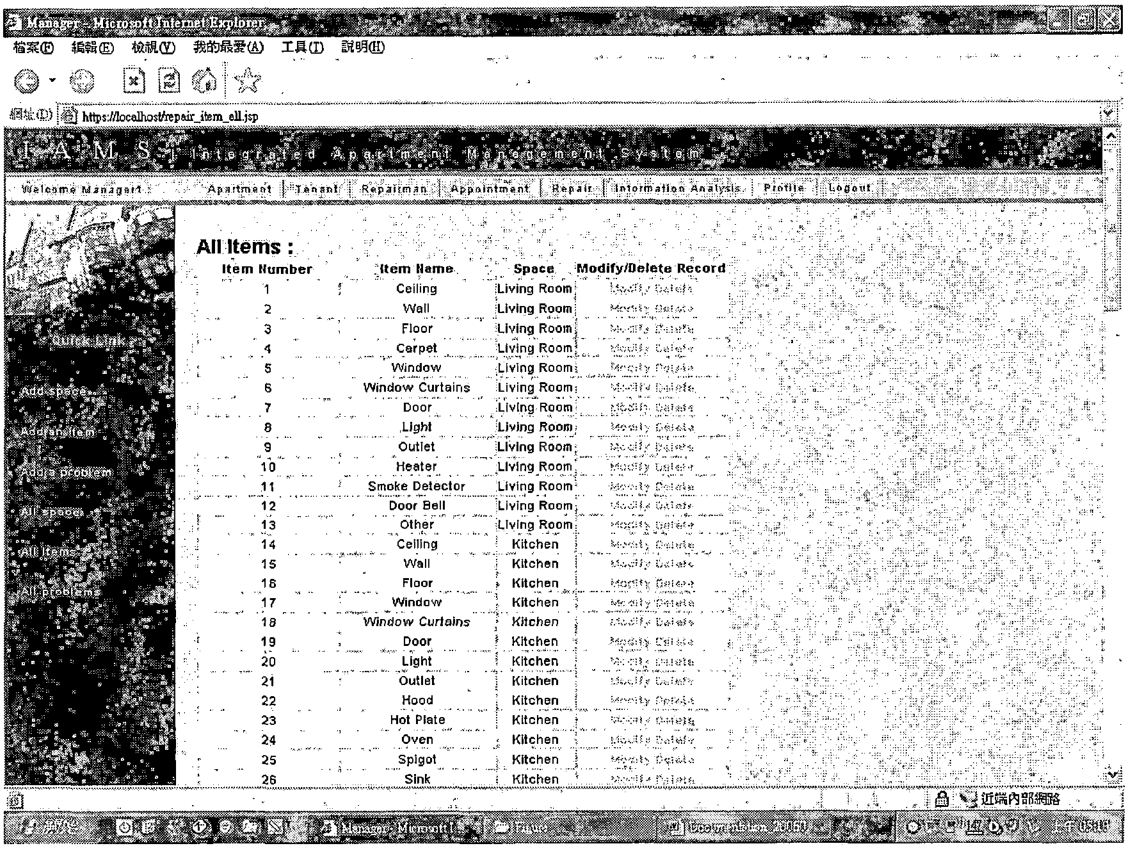


All Space :

Space Name	Modify/Delete Record
Balcony	Modify Delete
Bathroom-A	Modify Delete
Bathroom-B	Modify Delete
Bedroom-A	Modify Delete
Bedroom-B	Modify Delete
Hallway	Modify Delete
Kitchen	Modify Delete
Living Room	Modify Delete
Other	Modify Delete

Figure 50. All Space Page

The page shown in Figure 51 display all the records of items. The manager can easily modify or delete records of items by click the links modify and delete. The page will be forwarded to the page, either modify or delete page.



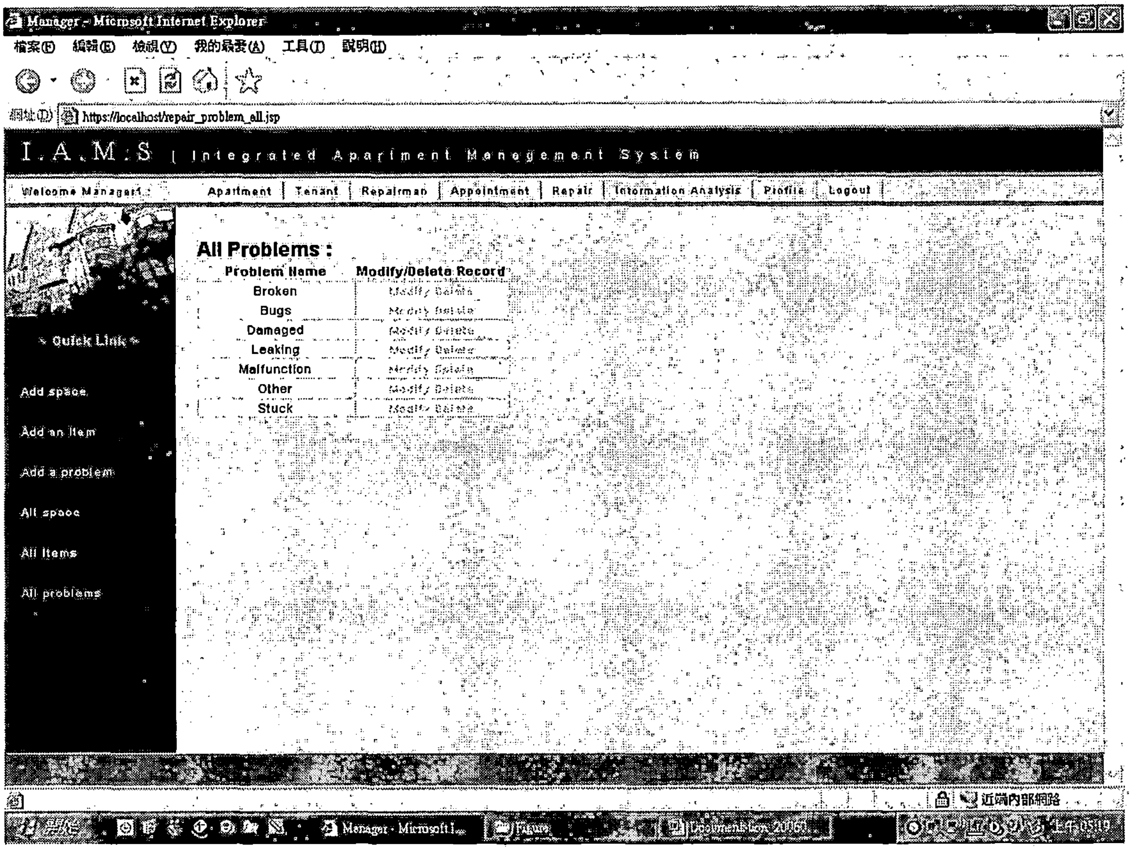
Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/repair_item_all.jsp
I.A.M.S Integrated Apartment Management System
Welcome Manager!
Apartment
Tenant
Repairman
Appointment
Repair
Information Analysis
Profile
Logout
Quick Link
Add space
Add an item
Add a problem
All spaces
All items
All problems
近端內部網路

All Items :

