



## **Protecting Databases Using Multiple Encryption**

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### **Abstract :**

The paper aims to protect the databases using multiple encryption. and presented a new method in the use of multiple encodings for a single selected experimental database. A number of methods were used to protect the selected database, the selected method is to hide database objects, The method develop be using in the Visual Basic programming language application in the databases, while the other method dealt with the design of the software code to convert the explicit text to the encrypted text. All of these methods were used for a single, trial-selected database, and all the methods used were designed to protect the elected database from unauthorized access to and manipulation of the database.

**Keywords:** Database protection, Microsoft office package, Multiple encryption.

### **I. Introduction**

Databases are a good solution to the problems of the information systems environment, most notably the problem of data redundancy and its negative effects on the use of storage media, conflicting information and the subsequent costs of maintaining, operating and maintaining them. In addition, updating any graphical component does not mean updating it at the system level, Which prevents data integrity and the inability to impose centralized management and security control that protects information from the risk of interference, breach or theft. [1]

The importance of protecting databases is becoming more important by increasing the importance of data to be protected. There are many ways



and means of security that help to maintain information security and encryption to the level that meets the requirements of security databases, because of a lot of means of penetration and espionage and access to data in the Internet. [2]

Encryption is the process of converting information that is simple text when storing on different storage media or when transferring it over networks that are text to text that is not readable to anyone except those who have special knowledge or special key to convert the encrypted text to readable text. This decryption process is done by the encryption key. As a result of the encryption process, the information becomes encrypted and is not available to anyone for clandestine, military, political or security purposes. This process is opposed to decoding, which is the process of using the key to return the encrypted text to readable text[2, 3].

Cryptography is used by companies and governments to facilitate confidential communications. Also secure the confidentiality of communication between civil units such as: computer networks (Internet, e-commerce, mobile phone, Bluetooth). Also in digital rights management to restrict the use of copyrighted material, and in software to protect it from software piracy and reverse engineering[3].

There are many methods to protect databases, represented in the design of passwords composed of letters, numbers and symbols, and in the adoption of the design of interfaces for database programs based on the language of other software such as C ++ or micro and other units, or protection within the code of the application by hiding the data fixed and not Show it to the user. [3,4]

## **II. Methodology**

### **1. Research Problem:**

the proliferation of thinking and planning to protect the databases from the entry of hackers on the data and the penetration and manipulation of their design and output, especially that the databases in the package of versions of Microsoft Office all can be opened and modified or manipulated content intentionally or unintentionally due to ignorance in



learning and use[4]., the solutions to the problem of protecting the rules of evidence, hence the idea of the current research in the use of one of the proposed solutions to protect databases using the use of multiple encryption

## **2. Objectives:**

The research aims to achieve the following:

1. Identifying databases in terms of concept, types, associations and related applications.
2. Attempt to access the protection of databases through the use of multiple encryption.
3. Simulation and experimentation of this attempt on one of the designs that use the databases.

## **3. Importance:**

Especially it is a tool to address the issue of protecting the databases and preventing access to them and manipulating their content. it also represents an addition of quality in this field. It can be used in protected database designs. It can also be used in the protection of models designed in other programming languages, Data in Fox Pro or Visual Basic.

## **III. Theoretically Study**

The researcher followed the descriptive and analytical approach in addressing the protection of multiple cryptographic databases, based on literature published in the field of research, in addition to surveying a set of programs that use databases in addition to the set of software solutions published on the websites of the international information network.

### **1.Previous Studies:**

The subject of protecting the databases is not far from the reach of researchers, especially those interested in the specialization or the optimal use of databases, has been conducted several studies for this subject by a number of researchers, as shown by some of these studies:

the behavior of databases in maintaining the security of stored data in order to identify the behavior of security databases and how to protect data



stored in database tables. The researcher pointed to the writing of some code in the language of structured inquiry and change some of the behaviors and procedures of these codes and their impact on the security of databases. The researcher stressed that these means of penetration is a fraud to access the databases, although the language of the software written databases is a language is solid. [2]

the protection of the database of banks operating within the state of Haiti, the US using the programming language of Oracle, while succeeding to prevent hackers and manipulators from entering the database designed for this purpose. [3]

the method of data encryption in the databases using micro-modules discussed, and concluded that the micro-modules provided by the databases can be used to close the access gap to a database designed for research on patients in Hilla Hospital. [5].

