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A Proposed RFID Based Student Attendance System

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Abstract: The majority of universities in the developing countries are still using a paper sheet for checking students' attendance. The use of an alternative system is becoming an urgent necessity to manage the students' attendance record automatically. The RFID enables the university management to adopt such emerging new technology to enhance the university's monitoring system, taking into account factors such as reliability, time saving, and easy control. This paper describes the design and development of a student attendance system in terms of hardware and software. The RFID readers are simulated using the Rifidi Platform and the system is integrated with a database handling system to obtain complete system functionality where the information could be manipulated in real time.

Keywords: RFID; Attendance System; Ubiquitous Computing; Database handling system.

1. INTRODUCTION

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of small chip and an antenna [1]. RFID is mostly used as a medium for numerous tasks including managing supply chains, tracking livestock in the agricultural field, controlling building access, parking lot access and control, supporting automated checkout, health care industry, wireless communications such as Bluetooth and Wireless Sensor Networks, also RFID has a growing market in home and business security systems [2,3,4]. In university monitoring applications, the use of RFID technology enables the university management to avoid attendance records from damages, loss, and misplacement. It also saves time and money and reduces labor efforts in managing the attendance records. Universities have increasingly become well aware of the importance of making processes less time consuming and more efficient. RFID could help to speed up the processes and thus reduce the lead time in several different areas such as parking, attendance, class access, and others [5,6]. The rest of this paper is organized as follows. The Basics of RFID are reviewed in section 2. In section 3 RFID Middleware is discussed. The architecture and structure of the proposed system named Nahrain University Smart Attendance and Monitoring System (NUSAMS) are introduced in section 4 and section 5 respectively. The system specifications and some preliminary simulation results are presented in section 6. Finally, some conclusions are given in section 7.

2. THE BASSICS OF RFID

Typical RFID systems are made up of four important components: an RFID Reader, an RFID Tag, the RFID Middleware and the Database Storage [7, 8].

The reader, which is also called the interrogator, sends and receives radio frequency data to and from the tags via antennas. A reader may have multiple antennas that are responsible for sending and receiving the radio waves. The tag or transponder is made up of the microchip that stores the data, an antenna, and a carrier to which the chip and antenna are mounted.

The Middleware is the layer at which the raw RFID readings are cleaned and filtered to make the data more application-friendly. It receives information passed into it from the readers and then applies some techniques to get only the useful data from the received stream. The filtrated records, including the tag and reader identifiers along with the timestamp of the reading taken, are then passed on to the database storage as shown in Fig.1 [7,9].

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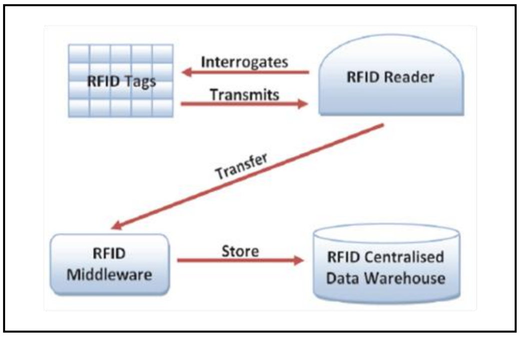


Figure 1. The flow of information between the different components of the RFID system

A. RFID Frequencies and Read Range

Radio frequencies of these systems range from very low frequency (VLF), which has a range of 10 to 30 kHz, to extremely high frequency (EHF), which has a range of 30 to 300 GHz. These frequencies are grouped into four basic ranges and are given in Table I. The distance at which a tag can be read is affected by the frequency used for identification, the antenna gain, the orientation and polarization of the reader antenna and the transponder antenna, as well as the placement of the tag on the object to be identified [10].

B. RFID System Types

There are many different types of RFID systems, and it is important to choose the right type of RFID system for a particular application [2,3]. Typically, there are two basic types of RFID systems: passive, and active. Passive tags transmit low frequencies so they are detectable up to few meters of distance, and are commonly used with issues relating to security. In contrast, active tags can transmit high frequencies so they can be detectable to a longer range, and are more expensive [11]. In addition, there is another type of tag which is called semi-passive RFID which is similar to passive tags except for the addition of a very small battery allowing it to have a small amount of constant power.

Two fundamentally different RFID design approaches exist for transferring power from the reader to the tag: magnetic induction and electromagnetic (EM wave capture).

TABLE I. RFID FREQUENCIES

		Range	Uses	
LF	Low Freq	30 kHz to 300 kHz	125 kHz	
HF	High Freq	3 MHz to 30 MHz	13.56 MHz	
VHF	Very High Freq	30 MHz to 300MHz	Not used for RFID	
UHF		Ultra High Freq	300 MHz to 3 GHz	866 MHz to 915MHz

These two designs take advantage of the EM properties associated with an RF Antenna – the near field and the far field. Both technologies can transfer enough power to a remote tag, usually the power levels will be in the range of 10µW and 1 mW which is very minimal when compared to regular Intel 4 processor power levels of 50W. Near-field is the most common approach used for implementing passive RFIDs, and used for near range communications. It has the physical limitations of range. The range of communication of near field technology depends upon the formula $c/2\pi f$ where c is the speed of light and f is the frequency. It has the limitation that frequency of operation increases as the distance decreases. One more limitation is the energy available for induction as a function of distance. These physical limitations have led to far field communication and far field communications depend upon backscattering [4].

