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Implementation of attendance system based on UHF RFID technique

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Abstract:

As it's known there are many problems of using traditional method to get the attendances persons by using pen and paper. These problems can be represented by cheat. The proposed system develops another method to get attendees by using RFID technology. The proposed system consists of tags reader camera and base station. The system can be demonstrated by five steps.

The first step involves embedded ID number to each tag and assigns it in the database. The second step represented by reading data from the tag inside the reading range of the reader. In the third step data would sent to the base station. The fourth step include query about another information from database and capture photo from camera to save it. The image processing is used to write a name of person on the image for accuracy purpose. Fifth step include add the name of person to database in two cases depend on the time. Also the proposed system provides some features like ability to print a report

about any person and any date. Also the administrator can add unlimited number of users or remove any user from the system.

Key words: RFID, UHF tag, UHF Reader, VB.NET, USB cam.

1- INTRODUCTION

Like bar code recognition, RFID relies on tagging in order to identify objects. RFID tags don't need to be visible to be read unlike bar codes. An RFID reader sends a radio signal, which is picked up by an RFID tag and then transmits back a string of data. Depending on the size and sensitivity of the strength of the transmission, and the reader's antenna the tag can be several feet away from the reader, enclosed in a book, box, or item of clothing. There are two types of RFID system: passive and active. Passive RFID tags are powered by the current that the reader's signal induces in their antennas. In an active RFID system, the tag has its own power supply. Active systems can transmit for a much longer range than passive systems, and are less error-prone. They are also much more expensive [1].

2- HISTORY OF RFID

The RFID technique is developed rapidly, appeared in the early World War II and continued to evolve through the 1980s. RFID at UHF represents a fast growing market. Huge progress has been made over the last 10 years [18]. Recently, this technique has evolved as a result of the development that has occurred in the integrated circuits, radios, and an increased interest in commercial and government. Thus, the first decade of the twenty-first century sees the world moving towards this technology's fast spreading. One of the many major landmarks was the announcement by Wal-Mart Company at the retail systems conference in June 2003 in Chicago to use RFID technology for its suppliers. The first electronic car code (ECC)

global standard is released in January 2005. Expected that worldwide revenue for RFID technique would eclipse 1.2$ billion in 2008. Imports increased about 31% over the previous year. RFID technology participated in markets such as: access control, sensors and metering applications, payment systems, communication and transportation, parcel and document tracking, distribution logistics, automotive systems, livestock/pet tracking, and hospitals/pharmaceutical applications [19].

3- RFID VS. BAR CODES [21]

Generally, barcode uses laser light as data carrier while RFID uses radio waves to carry information. In the following a detailed of comparison between RFID and bar code technology.

i. Memory Size/Data Storage

Bar codes can only hold a limited amount of data approximately 20 digits while RFID tags are capable of holding far more information. Though RFID tags can be made with smaller memories to hold only a few bytes, the current state of technology puts the upper limit at 128 K bytes, orders of magnitude larger than most bar code symbols. 96 bits memory capacity is used in this proposed system.

ii. Read/Write

Bar codes are not able to modify the identification (ID). In contrast, RFID tags have an addressable, writeable memory that can modify ID number and high number of times over the life of the tag.

iii. Line-of-Sight

Another advantage of RFID technology over bar codes is that RFID systems do not require a line-of-sight between a tag and reader to work properly because radio waves are able to

propagate through many solid materials. In addition, tags embedded inside objects, and not just applied to packaging, it can also be read without problems. Bar codes require a direct line of sight with the scanner in order to work properly. This means that bar codes must be placed on the outside of packaging and objects must be removed from pallets in order to be read.

iv. Read Range

The read ranges of RFID tags vary widely, depending on frequency of operation, antenna size and whether the tag is active or passive. The reading range of bar codes can be quite long. Bar code scanners can be made to scan tags up to several yards away, though only under certain conditions and not without a direct line of sight. The reading range used in this proposed system is around 9 meters.

v. Multiple read and Anti-collision

RFID systems can read multiple tags simultaneously so pallet of RFID items wouldn't need to be unpacked. Whereas a pallet of bar-coded items would need to be unpacked and scanned individually in order to be inventoried.

vi. Access Security

Bar code data is not having high security because it requires a line-of-sight therefore placed very visibly on the outside of object, anyone with a standard bar code scanner or even a camera can read and record the data so the level of security is low. RFID systems offer a much higher level of security. RFID systems present the user with the ability to prevent third-party interception, and to encrypt sensitive data.

vii. Difficult to Replicate

Because RFID tags and electronics are so much more complex, then it is difficult to build or replicate it. In other side the bar code is unprotected for being replicated.