Item Number	Item Name	Space	Modify/Delete Record
1	Ceiling	Living Room	Modify Delete
2	Wall	Living Room	Modify Delete
3	Floor	Living Room	Modify Delete
4	Carpet	Living Room	Modify Delete
5	Window	Living Room	Modify Delete
6	Window Curtains	Living Room	Modify Delete
7	Door	Living Room	Modify Delete
8	Light	Living Room	Modify Delete
9	Outlet	Living Room	Modify Delete
10	Heater	Living Room	Modify Delete
11	Smoke Detector	Living Room	Modify Delete
12	Door Bell	Living Room	Modify Delete
13	Other	Living Room	Modify Delete
14	Ceiling	Kitchen	Modify Delete
15	Wall	Kitchen	Modify Delete
16	Floor	Kitchen	Modify Delete
17	Window	Kitchen	Modify Delete
18	Window Curtains	Kitchen	Modify Delete
19	Door	Kitchen	Modify Delete
20	Light	Kitchen	Modify Delete
21	Outlet	Kitchen	Modify Delete
22	Hood	Kitchen	Modify Delete
23	Hot Plate	Kitchen	Modify Delete
24	Oven	Kitchen	Modify Delete
25	Spigot	Kitchen	Modify Delete
26	Sink	Kitchen	Modify Delete

Figure 51. All Items Page

The page showed in Figure 52 display all the records of problems. The manager can also easily modify or delete records of problems by click the links modify and delete. The page will be forwarded to the page, either modify or delete page.



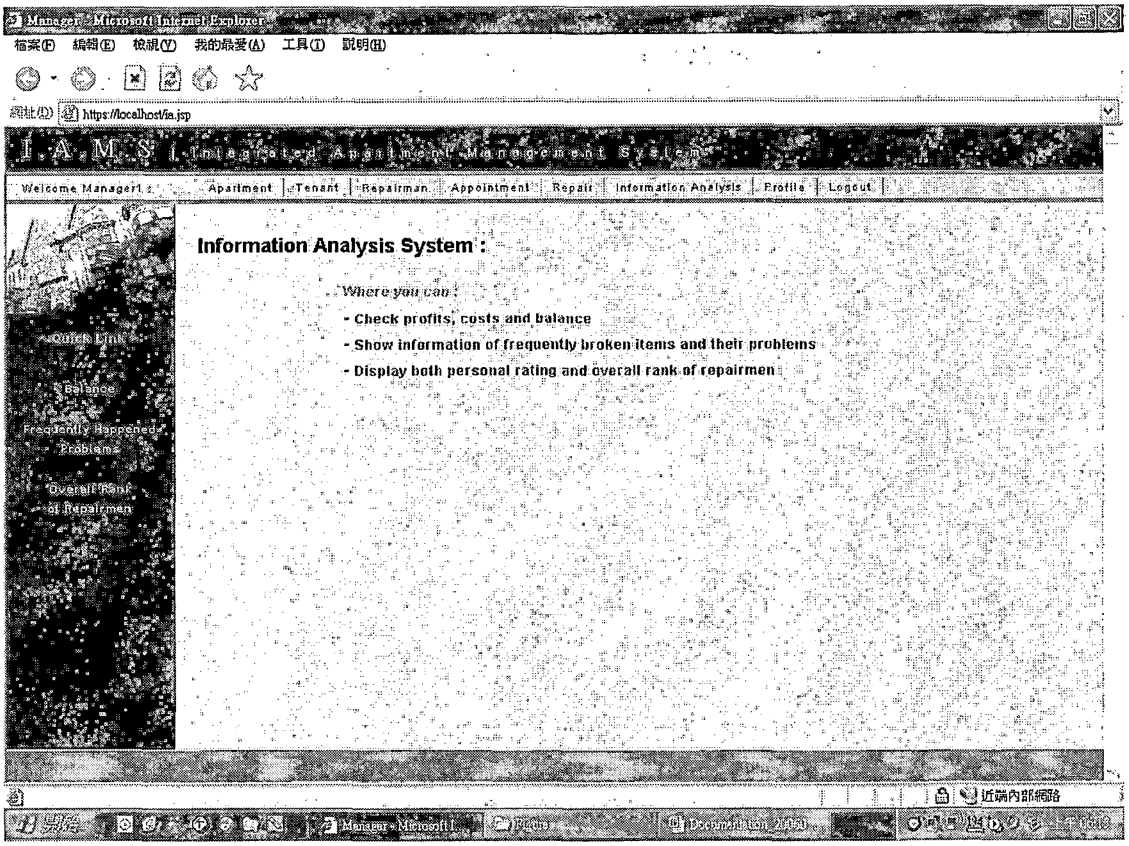
All Problems :

Problem Name	Modify/Delete Record
Broken	Modify Delete
Bugs	Modify Delete
Damaged	Modify Delete
Leaking	Modify Delete
Malfunction	Modify Delete
Other	Modify Delete
Stuck	Modify Delete

Figure 52. All Problems Page

4.6.18 Information Analysis Main Page

The page not only provides integrated information of statistics to apartment managers but also can be used for business strategic analysis and further decisions. For example, by knowing what kinds of problems frequently happened during particular time periods, managers can know how long and time they should contract with repairman more frequently. By rating all repairmen, managers could have more idea about the repairman to evaluate them properly.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/ia.jsp
I. A. M. S. Integrated Apartment Management System
Welcome Manager1 !
Apartment
Tenant
Repairman
Appointment
Repair
Information Analysis
Profile
Logout
Quick Link
Balance
Frequently Happened Problems
Overall Rank of Repairmen

Information Analysis System :

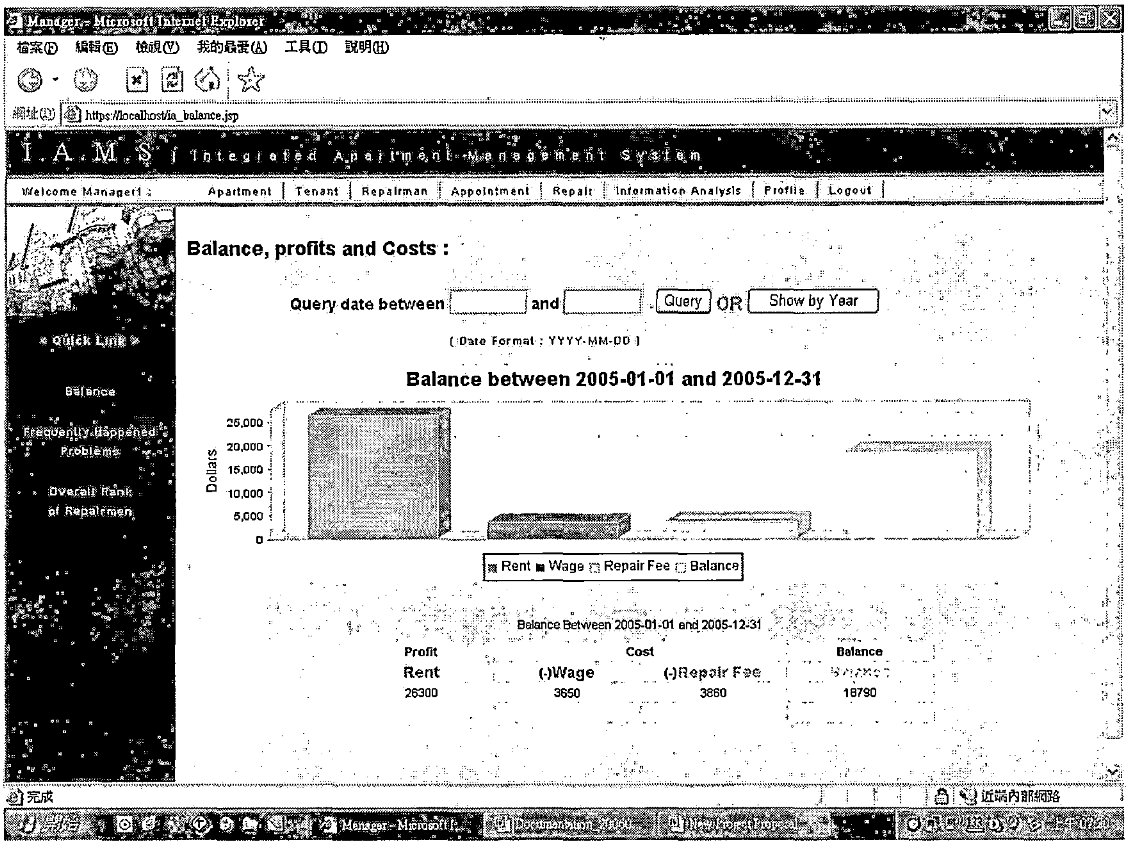
Where you can :