3. RFID MIDDLEWARE

The widespread adoption of RFID requires not only low cost tags and readers, but also the appropriate networking infrastructure. Such a supporting RFID infrastructure typically comprises a component-often referred to as RFID middleware [12]. RFID middleware is a new class of software which facilitates information communication between automatic identification physical layer and enterprise applications [13]. It provides a distributed environment to process the data from tags read by the readers, translates the data where necessary, and routes it to variety of backend applications using suitable technologies and should include the following functions [14]:

1) Data filtering and aggregation: when the reader reads the mistake or the burdensome data, middleware should be responsible to revise the mistake to correct. In case of a large amount of data, RFID middleware must offer the buffer capacity to filter and assemble by dealing with the huge data.
2) Data routing and integration: Some companies may have systems that hopes a middleware can offer the ability that routes send and combine the data, in order to enable the manufacturer to pass RFID more efficient operation.
3) Process Management: middleware is responsible for monitoring data and arrival of materials through customizes work. That is to say, it can set up and monitor the administrative system of stocks, when the system stock is lower or already out of more stock, it must supplement the necessary products again through this software.

RFID middleware is considered as essential material to organize RFID systems. There are many organizations and corporations that take on research and development about RFID middleware. Besides RFID middleware, there are many research and development of test techniques and test tools. Most of the researchers have limitations that they pay attention to just one or two features. But RFID middleware has many features such as performance, abstract, scalability, robustness and reliability. So it is very important for RFID middleware requirements for research into a test of various features [15]. RFID technology is able to be applied to various fields, but the suitability and those features cannot be tested, because RFID devices are very expensive and it is almost impossible to install such devices in all environments. So integrated test framework and virtual environment which replaces real environment are required to evaluate RFID middleware features before installation of the physical devices in a real environment [15].

4. NUSAMS ARCHITECTURE

The main objective of this project is to automate the whole system of student attendance and tracking using RFID. The components of the proposed system are readers, tags and a computer application. The computer application is connected or integrated with a database management system to manage the huge information gathered from readers in real time and make use of the availability of web services that uses the same database system as a common source of information.

The students and lecturers are given unique RFID identification cards which contain embedded tags to enable the readers to identify them as they pass through the reader interrogation field. These readers are installed in all classrooms, laboratories, or any other possible locations to be reached. In general, the proposed architecture is shown in Figure 2 and can be divided in two groups.

The first group comprises RFID server, database (DB) server and a web services server.

The RFID server is the host computer to which the readers are connected and is responsible for establishing communication with readers, managing and handling the received data from readers in real time. Once it receives the read data, and providing the latter is correct, this server inserts a new attendance record in the DB Server. The DB Server contains and handles all the information related to the university such as students' basic information, attendance records and other related information like university readers' settings, particularly the IP address, the port, the building and the classroom number. Web Services Server provides some web methods to serve NUSAMS users. To obtain data, this server queries the DB Server to get attendance records, lecture's information, students' information records and other related information.

The second group is made up of various RFID readers installed in the university that are simulated using Rifidi platform as an RFID middleware. Rifidi is the premier open source simulator for RFID that develops RFID system entirely with simulated components (readers and tags) and remove the dependency on hardware and infrastructure that RFID typically demands [16]. Rifidi is a software tool which emulates RFID systems. It allows the virtual creation of an RFID-based scenario while being sure that the software created for this purpose will run as in the real world. Indeed, Rifidi is a program that emulates the reader/client interface of an RFID reader. This means that a client communicates with the Rifidi reader in the same way that it would communicate with a real reader [17].

The bridge between these two groups is presented by the LAN of the university to which all readers are connected. The RFID server is also connected to the LAN to enable communication between them.

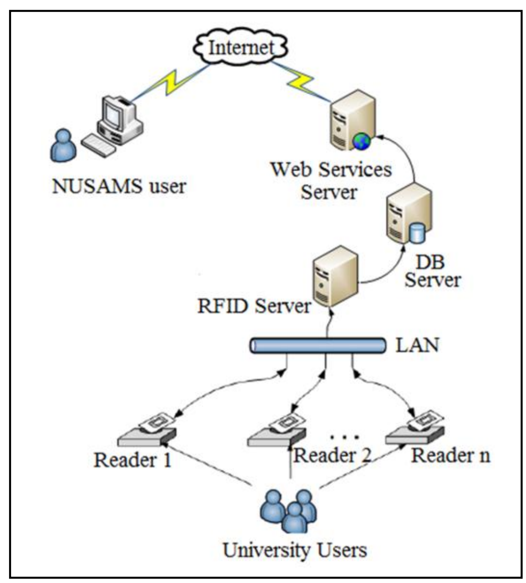


Figure 2. NUSAMS architecture

5. NUSAMS STRUCTURE

The NUSAMS components are divided into two parts: software and hardware. The software part is implemented while the hardware part is simulated. The software managing all the processes is programmed using VB.net and the website using ASP.net that works with Microsoft .NET Framework 4.0 environment and shares a common database of MsSQL that is designed using Microsoft SQL Server 2008 R2 Management Studio. The hardware part consists of all RFID readers and tags. In NUSAMS, the RFID readers are simulated using Rifidi Platform. The design and development of hardware and software are described in the following subsections.

A. Hardware Part

The RFID reader module is emulated using Rifidi. It is important to understand that this virtual environment allows using the real protocol of the RFID tag and reader. The Rifidi emulates the reader/client interface of actual RFID readers; a client communicates with the Rifidi reader in the same way that it would communicate with a real reader. Therefore, the virtual module can be substituted with a physical module which manages the physical RFID objects and the whole system will still work [17].