Table 1-1 Comparison of Bar Code vs. RFID System Characteristics

System	Bar Code	RFID
Data Transmission	Optical	Electromagnetic
Memory/Data Size	Up to 100 bytes	Up to 128 kbytes
Tag Writable	No	Possible
Position of Scan/Reader	Line-of-sight	Non-line-of-sight possible
Access Security	Low	High
Anti-collision	Not possible	Possible
Environmental Susceptibility	Dirt	Low

4- RFID SYSTEM COMPONENTS

RFID system consists of two main parts which are tag and reader. Tag is an electronic device used to give indication about the object carries it by transmitting its ID to the reader. Tag is also called "transmitter responder (transponder)" [22]. The main important point that is used to distinction of different RFID system is depending on energy supply of the tag. In this relation there is a difference between passive and active tags. Passive tag does not have any power supply and the reader provides all the energy required for operating through the transponder antenna from the electromagnetic field of the reader. The energy emitted by the reader is used for data transmission both from the reader to the transponder and back to the reader, so the passive tag can't send signals without reader existence. On the other side active tags have their own energy supply in the form of a battery. The power supply is used to provide voltage to the electronic circuit of the tag. So in active tag the electromagnetic field received from the reader is not necessary to supply the tag [23][24]. A maximum distance between the reader's antenna and the tag at which the reader can reliably read from or write to the tag is called operating

distance. In passive RFID systems, maximum operating distances for reading and writing operations are not always the same. The reason is that when writing to its memory, most tags require more power and, therefore, the operating distance is reduced. The maximum distance for reading operation is called read range while the corresponding distance for the writing operation is called write range [25]. Figure 1 show passive and active transponders. The second part is Reader. It is responsible for reading the identification number (ID) of each tag in its range .The task of reader is to receive commands from the computer and executes them independently. Figure 2 shows the most important reader components. RFID reader has one antenna or more. The task of antenna is to emit the transmission output in a suitable manner and to record the transponder signal. The antennas have different style depend on the required application (reading range, grouping ability, operation frequency ... etc.). Normally, the antenna and reader are connected with other by 50 Ohm coaxial cable. The RF connection between tag and reader is fully controlled by the reader in the case of passive tags, which means the tag is not capable of sending data unless triggered by the reader. The communication from the reader to the tag is referred to as the forward link, while the communication from the tag to the reader is referred to as the reverse link.

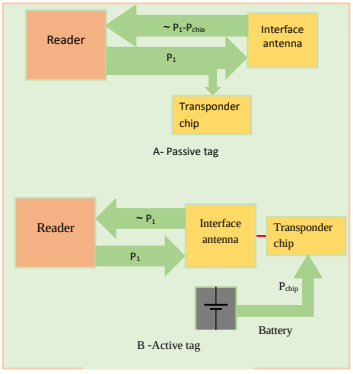

Figure 1 Type of tags (A- Passive tag, B -Active tag) [23].

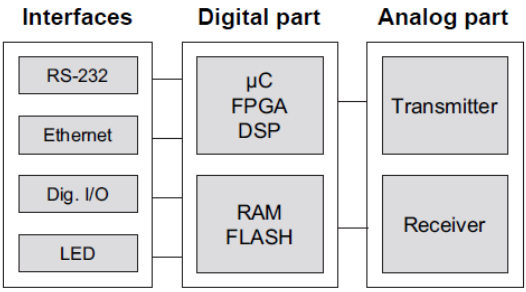

Figure 2 Reader components

5- PROPOSED SYSTEM

The basic idea of the proposed system is to design an applicable electronic attendance system instead of traditional systems that use papers which increase the accuracy and safe information from fraud. The proposed system consists of Tags, Reader, USB camera and base station. All these part work together according to the following block diagram