- Check profits, costs and balance
- Show information of frequently broken items and their problems
- Display both personal rating and overall rank of repairmen

Figure 53. Information Analysis Main Page

4.6.19 Balance Page

This page provides the summary of reports and allows users to check where your facility is gaining and losing profits. User can know where you can improve during a period of time. The query is base on a period of time or by a particular year. There are three elements in the graph which are profit, cost, and balance. And cost is composed of wage of repairmen and cost of repairing the apartments.



Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/ia_balance.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout |
« Quick Link »
Balance
Frequently Happened Problems
Overall Rank of Repairmen
Query
Show by Year
25,000
20,000
15,000
10,000
5,000
0
Dollars
▨ Rent ■ Wage □ Repair Fee □ Balance
完成
近端內部網路

Balance, profits and Costs :

Query date between [ ] and [ ] Query OR Show by Year

(Date Format : YYYY-MM-DD)

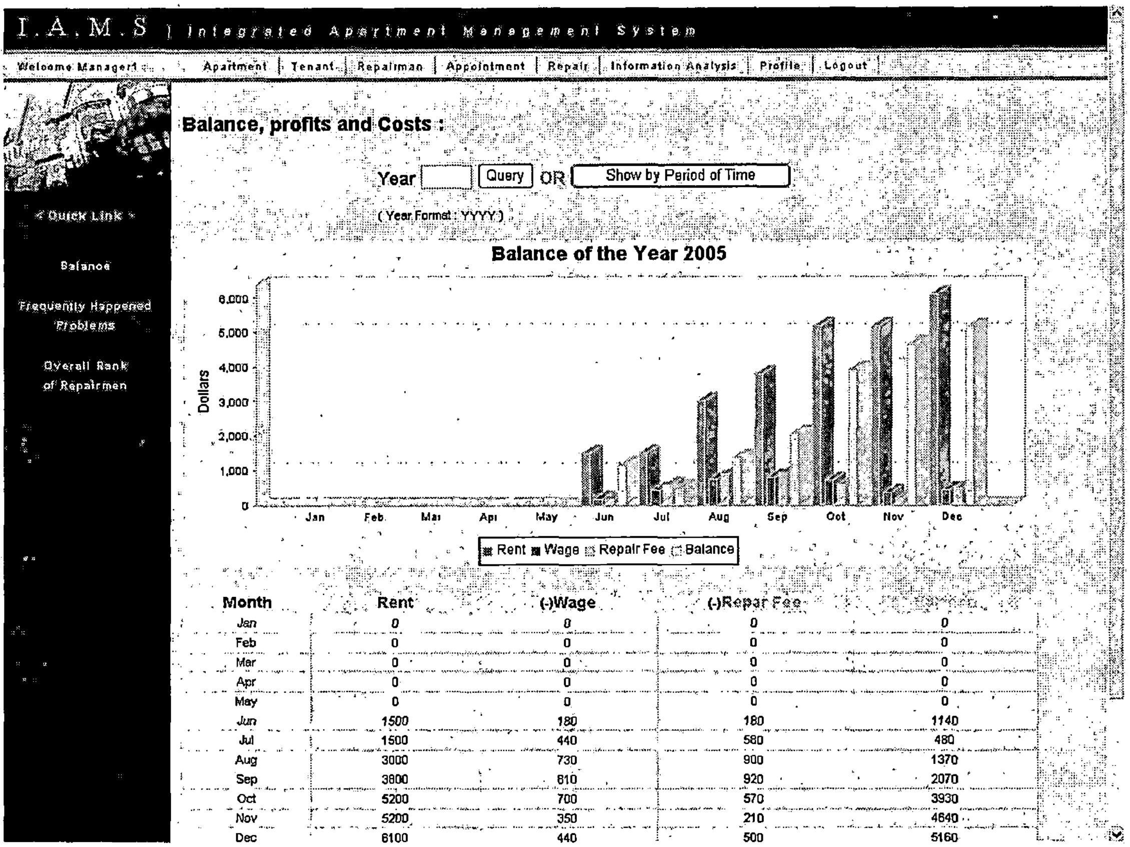
Balance between 2005-01-01 and 2005-12-31

Balance Between 2005-01-01 and 2005-12-31

Profit	Cost		Balance
Rent	(-)Wage	(-)Repair Fee	Balance
26300	3650	3860	18790

Figure 54. Balance of a Period of Time Page

The balance of year 2005 is presented in Figure 55. Data are displayed both by a chart and a table, which includes balance for each months and entire total amount of rent, wage, repair fee and balance. By this information, a manager can understand what costs more than other months and what the reason is.