In our work, we have considered RFID AlienALR9008 readers, which operate on UHF ranges. We have also created some RFID tags that are presented as boxes under reader specified fields and treated as readers' antennas. Alien ALR-9800 Enterprise RFID Reader supports Serial port (RS-232, DB-9 F) and TCP (LAN, RJ-45) connections. The serial connection is not suitable in NUSAMS because the readers are distributed over large areas. When a NUSAMS needs to connect to RFID reader, it uses a software component called a socket. A socket is one endpoint which makes communication between two programs that are running on the same machine or over a network. Sockets are used to represent the connectivity between client and server. The socket is bound to an IP address and port number so that the TCP layer can identify the application. Fig. 3 shows the connection between client and server on specific port [18].

Normally, a server runs on a specific host and has a socket which is bound to a specific port number. The listening server (Rifidi) waits for a connection request from a client (the system applied in NUSAMS) .At the client end, the client knows the IP address of the server and the port number of the listening server. To make a connection request the client program tries to negotiate with the server program on the IP address and port number. When connection is established between server and a client, the client uses the same socket to communicate with the server (read/write) [18].

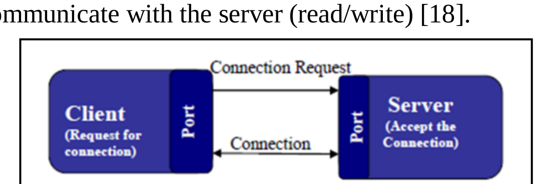


Figure 3. The connection between client and server on a specific port

Hence, the readers are connected to the NUSAMS through software which provides many controlling features. Generally, the following features are used in this program:

- Reader information: sets a new instance of the reader information.
- An interface type: sets/gets that identifying current reader interface as (TCP/IP).
- IP address: sets/gets the connected readers IP addresses.
- Name: sets/gets the reader's name (here the reader carries the classroom name).
- Antenna: sets/gets the no. of antenna is being used.
- Regions: sets/gets the region name which is recognized by the system as reader name and antenna number.
- Time: sets/gets the time at which the tag has been detected.
- Command port: gets/sets the current network port number. In this project port number 23 (Telnet) was used.
- Tag list: sets/gets array of tag information represented in the Alien tag list.

B. Software Part

The software managing the entire system will be designed using VB.net and the website using ASP.net, as integrity between them is very strong, and share a common database of MsSQL [19]. MsSQL server can provide a smart as well as large data storage as it is desired in building the project due to the fact that the NUSAMS manage huge information from readers in real time and deals with large numbers of students/staff within the university campus. MsSQL Server 2008 R2 Management Studio can offer a comfortable environment to build and manage NUSAMS's database tables. Information can be stored/inserted, retrieved/selected, deleted and updated using Structured Query Language (SQL) which is a standard language for interrogating and working with Microsoft SQL Server 2008.

The database contains the following six main tables:

- Basic information table: this table is constructed to maintain all the information related to the university members: students, lecturers, and university administration. It keeps information such as: tag ID of student/staff, first name, middle name, surname, the type (student, lecturer, or head master), department and stage and other contacting information including emails.

- Data online table: This table keeps all the data received from readers as well as the information about tag recognition arrived online to CMS as tag ID, reader name that sent these tags which it deduced from reader IP, port and region that the reader fall in, antenna number, the date and time of detection.
- Lecture table: It is the most important table that the system relies on and includes all the information related to classes. It includes ID which is the number of hours per class per day, department, stage, hall name, day, lecture time, lecture name, lecturer's name, and if there are any free hours in that day.
- Attendance table: this table contains the attendance record of all the students, which is updated during the semester and then cleared in the next semester.
- Users table: This table is constructed to secure and protect the information of NUSAMS from anyone unlicensed that may be penetrating NUSAMS system and destroying the system and database. The authorized users table consists of a set of pairs as users name and passwords.
- Reader settings table: This table contains all the settings information of the readers distributed in the institution, including reader's IP and port, reader's name, and user name and password of the reader.

The flow chart of the main program of NUSAMS is illustrated in Fig.4.

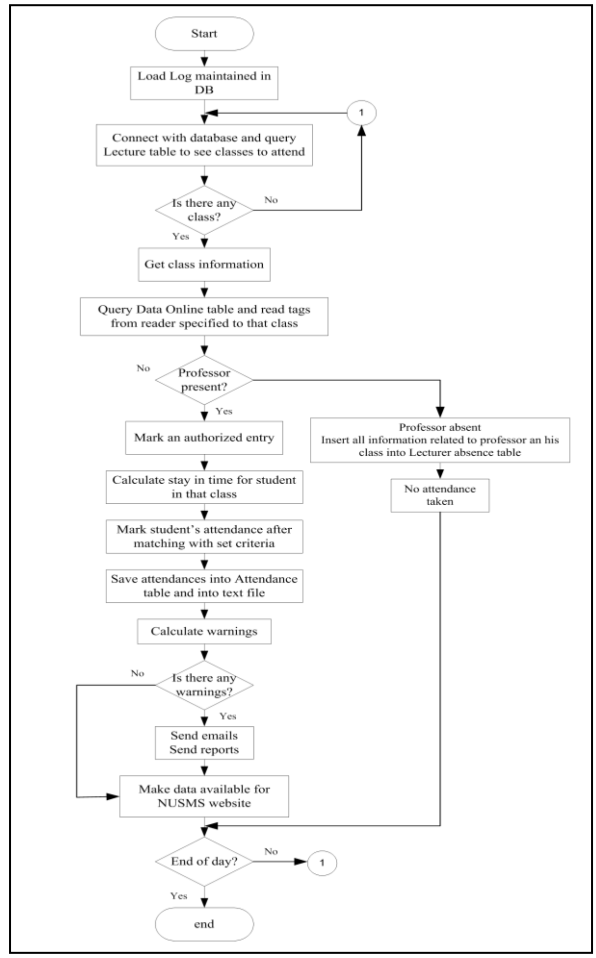


Figure 4. NUSAMS main program flowchart

6. SYSTEM SPECIFICATIONS AND SOME PRELIMINARY SIMULATION RESULTS

The Rifidi platform is installed on a host computer, AlienALR9008 readers are chosen and CuctomEPC96 tags are generated in their fields. The information is collected from readers and passed to the RFID Server. After filtering and correcting the information, it will pass to DB server, which manages the gathered information and maintains the attendance Log.