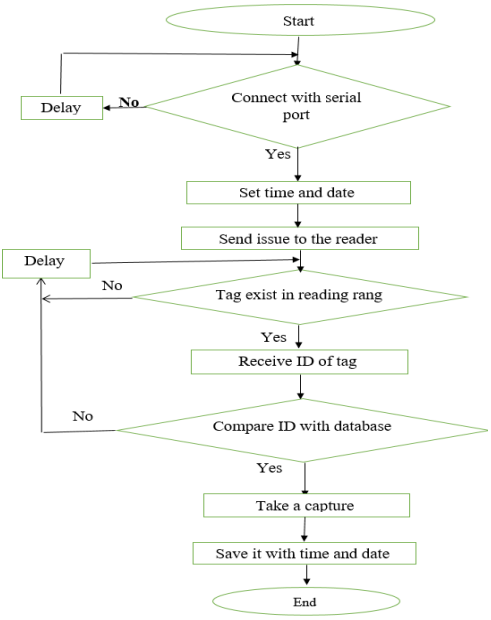

Fig 3 . Block diagram Reader operation

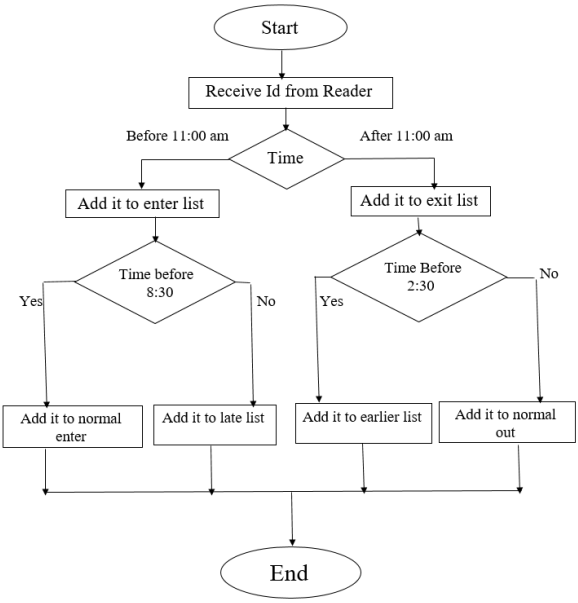

Fig4. Block diagram of base station operation

The above block diagrams demonstrate exactly how the proposed system operates. Also the following image explains the Graphical User Interface (GUI) of each tap of program.

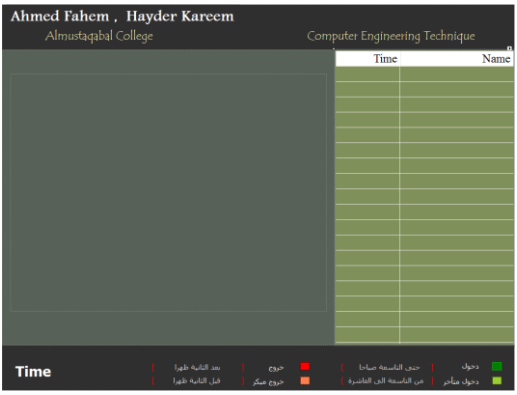

Fig 5. display GUI

The display GUI used during the normal work of system when the employee are still coming. It displays all periods of times and its decisions.

Fig6. Edit GUI

The Edit GUI used to add or delete any user by just insert the name of user and the ID of RFID tag and click Add.

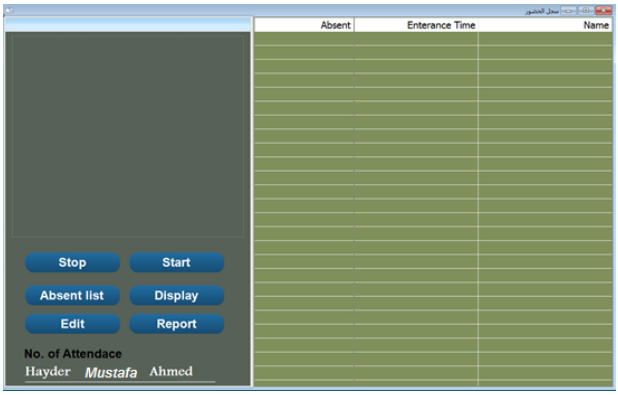

Fig7. the main GUI

From the main GUI, The in charge person can start and stop the system, also he can go to any GUI in the system and print the report of any day he want or any person he want.

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