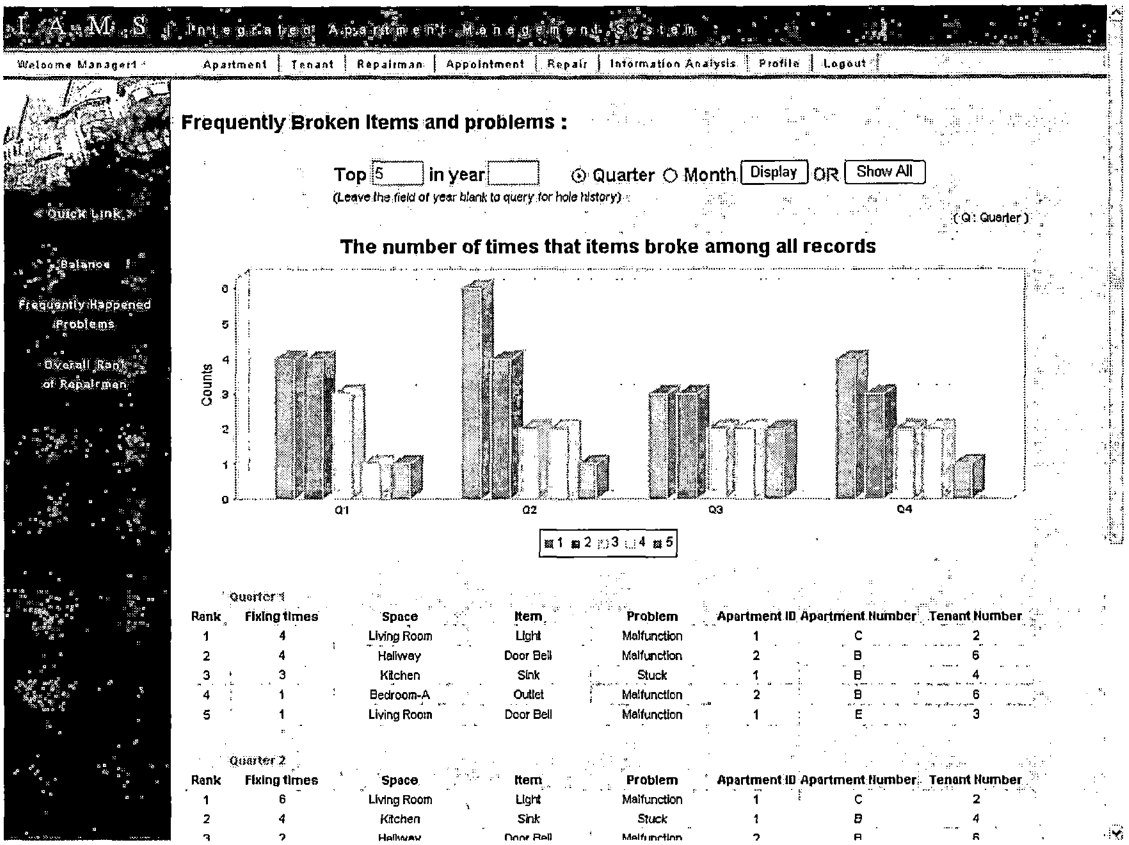
Balance, profits and Costs :

Month	Rent	(-)Wage	(-)Repair Fee	[illegible]
Jan	0	0	0	0
Feb	0	0	0	0
Mar	0	0	0	0
Apr	0	0	0	0
May	0	0	0	0
Jun	1500	180	180	1140
Jul	1500	440	580	480
Aug	3000	730	900	1370
Sep	3800	810	920	2070
Oct	5200	700	570	3930
Nov	5200	350	210	4640
Dec	6100	440	500	5160

Figure 55. Balance of a Year Page

4.6.20 Problems Analysis Page

By knowing what kinds of problems frequently happened during particular time periods, managers can know how long and for which seasons should they contract with repairman more frequently or longer. This information not only can be queried by month and quarter.


I A M S Integrated Apartment Management System
Welcome Manager1
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
« Quick Link »
Balance
Frequently Happened Problems
Overall Rank of Repairmen

Frequently Broken Items and problems :

Top 5 in year ____ ● Quarter ○ Month [Display] OR [Show All]

(Leave the field of year blank to query for hole history)

(Q : Quarter)

The number of times that items broke among all records

Counts
0
1
2
3
4
5
6
Q1
Q2
Q3
Q4
▨1 ▨2 ▨3 □4 ▨5

Quarter 1

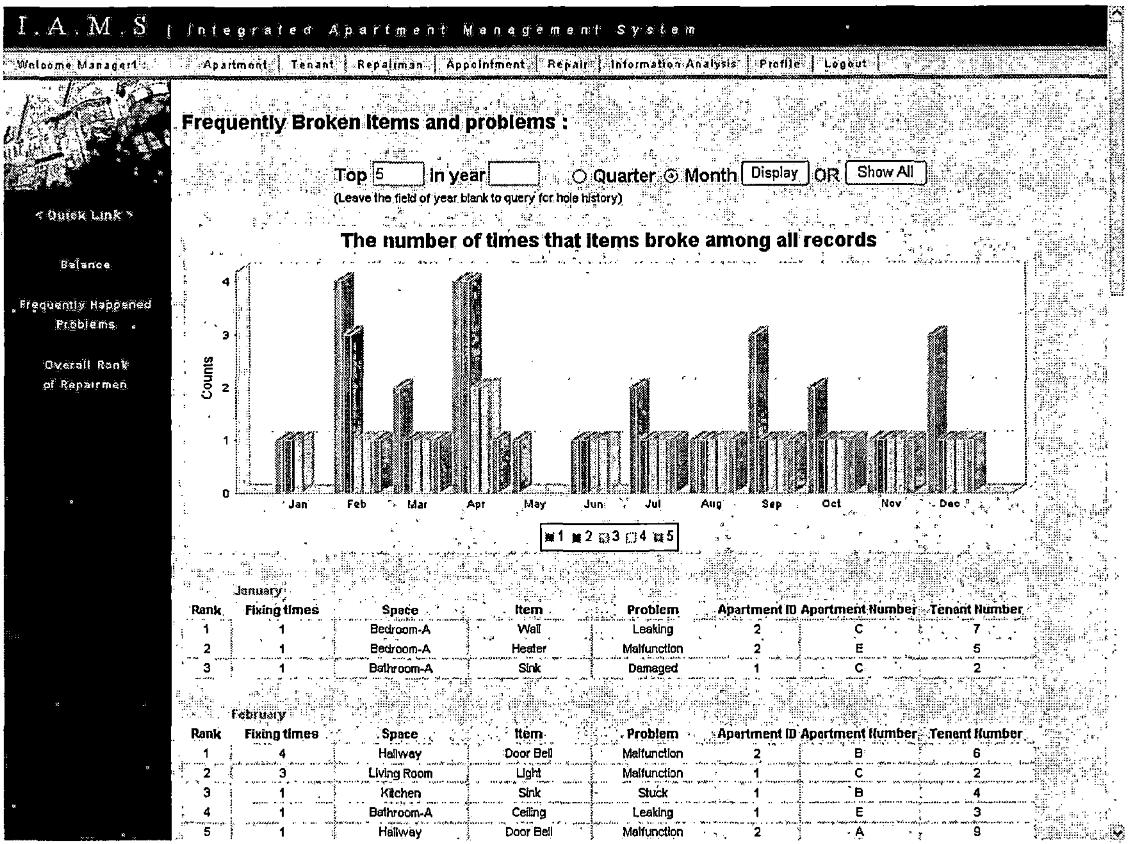
Rank	Fixing times	Space	Item	Problem	Apartment ID	Apartment Number	Tenant Number
1	4	Living Room	Light	Malfunction	1	C	2
2	4	Hallway	Door Bell	Malfunction	2	B	6
3	3	Kitchen	Sink	Stuck	1	B	4
4	1	Bedroom-A	Outlet	Malfunction	2	B	6
5	1	Living Room	Door Bell	Malfunction	1	E	3

Quarter 2

Rank	Fixing times	Space	Item	Problem	Apartment ID	Apartment Number	Tenant Number
1	6	Living Room	Light	Malfunction	1	C	2
2	4	Kitchen	Sink	Stuck	1	B	4
3	2	Hallway	Door Bell	Malfunction	2	B	6

Figure 56. Problems Analysis - Quarter Page

In Figure 57, it shows more detail, which is based on each month. It is obvious to know that a manager should hire more short-term repairman in a particular month and what the problems they are. According to the chart and tables, a manager can know which problem usually happened and in which apartment.