The following system specifications are discussed and some of the preliminary results are shown in the described system.

A. Specifications

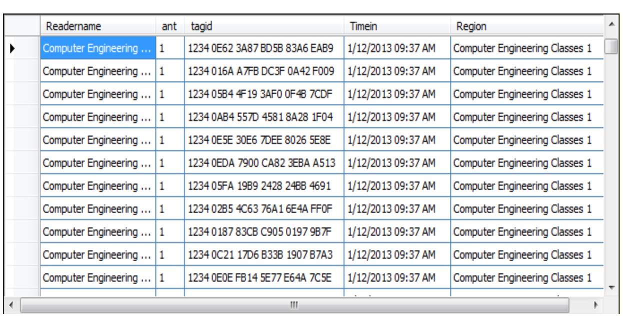
The system accepts only four different levels of accesses or users, namely, Administrator, University Administration, Lecturer, and Student. Every user will have specific access to the system according to the user level. For example, the Administrator will have all security authorizations. Meanwhile, other users will have limited access to the system. The user has to log in first from a login form to ensure the security of the system from unauthorized access and to provide dedicated services to the specified user. The user specific identification and monitoring applications are listed below:

- System Administrator: this application gives the system administrator all security authorizations of the system, enabling him to control and manage RFID readers, for example: connect/disconnect readers, managing users' login information, adding new user account and monitoring data flow in NUSAMS.

- University Administration: this application enables the University Administration monitoring all the activities and issues related to lecturers, students and attendance as well as adding/removing members to/from the institution.
- Lecturer: this application is specified to lecturers enabling them to see lecturer schedule, hall schedule, students' attendance, students' warnings, lecture table, classes to give, distributed notes, make reparation in the case of their absence, see their email warnings and find location of any person in the institution by specifying the assigned name or tag ID.
- Student: the student accesses the system after specifying the assigned username and password. The system will respond by displaying the dedicated page which shows the attendance, warnings (if any), lecture table, classes to attend.

B. Preliminary results

The system was designed and tested via simulation. The results show that the system works successfully in such an efficient manner that it can connect with readers and collect information in real time. Fig. 5 shows the real-time data form. Four typical program forms are shown in Fig. 6 to Fig. 9 for the login, student, lecturer and administrator forms respectively.



Readername	ant	tagid	Timein	Region
Computer Engineering ...	1	1234 0E62 3A87 BD5B 83A6 EAB9	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 016A A7FB DC3F 0A42 F009	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 05B4 4F19 3AF0 0F4B 7CDF	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 0AB4 557D 4581 8A28 1F04	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 0E5E 30E6 7DEE 8026 5E8E	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 0EDA 7900 CA82 3EBA A513	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 05FA 19B9 2428 24BB 4691	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 02B5 4C63 76A1 6E4A FF0F	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 0187 83CB C905 0197 9B7F	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 0C21 17D6 B33B 1907 B7A3	1/12/2013 09:37 AM	Computer Engineering Classes 1
Computer Engineering ...	1	1234 0E0E FB14 5E77 E64A 7C5E	1/12/2013 09:37 AM	Computer Engineering Classes 1

Figure 5. Data online form

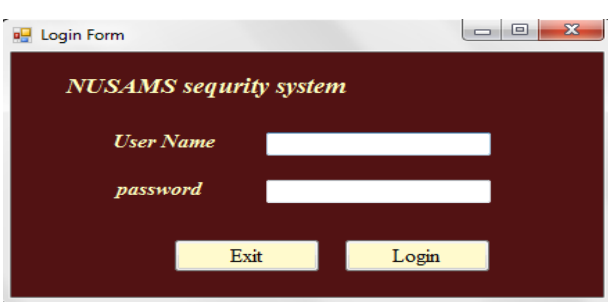


Figure 6. Login form

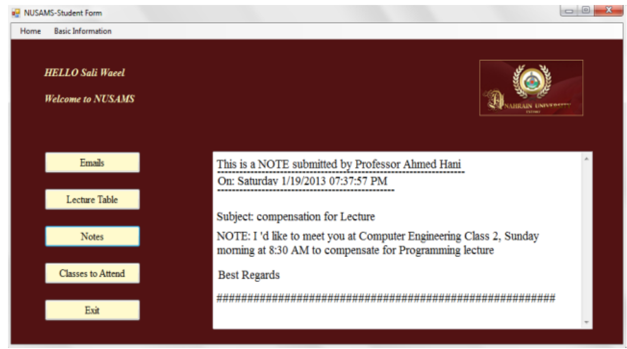


Figure 7. Student form

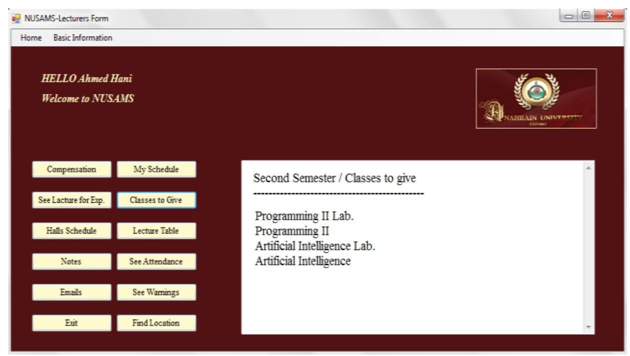


Figure 8. Lecturer form

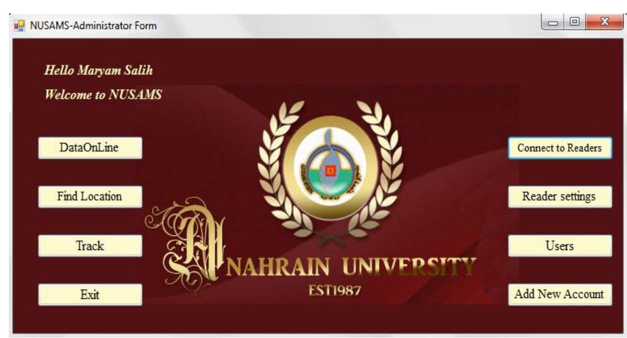


Figure 9. Administrator form

Setting attendance and warning calculations will be done in the following manner:

A connection with the database will be established to check the lecture table for classes to be attended, see Fig. 10.

In case there is a class to be attended as depicted in Fig. 11, the first step in the attendance procedure is checking if the lecturer is present in the class to start the whole operation of attendance taking. The student attendance will be taken by calculating stay in time and setting the attendance after matching with set criteria which is the lecture time, equal '3' in our example as depicted in Fig. 11. If the student attends 80% of the lecture time he or she will be recorded 'present' in that class.

The student attendance will be registered in a temporary table, see Fig. 12. In this table the student attendance will be marked against his tag ID, department, stage, class, the day, lecture and represented as '1' if he is present in his class and the absence hours will be '0'. Otherwise, the student attendance field will be marked as '0' if he is absent in that class and the hours of absence will be the lecture time, which is '1' because the whole operation of the attendance based on an hourly basis.

The records of student attendance form the temporary table will be inserted into the attendance table, see Fig. 13. Where the absence hour in the attendance table will be updated and accumulated with the recent absence hours of the student, see Fig. 14.

Warning calculations will be done after every class by comparing the student absence hours in the attendance table with the lecture weight criteria in the lecture table. In the case of '3' lecture hours the weight will be: first warning 5% =2.25, second warning 7%=3.15 and final warning 10%=4.5, as depicted in Fig. 11.

If the absence hours of the student exceed these weights a warning will be marked against the student account, see Fig.14. Then an email will be sent to the absent student and a copy of this mail will be created and sent to the university administration.

7. CONCLUSIONS

Automation of Attendance System using RFID has been developed using the Rifidi platform and the .NET Framework for Nahrain University in Baghdad. In order to have complete system functionality, the system is integrated with a database handling system. The results show that the system works successfully in real time. The system is comprehensive, efficient and flexible that can be used as an attendance system for any institution for this, only few modifications needed to be done to make it works correctly by altering the lecture table with the table dedicated for the institution that includes attendance times or shifts. Currently, the security issues of the system is being investigated to make it immune from any attack and also to couple the system with other useful technologies like biometrics or additional control equipment to cater for misuse and deceit, and it is to be the subject of a future research paper. Another enhancement to the NUSAMS can be that the various doors in each building are managed by the system itself and are unlocked and locked accordingly.

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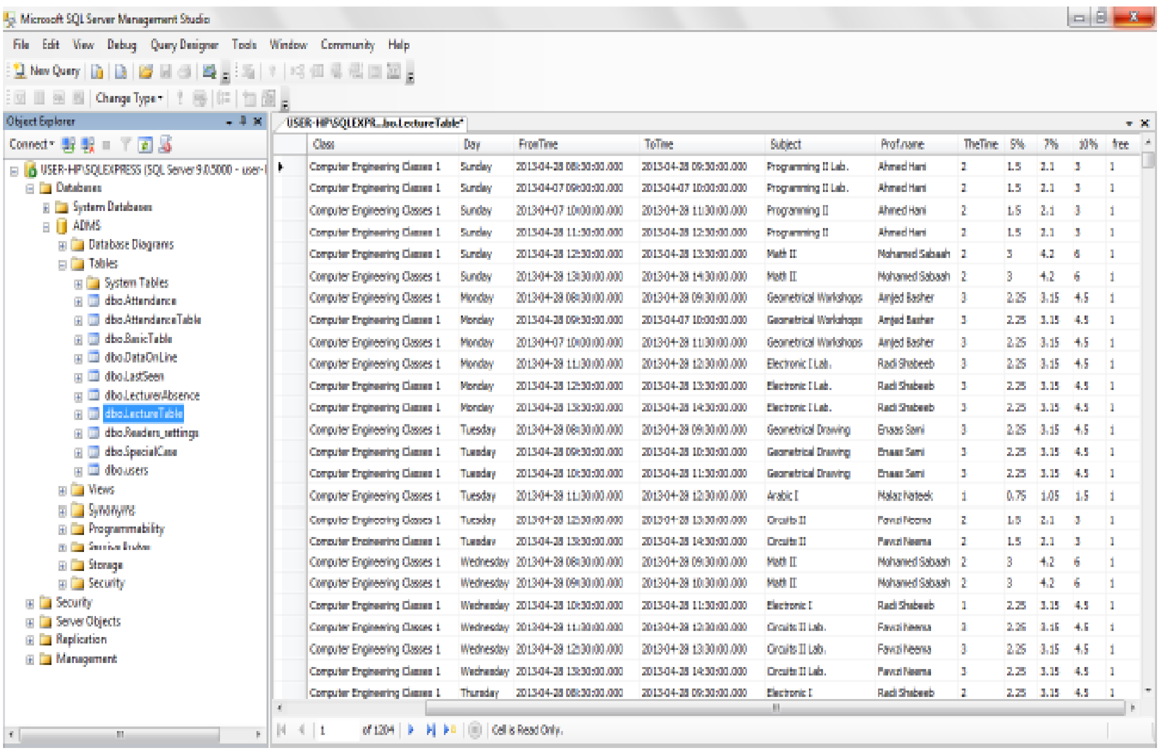