I.A.M.S | Integrated Apartment Management System
Welcome Manager1
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
< Quick Link >
Balance
Frequently Happened Problems
Overall Rank of Repairmen
Display
OR
Show All
Counts
0
1
2
3
4
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
▨1 ▨2 ▨3 □4 ▨5

Frequently Broken Items and problems :

Top 5 in year ○ Quarter ● Month

(Leave the field of year blank to query for hole history)

The number of times that items broke among all records

January

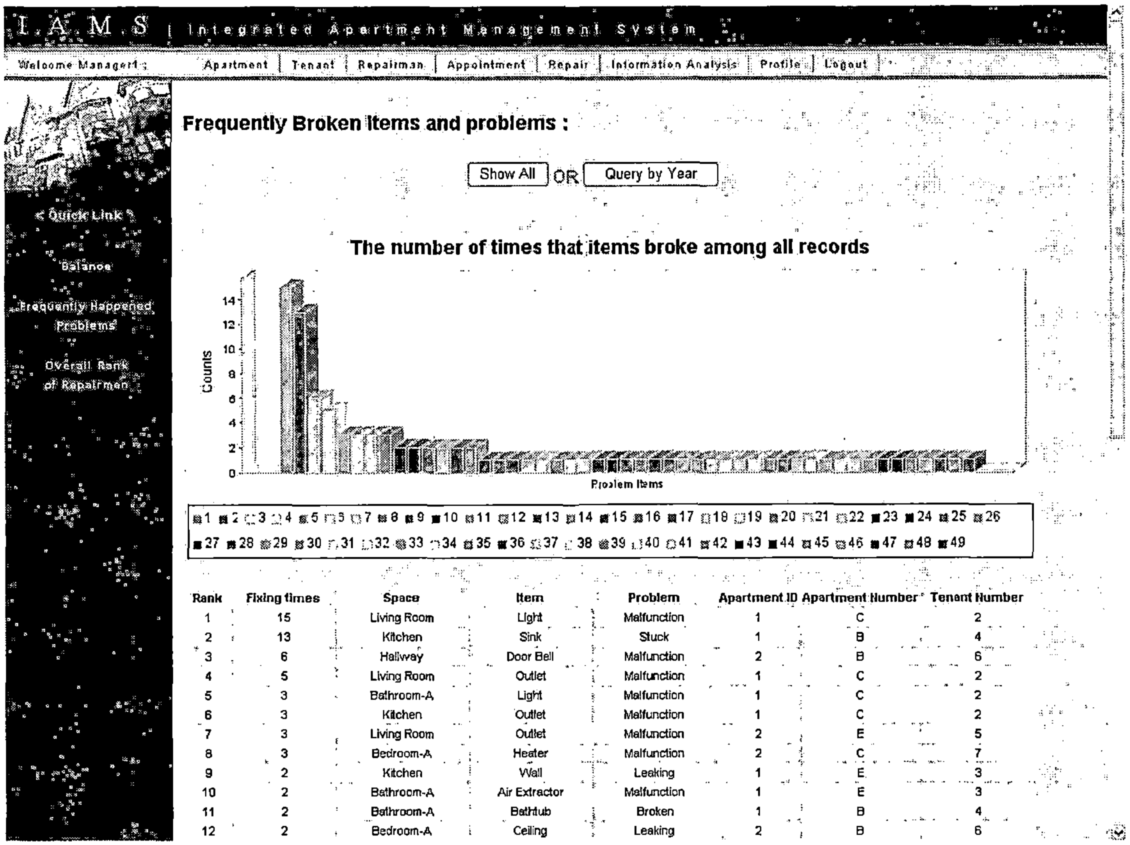
Rank	Fixing times	Space	Item	Problem	Apartment ID	Apartment Number	Tenant Number
1	1	Bedroom-A	Wall	Leaking	2	C	7
2	1	Bedroom-A	Heater	Malfunction	2	E	5
3	1	Bathroom-A	Sink	Damaged	1	C	2

February

Rank	Fixing times	Space	Item	Problem	Apartment ID	Apartment Number	Tenant Number
1	4	Hallway	Door Bell	Malfunction	2	B	6
2	3	Living Room	Light	Malfunction	1	C	2
3	1	Kitchen	Sink	Stuck	1	B	4
4	1	Bathroom-A	Ceiling	Leaking	1	E	3
5	1	Hallway	Door Bell	Malfunction	2	A	9

Figure 57. Problems Analysis - Month Page

The Figure 58 displays which problem usually happened among all records, which gives a manager an idea about which parts of an apartment should be checked entirely.



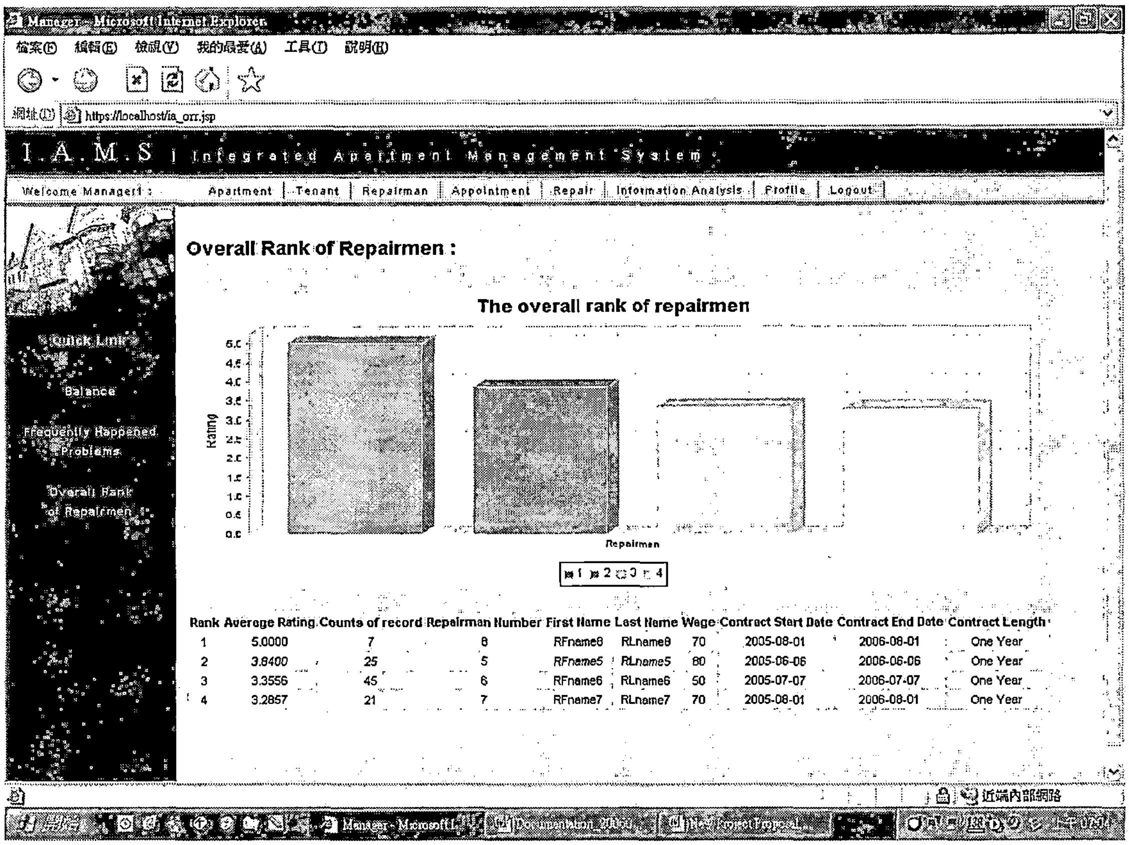
Frequently Broken Items and problems :