Figure 10. Lecture table

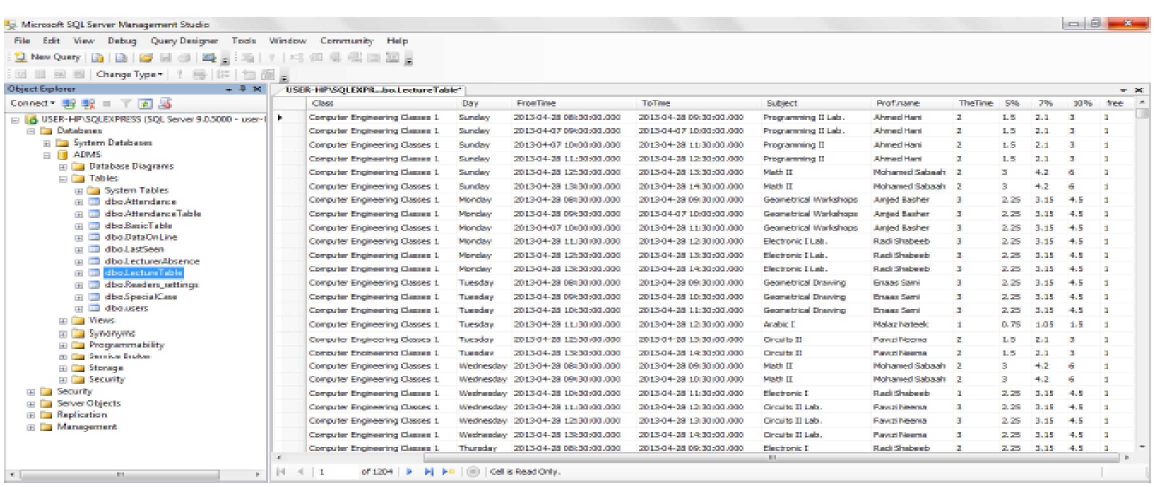
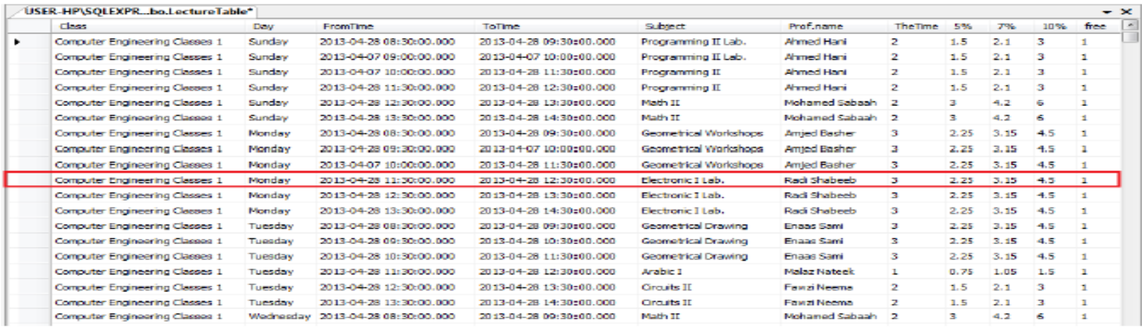
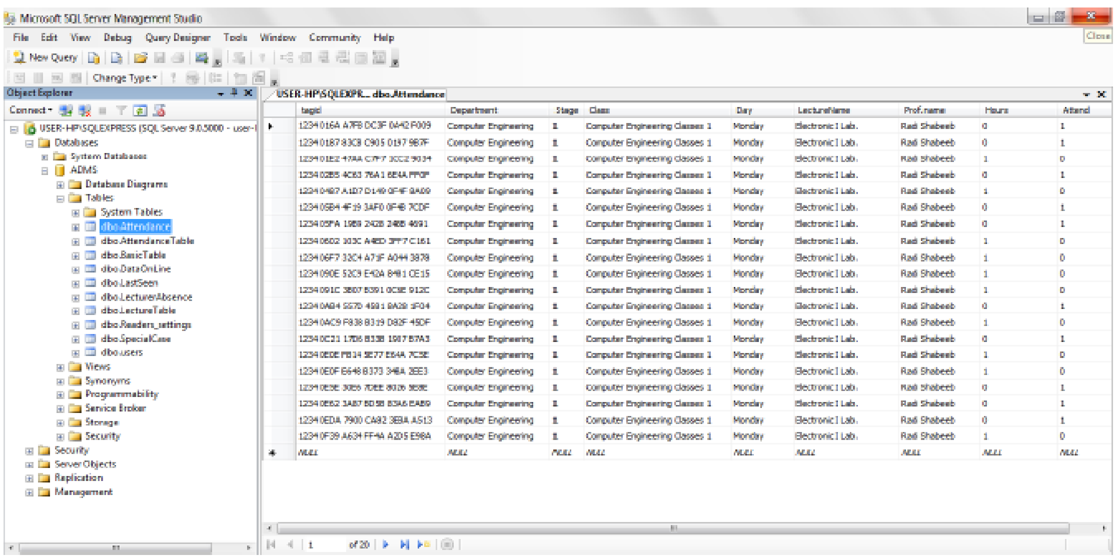


Figure 11. Class information



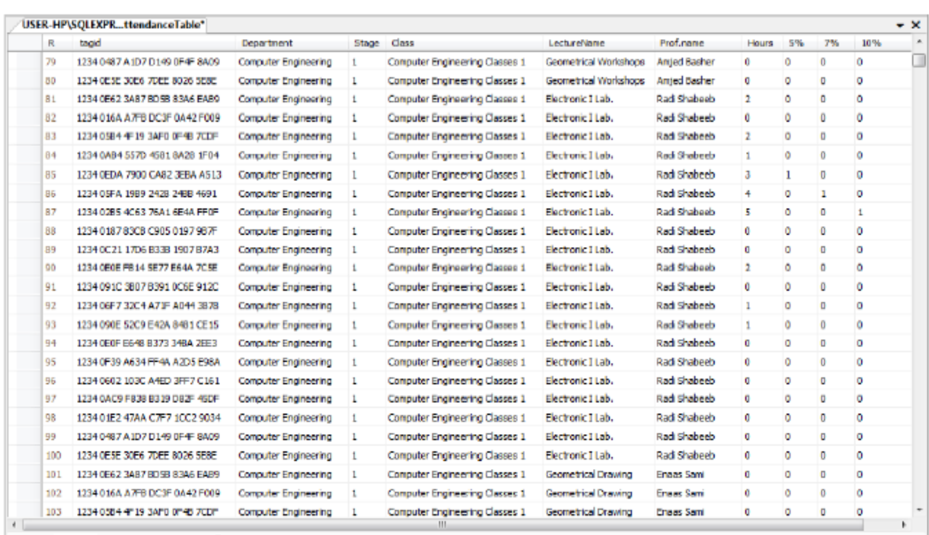
Class	Day	FromTime	ToTime	Subject	Prof.name	TheTime	5%	7%	10%	free
Computer Engineering Classes 1	Sunday	2013-04-28 08:30:00.000	2013-04-28 09:30:00.000	Programming II Lab.	Ahmed Hani	2	1.5	2.1	3	1
Computer Engineering Classes 1	Sunday	2013-04-07 09:00:00.000	2013-04-07 10:00:00.000	Programming II Lab.	Ahmed Hani	2	1.5	2.1	3	1
Computer Engineering Classes 1	Sunday	2013-04-07 10:00:00.000	2013-04-28 11:30:00.000	Programming II	Ahmed Hani	2	1.5	2.1	3	1
Computer Engineering Classes 1	Sunday	2013-04-28 11:30:00.000	2013-04-28 12:30:00.000	Programming II	Ahmed Hani	2	1.5	2.1	3	1
Computer Engineering Classes 1	Sunday	2013-04-28 12:30:00.000	2013-04-28 13:30:00.000	Math II	Mohamed Sabaah	2	3	4.2	6	1
Computer Engineering Classes 1	Sunday	2013-04-28 13:30:00.000	2013-04-28 14:30:00.000	Math II	Mohamed Sabaah	2	3	4.2	6	1
Computer Engineering Classes 1	Monday	2013-04-28 08:30:00.000	2013-04-28 09:30:00.000	Geometrical Workshops	Amjed Basher	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Monday	2013-04-28 09:30:00.000	2013-04-07 10:00:00.000	Geometrical Workshops	Amjed Basher	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Monday	2013-04-07 10:00:00.000	2013-04-28 11:30:00.000	Geometrical Workshops	Amjed Basher	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Monday	2013-04-28 11:30:00.000	2013-04-28 12:30:00.000	Electronic I Lab.	Radi Shabeeb	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Monday	2013-04-28 12:30:00.000	2013-04-28 13:30:00.000	Electronic I Lab.	Radi Shabeeb	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Monday	2013-04-28 13:30:00.000	2013-04-28 14:30:00.000	Electronic I Lab.	Radi Shabeeb	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Tuesday	2013-04-28 08:30:00.000	2013-04-28 09:30:00.000	Geometrical Drawing	Enaas Sami	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Tuesday	2013-04-28 09:30:00.000	2013-04-28 10:30:00.000	Geometrical Drawing	Enaas Sami	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Tuesday	2013-04-28 10:30:00.000	2013-04-28 11:30:00.000	Geometrical Drawing	Enaas Sami	3	2.25	3.15	4.5	1
Computer Engineering Classes 1	Tuesday	2013-04-28 11:30:00.000	2013-04-28 12:30:00.000	Arabic I	Malaz Nateek	1	0.75	1.05	1.5	1
Computer Engineering Classes 1	Tuesday	2013-04-28 12:30:00.000	2013-04-28 13:30:00.000	Circuits II	Fawzi Neema	2	1.5	2.1	3	1
Computer Engineering Classes 1	Tuesday	2013-04-28 13:30:00.000	2013-04-28 14:30:00.000	Circuits II	Fawzi Neema	2	1.5	2.1	3	1
Computer Engineering Classes 1	Wednesday	2013-04-28 08:30:00.000	2013-04-28 09:30:00.000	Math II	Mohamed Sabaah	2	3	4.2	6	1