Rank	Fixing times	Space	Item	Problem	Apartment ID	Apartment Number	Tenant Number
1	15	Living Room	Light	Malfunction	1	C	2
2	13	Kitchen	Sink	Stuck	1	B	4
3	6	Hallway	Door Bell	Malfunction	2	B	6
4	5	Living Room	Outlet	Malfunction	1	C	2
5	3	Bathroom-A	Light	Malfunction	1	C	2
6	3	Kitchen	Outlet	Malfunction	1	C	2
7	3	Living Room	Outlet	Malfunction	2	E	5
8	3	Bedroom-A	Heater	Malfunction	2	C	7
9	2	Kitchen	Wall	Leaking	1	E	3
10	2	Bathroom-A	Air Extractor	Malfunction	1	E	3
11	2	Bathroom-A	Bathtub	Broken	1	B	4
12	2	Bedroom-A	Ceiling	Leaking	2	B	6

Figure 58. Problems Analysis - All Page

4.6.21 Rank of Repairmen Page

Average rating for each repairman provides managers a better idea about the performance of repairman. Show the ranking of all repairmen so that the manager can know which repairmen have higher performance and satisfaction.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/ia_orr.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager! :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
Quick Link
Balance
Frequently Happened Problems
Overall Rank of Repairmen
The overall rank of repairmen
Rating
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Repairmen
1 2 3 4
近端內部網路

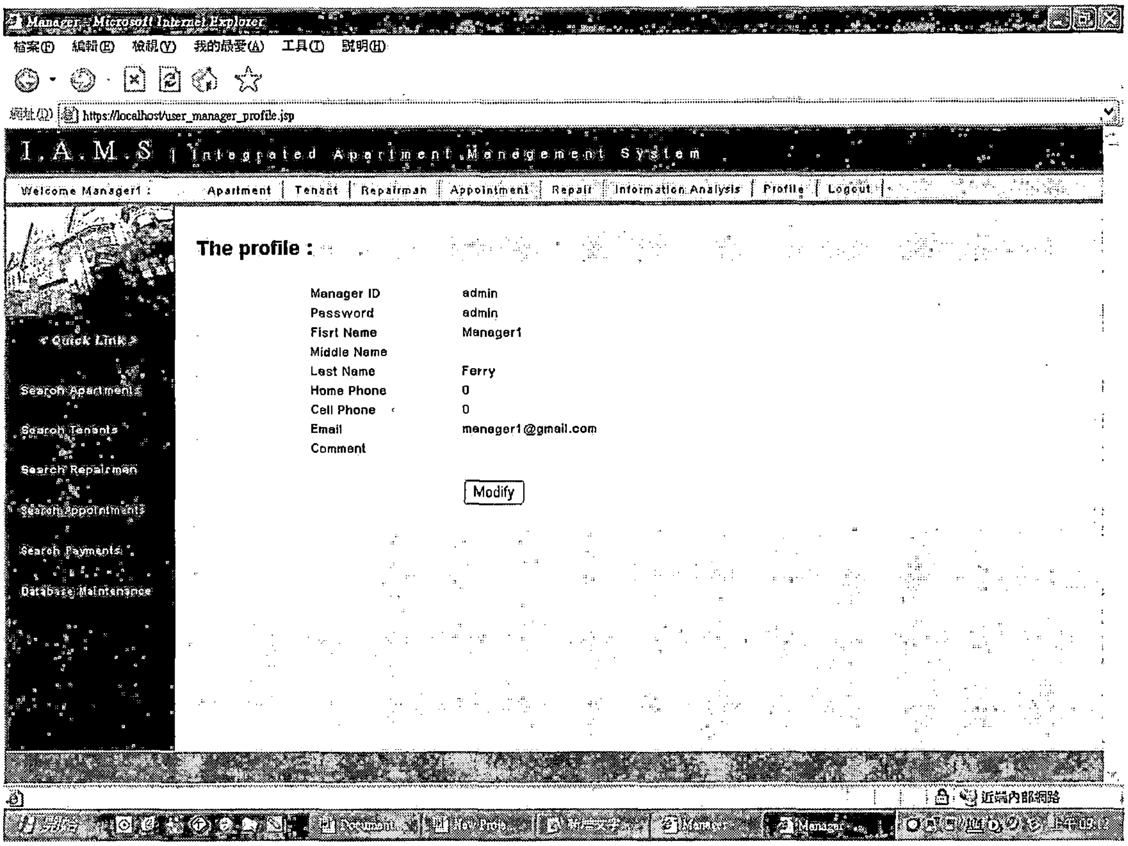
Overall Rank of Repairmen :

Rank	Average Rating	Counts of record	Repairman Number	First Name	Last Name	Wage	Contract Start Date	Contract End Date	Contract Length
1	5.0000	7	8	RFname8	RLname8	70	2005-08-01	2006-08-01	One Year
2	3.8400	25	5	RFname5	RLname5	80	2005-06-06	2006-06-06	One Year
3	3.3556	45	6	RFname6	RLname6	50	2005-07-07	2006-07-07	One Year
4	3.2857	21	7	RFname7	RLname7	70	2005-08-01	2006-08-01	One Year

Figure 59. Rank of Repairmen Page

4.6.22 Profile Page

The page shown in Figure 60 displays all information of the manager. The manager can modify his information by clicking the modify button. The quick link of database maintenance will lead to the database maintenance page. Because each manager's id represents a particular manager in the system, the manager's id should be unique and is not allowed to be duplicated. The system will pop up a dialogue, if the user changes his id which is already taken.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
https://localhost/user_manager_profile.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 :
Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout
Quick Link
Search Apartments
Search Tenants
Search Repairman
Search Appointments
Search Payments
Database Maintenance
Modify
近端內部網路

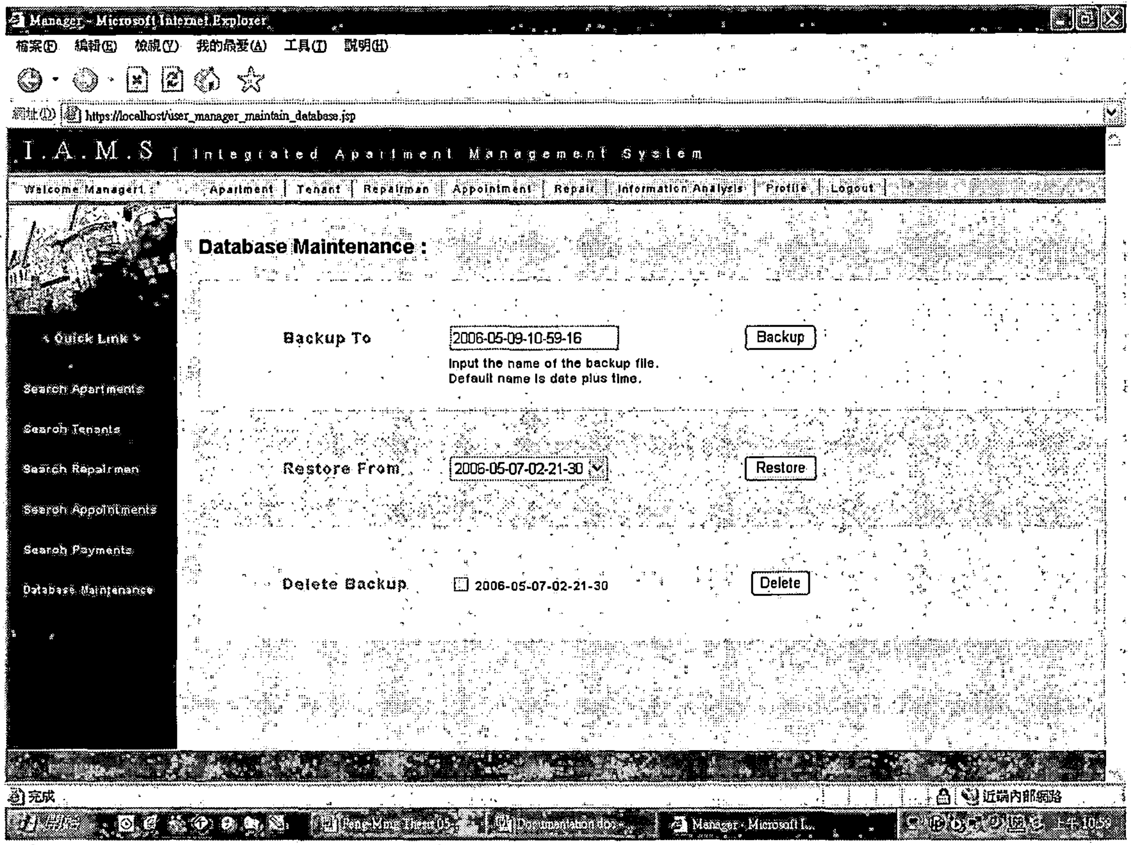
The profile :

Manager ID	admin
Password	admin
Fisrt Name	Manager1
Middle Name	
Last Name	Ferry
Home Phone	0
Cell Phone	0
Email	manager1@gmail.com
Comment	

Figure 60. Profile Page

4.6.23 Database Maintenance Page

This page implement the functions to backup, restore database just by one-click. It is the easiest way to let people who are not familiar with database system use the database. In the backup function, system will backup all IAMS database into a file. The file created in the backup section will be dynamically added into the list of restore and appear in delete section. A manager can delete old backup files. The design of the interface is easy for a manger without knowledge about database.


Manager - Microsoft Internet Explorer
檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)
網址(D) https://localhost/user_manager_maintain_database.jsp
I.A.M.S | Integrated Apartment Management System
Welcome Manager1 : | Apartment | Tenant | Repairman | Appointment | Repair | Information Analysis | Profile | Logout |
< Quick Link >
Search Apartments
Search Tenants
Search Repairmen
Search Appointments
Search Payments
Database Maintenance
完成
近端內部網路

Database Maintenance :

Backup To 2006-05-09-10-59-16 Backup

Input the name of the backup file.
Default name is date plus time.

Restore From 2006-05-07-02-21-30 Restore

Delete Backup □ 2006-05-07-02-21-30 Delete

Figure 61. Database Maintenance Page

CHAPTER FIVE

SYSTEM VALIDATION

To valid a system with both hardware and software is very important. Validation testing is a concern that overlaps with integration testing for whole parts of the product. Ensuring that the application fulfils its specification is a major criterion for the construction of an integration test. Validation testing also overlaps to a large extent with system testing, where the application is tested with respect to its typical working environment.

5.1 Unit Test

The Unit test presents the fundamental level of testing of all procedure. This test includes every component and method, which will be used in the program. The report of unit test is showed below.

Table 11. The Unit Test Report

Unit Test	Tests Performed	Results
Home Page	• Check the result, which is showed on the page. • Check connectivity between JSP and database. • Verify the login function.	OK
Password Retrieve Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check email function.	OK
Add/Modify/ Delete/Search/ Available/ Contracted Apartment Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Add/Modify/ Delete/Search/ Existing/ Unpaid Tenant Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK

Unit Test	Tests Performed	Results
Add/Modify/ Delete/Search Payment Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly. • Check email function works properly.	OK
Add/Modify/ Delete/Search Repairman Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Add/Modify/ Delete/Search/ Coming Appointment Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly. • Check email function works properly.	OK

Unit Test	Tests Performed	Results
Add/Modify/ Delete Space Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Add/Modify/ Delete Item Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Add/Modify/ Delete Problem Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Balance Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar. • Check the entire selection buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page.	OK

Unit Test	Tests Performed	Results
Frequently Happened Problems Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar. • Check the entire selection buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Overall Rank of Repairmen	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar. • Check the entire selection buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Add/Modify/ Delete Profile Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK
Database Maintenance Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check the file that created in the backup section can be dynamically added into the restore and delete section. • Check the entire selection list, buttons, and links working properly. • Check JavaScript works properly. • Verify data after backup and recovery.	OK

Unit Test	Tests Performed	Results
Vacation Page	• Check the result, which is showed on the page. • Verify connectivity between JSP and database. • Check dynamic navigator bar and pull down menu and list. • Check the entire selection, buttons, and links working properly. • Check JavaScript works properly. • Verify by inputting data and executing the page. • Check the data can be stored in database correctly.	OK

5.2 Subsystem Testing

Subsystem testing is the next step up in the testing process where all related units from a subsystem does a certain task. Thus, the subsystem test process is useful for detecting interface errors and specific functions. Table 12 show subsystem test results in detail.

Table 12. The Subsystem Test Report

Subsystem	Tests Performed	Results
Apartment Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/modify/delete information to database.	OK
Tenant Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/modify/delete information to database.	OK
Payment Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/delete information to database. • Check email function works properly.	OK
Repairman Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/modify/delete information to database.	OK

Subsystem	Tests Performed	Results
Appointment Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/modify/delete information to database. • Check email function works properly.	OK
Repairman Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/modify/delete information to database.	OK
Information Analysis Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works.	OK
Profile Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works. • Verify the subsystem check the information before insert/modify/delete information to database.	OK
Database Maintenance Subsystem	• Make sure all records are showed on the list. • Make sure all information is displayed properly. • Test if it can get the error message. • Verify the subsystem check membership before it works.	OK

5.3 System Test Plan

System test plan is the process to manipulate and test the system by real data, where all subsystem should be integrated into an entire system. In order to simulate the real situation, the entire system will be tested by real data that may be used in the real world. The procedures for the system test plan are showed as below.

Table 13. The System Test Report

Test Performed	Results
1. Install IAMS into the server.	OK
2. Install JDK into the server.	OK
3. Start up Tomcat web server, MySQL database server.	OK
4. To access all functions of IAMS and to test reliability of IAMS on the internet.	OK

CHAPTER SIX

MAINTENANCE MANUAL

The Maintenance Manual provides the necessary information to effectively maintain the system. There are three main issues that will be discussed in this chapter: software installation, Configuration of environment variables and IAMS installation.

6.1 Software Installation

For installing IAMS, Micriosoft Windows XP, JDK, Tomcat with SSL enabled, MySQL, MySQL connector/j, JfreeChart, Javamail, JAF are necessary to execute this web-based application. The procedures of installation of all these software are listed by the following except for Microsoft Windows XP, because generally it has been pre-installed in computers. Here, the variable $CATALINA_HOME refers to the directory, where the user is going to install Tomcat web server. After finish all procedures in this section, IAMS can be visited by https://localhost/

6.1.1 Install Development Kit

The procedures of installing J2SE SDK are given below

1. Download a latest version of Windows Platform - J2SE(TM) Development Kit 5.0 Update 6 in the following website

https://sdlc4e.sun.com/ECom/EComActionServlet;jsessionid=0C4BB819386F80D6B4596B0AC69113D4

2. Execute the file downloaded from the website.
3. Follow the wizard and sets up the required information.

6.1.2 Install the Web Server

Tomcat is a popular and open-sourced web server in the world. The steps of installation are given below.