Figure 12. Temporary attendance table



tagid	Department	Stage	Class	Day	LectureName	Prof.name	Hours	Attend
1234 016A A7FB DC3F 0A42 F009	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0187 83C8 C905 0197 987F	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 01E2 47AA C7F7 1CC2 9034	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 02B5 4C63 76A1 6E4A FF0F	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0487 A1D7 D149 0F4F 8A09	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 05B4 4F19 3AF0 0F4B 7CDF	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 05FA 1989 2428 24B8 4691	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0602 103C A4ED 3FF7 C161	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 06F7 32C4 A73F A044 3878	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 090E 52C9 E42A 8481 CE15	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 091C 3807 B391 0C8E 912C	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 0A84 5570 4581 8A20 1F04	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0AC9 F838 8319 D82F 45DF	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 0C21 17D6 B338 1907 B7A3	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0E0E FB14 5E77 E64A 7C5E	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 0E0F E648 B373 348A 2EE3	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
1234 0E5E 30E6 7DEE 8026 5E8E	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0E62 3A87 8D58 83A6 EAB9	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0EDA 7900 CA82 3EBA A513	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	0	1
1234 0F39 A634 FF4A A2D5 E98A	Computer Engineering	1	Computer Engineering Classes 1	Monday	Electronic I Lab.	Radi Shabeeb	1	0
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 13. Attendance table



R	tagid	Department	Stage	Class	LectureName	Prof.name	Hours	5%	7%	10%
79	1234 0487 A1D7 D149 0F4F 8A09	Computer Engineering	1	Computer Engineering Classes 1	Geometrical Workshops	Amjed Basher	0	0	0	0
80	1234 0E5E 30E6 7DEE 8026 5E8E	Computer Engineering	1	Computer Engineering Classes 1	Geometrical Workshops	Amjed Basher	0	0	0	0
81	1234 0E62 3A87 8D58 83A6 EAB9	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	2	0	0	0
82	1234 016A A7FB DC3F 0A42 F009	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
83	1234 05B4 4F19 3AF0 0F4B 7CDF	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	2	0	0	0
84	1234 0A84 557D 4581 8A28 1F04	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	1	0	0	0
85	1234 0EDA 7900 CA82 3EBA A513	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	3	1	0	0
86	1234 05FA 1989 2428 24B8 4691	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	4	0	1	0
87	1234 02B5 4C63 76A1 6E4A FF0F	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	5	0	0	1
88	1234 0187 83C8 C905 0197 987F	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
89	1234 0C21 17D6 B338 1907 B7A3	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
90	1234 0E0E FB14 5E77 E64A 7C5E	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	2	0	0	0
91	1234 091C 3807 B391 0C6E 912C	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
92	1234 06F7 32C4 A73F A044 3878	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	1	0	0	0
93	1234 090E 52C9 E42A 8481 CE15	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	1	0	0	0
94	1234 0E0F E648 B373 348A 2EE3	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
95	1234 0F39 A634 FF4A A2D5 E98A	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
96	1234 0602 103C A4ED 3FF7 C161	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
97	1234 0AC9 F838 8319 D82F 45DF	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
98	1234 01E2 47AA C7F7 1CC2 9034	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
99	1234 0487 A1D7 D149 0F4F 8A09	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
100	1234 0E5E 30E6 7DEE 8026 5E8E	Computer Engineering	1	Computer Engineering Classes 1	Electronic I Lab.	Radi Shabeeb	0	0	0	0
101	1234 0E62 3A87 8D58 83A6 EAB9	Computer Engineering	1	Computer Engineering Classes 1	Geometrical Drawing	Enaas Sami	0	0	0	0
102	1234 016A A7FB DC3F 0A42 F009	Computer Engineering	1	Computer Engineering Classes 1	Geometrical Drawing	Enaas Sami	0	0	0	0
103	1234 05B4 4F19 3AF0 0F4B 7CDF	Computer Engineering	1	Computer Engineering Classes 1	Geometrical Drawing	Enaas Sami	0	0	0	0

Figure 14. Warning calculation

Professor Fawzi M Al-Naima received both, the B.Sc. (First Class Honors), and Ph.D degrees in Electrical Engineering from Newcastle University, UK in 1971 and 1976 respectively. He worked as a Faculty Member in Al-Rasheed College of Engineering, Baghdad, Iraq from 1977 to 1989. He has been with the College of Engineering, Nahrain University/ Baghdad, Iraq since 1989, and was promoted to the rank of Professor Emeritus in January 2014. He served as Head of Department of Electronics and Communication Engineering from 1992 to 2000, and Head of Department of Computer Engineering from 2000 to 2003, and then a Dean of the College of Engineering from 2003 to 2007 in the same university. He spent one Sabbatical year in Aleppo University, Syria from October 2006 to September 2007. Also, he worked as a Foreign Faculty Professor in the University of Engineering and Technology UET Taxila, Pakistan from October 2007 to September 2008. Professor Al-Naima has published more than 70 research papers in national and international journals and conferences. He is the co-author of a book on the analysis of large circuits published by an international publisher in USA. He is also the co-author of four chapters in four books published by international science publishers. His current research interests include computer aided design of large circuits, analog and digital signal processing, solar tracking system, and smart home energy managements.

Professor Al-Naima is a Life Fellow Member of the Institution of Electronics and Telecommunication Engineers (FIETE), India, and a Senior Member of the Institute of Electrical and Electronics Engineers (SMIEEE). He has been working in Al-Esraa University College in Baghdad as a Consultant Professor since January 2014.

Maryam Alaa Saleh received the degree of B.Sc. in Software Engineering from Al-Mustansiria University, Baghdad, Iraq in 2009, and the degree of M.Sc. in Computer Engineering from Nahrain University, Baghdad, Iraq in 2013. She has been working as an Assistant Lecturer in Al-Farabi University College, Baghdad, Iraq since January 2014. Her current research interests include design of intelligent systems, and computer control system design.