1. Download Tomcat 5.5.17 in the website http://tomcat.apache.org/download-55.cgi#5.5.17
2. Execute the file downloaded from the website.
3. Follow the wizard and sets up the required information. Change the default setting from port 8080 to port 80.
4. Go to the directory, where you have installed JDK and type "keytool -genkey -keyalg RSA -alias tomcat -keystore C:\.keystore"
5. Answer the question from the program and then Copy the file ".keystore" from C:\ to $CATALINA_HOME\conf
6. Uncomment the following section in $CATALINA_HOME\conf\server.xml

```
<Connector port="443" maxThreads="150"
minSpareThreads="25"
```

```
maxSpareThreads="75"enableLookups="false"
disableUploadTimeout="true"acceptCount="100"
debug="0" scheme="https"
secure="true"clientAuth="false"
sslProtocol="TLS" keystore = "conf/.keystore"/>
```

7. Change all 8443 to 443 in server.xml so that a user can access web pages without assigning the port 8443.

6.1.3 Install the Database Server

MySQL is an open-sourced and popular database in the world. The procedures of installing MySQL are given below.

1. Download a recommended version of MySQL 5.0.18 in the following website
   http://dev.mysql.com/downloads/mysql/5.0.html
2. Execute the file that you just downloaded from the website.
3. Follow the wizard and sets up the required information.

6.1.4 Install the Framework

The procedures of installing JavaBeans Activation Framework (JAF) are given below.

1. Download a recommended version of JAF 1.1 in the following website

http://java.sun.com/products/javabeans/jaf/downloads/ea/index.html

2. Execute the file downloaded from the website.

6.1.5 Download the Connector

MySQL connector/j is JDBC driver, by which the user can access MySQL database from a Java program. The procedures of installing MySQL connector/j 3.1 are given below.

1. Download a recommended version of MySQL connector/j in the following website http://dev.mysql.com/downloads/connector/j/3.1.html

6.1.6 Download JfreeChart

The procedures of installing JfreeChart are given below.

1. Download a recommended version of JfreeChart 1.0 in the following website http://prdownloads.sourceforge.net/jfreechart/jfreechart-1.0.1.zip?download

6.1.7 Download Javamail

The procedures of installing Javamail are given below.

1. Download a recommended version of Javamail 1.3 in the following website

http://java.sun.com/products/javamail/downloads/index.html

6.2 Configuration of Environment Variables

In order to access IAMS, some environment variables will be added and modified in the Microsoft Windows XP and in file server.xml located in Tomcat server configuration directory.

6.2.1 System Variables

1. Find the line "<Host name="localhost" appBase="webapps"" and modify into "<Host name="localhost" debug="0" appBase="webapps/iams"" in file $CATALINA_HOME\conf\server.xml
2. Add "<Context path="" docBase="./" reloadable="true"> </Context>" after the section mentioned in the previous step

6.3 Installation/Migration

1. Copy all IAMS package into $CATALINA_HOME\webapps so it looks like $CATALINA_HOME\webapps\iams
2. Copy mysql-connector-java-3.1.12-bin.jar, jfreechart-1.0.1-demo.jar mail.jar

that you have downloaded in the section 6.1 into $CATALINA_HOME\webapps\iams\WEB-INF\lib

6.4 Backup and Restore

It is very important to backup data for database, because a manager can only restore data if and only if he backup data before. In order to ensure the backup files are valid, the backup data has to be verified periodically. A manger has to backup the entire IAMS system and the database used by IAMS.

6.4.1 System Backup

IAMS has been installed in the following directory:

$CATALINA_HOME\webapps\iams

Therefore, a user can backup the system by burning the whole directory "/iams" into a CD or a DVD.

6.4.2 Database Backup

There are two methods to backup MySQL database.

First one is to use the build-in function in IAMS. The files backups by this function are stored in the directory: $CATALINA_HOME\webapps\iams\mysql_backup

Second one is to execute the following command line in a terminal:

mysqldump --quick --user=admin --password=pwd iams > C:\test.sql", where admin means the user's account name, pwd is the password. After the command is executed, Mysql will generate a backup file named test.sql.

6.4.3 System Restore

For restoring the system file, a user has to copy the backup files from the directory into the following directory:

```
$CATALINA_HOME\webapps\
```

6.4.4 Database Restore

There are two methods to backup MySQL database.

First one is the build-in function in IAMS. The only step is to choose a file from the pull down menu, and push the restore button.

Second one is to restore database by using MySQL commands. First of all, execute the following command line in a terminal to shutdown the database: "mysqladmin -u admin -p pwd shutdown", where admin means the user's account name and pwd is the password. Second, execute the following command line in a terminal to restore data back to the database: "mysqldump --quick --user=admin --password=pwd iams < C:\test.sql" Third, execute the following command line in a terminal to restart the database: "mysqld". After these three commands are executed, data will be restored to MySQL database.

CHAPTER SEVEN

CONCLUSION AND FUTURE RESEARCH

7.1 Conclusion

Integrated Apartment Management System (IAMS) is a web-based system that users can deal with all the complicated matters involved in apartment management and communication between tenants and repairmen. Traditionally, tenants have to contact managers of apartments first to ask for service for broken items. It usually takes a long time to negotiate among tenants, mangers and repairmen. Instead of wasting time in such a procedure, IAMS provides an efficient way so that tenants can make appointments with repairmen on-line and notify both managers and repairmen of the appointments through an email directly from IAMS. Tenants can also check their history of appointments, payments, and contracts online such as upcoming appointments. Repairmen can also check their own history of appointments, contracts, and upcoming appointments. If tenants or repairmen forget the details of the appointment, they can log in to this on-line system at any time to retrieve the necessary information. Additionally, the system emails the tenants, repairmen and managers information about appointments, including the date and time of the appointment, name of the tenant, name of the repairman, etc.

In addition to dealing with affairs between tenants and repairmen, the system provides powerful functions that not only give managers a clear picture about the status of the apartments, tenants, repairmen, appointments, payments, etc., but also gives them helpful information, including financial balance in a period of time, the number of times that items were broken and individual and overall ranking of repairmen. This complicated information is represented both by easy charts and detailed tables, by which a manager can evaluate every repairman and item precisely and easily. All this valuable information is stored in a highly reliable database system. The key feature is that managers who are not familiar with the database systems can backup and restore the database easily with by just one click, by using our easy database maintenance function.

This project is based on a web-based architecture, which provides a single point of entry to the Web system and can easily be accessed everywhere. This system is implemented by JSP and HTML. MySQL is used as the main database server and the web server is Tomcat.

7.2 Future Research

For further maintenance, applying standard of JAVA Module 2 will make it easier to maintain the system. There are two major reasons. The first reason is that the system is modulated and less coupling among all components. The second reason is that because business logic is extracted from the code and page so that it is convenient to add or modify functions without modifying the whole page which performs the web page to users. For example, the results of all inquiry are presented as tables to be showed on the page. When we need to change inquiry, we might have to rewrite and redesign the appearance of the page. Therefore, I would like to change the design of this project to JAVA Module 2.

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