## **2.Database Concept**

Database is a compilation of a large amount of information or data and presented in one way or more to facilitate the use of them according to the definition of Ayman Daniel, [6] and defined by Muhi as data were organized or processed to make the most of it [7], as defined as a set of data and information Which are needed by the Organization from time to time are coordinated according to the desire and need of the organization so that they can be used to control their activities and activities, and differ from database systems, which are defined as a set of ready programs that implement all the functions required from the database. [8]

There are many databases that can deal with a huge amount of data, but what made Microsoft Access in all its versions different from all of them is that Access is not an ordinary database that simply stores and retrieves data next to sorting and sorting, but it is an integrated rule management system (RDBMS - Relational Data Base Management System). [8]

## **3.Databases Importance:**



The databases are of great importance in the various jobs, activities and events of individuals or organizations that help to [9] ;

- a. Storing all data for all activities in one way in an integrated and accurate manner, classification and organization of these data so that it can be retrieved in the future.
- b. Follow up changes in the stored data and make the necessary adjustments to them so that they are always in the appropriate picture to be used as soon as they are requested.
- c. Contain a vast amount of data beyond human potential to recall its details and then perform some processes and treatments that are impossible to implement manually.
- d. Linking different types of data to all activities.
- e. To ensure the complete confidentiality of the data stored therein so that no information is available to anyone who is not entitled to access it.

The database management functions are summarized as follows: [10]

1. Storing and saving data, retrieving data, analyzing data, updating data, modification, deletion and entry data.
2. Through these tasks, the human elements needed to manage the databases can be drawn from these elements:
3. Administrator of the Database, programmers, users and data entry.

#### **4. Microsoft Access:**

Microsoft Access is a software and system that is used to manage various databases by dealing with multiple tables, used to store data in one or more databases, which are files for storing data, and storing data in any database that has benefits and features Including storing a large amount of data without affecting the performance and effectiveness of the database, and can summarize some of the most important functions of database systems [9]:

- a. Add new data or information to the file,
- b. Delete old data that is no longer needed,
- c. Change existing data according to information you have created,
- d. Search and query for specific information,



- e. Organize and organize data within files,
- f. View data in the form of structured reports or templates, and
- g. Perform some calculations using mathematical equations and statistical data required

The most important features of the Microsoft Access database are: [10]

- a. Its ability to create a large number of tables and link them.
- b. Ease of adding and entering data to database.
- c. Ability to search for any information in the database in many ways and print it.
- d. Its ability to create data entry forms as needed.
- e. Ability to create and print formatted reports.
- f. Ability to integrate images and graphics into forms and reports.

In order to analyze and design a database system, you can begin by defining the purpose of the database, tables, and fields that it requires. The system defines the fields, their types, the relations between the tables and the requested queries, the form of the interfaces, the nature of the required reports, the design of the macro and the necessary buttons[10,11].

### **5. Protection of databases :**

The concept of database protection is to maintain the security, privacy and privacy of data, against the activities of hackers and unauthorized access to the database and manipulation in terms of data, design or theft or change property rights, [11] With full registrations of all database data updates away from the authorized users. [12] Database designers must therefore give serious attention to the security and confidentiality of data and information and prevent their improper use or tampering by granting specific powers. Define the nature of the beneficiary and the continuous monitoring of system use activities [13].

All database applications provide a means to add passwords, in addition to the possibility of the user to provide his own programs to use passwords away from the passwords provided by database applications, which are advised to be away from the explicit name or date of birth or title and the



nickname that can be guessed from Before spamming, so that it is difficult by using a combination of letters, numbers and symbols provided by different operating systems [14].

The databases designed by Microsoft Office of the Access program until Microsoft Office 2013. It can be accessed and modified, including access to the dynamic part of the written commands by the source code that represents the Visual Basic applications in the database by pressing a key from the keyboard continuously while opening, you can view the database components, tables Models, queries, etc., despite the existence of passwords and traffic [13].

## **6. Concept of Encryption**

Encryption is defined as the process of changing the appearance and shape of information to conceal its true meaning by transforming the form of data to be incomprehensible to those trying to view it. [13]

Encryption is defined as the process of converting text that is written, understood and clearly understood into symbols that are not understood by the public. It is a means of replacing any text or document that is read and understood into an unreadable and incomprehensible form, because it has been transformed from a literal form into symbols that can not be understood using the same letters, Different than usual or replaced with numbers, symbols and signals. [15]

Encryption is intended to protect files, databases, worksheets, images, charts and text format files in computers, as well as to prevent the understanding and use of data by persons or entities not allowed to enter or use data and electronic data preservation media.

## **7. Encryption Purpose:**

The purpose of encryption is to protect the confidentiality of digital data stored on computer systems or transmitted over the Internet or other computer networks. Modern cryptographic algorithms play a vital role in ensuring the security of ICT systems. [16]

## **8.Types of Encryption:**

The types of encryption can generally be classified as follows: [16]



a. Transient or virtual encryption: In this type of encryption, the letters of the read message are rearranged so that they remain the same, while their location changes. Therefore, the encoded text has the same characters as the original text, but the arrangement is different, for example Zig-Zag.

b. Compensatory Encryption:

In the compensation technique, plain text characters are replaced by other letters, numbers, or symbols. If you look at the plain text as a string of bits, the compensatory code is to replace the plain code bits with the encrypted text bits, Will change, divided into two parts: the mon alphabetic alphabet (additive, Caesar's cipher, affine) and the polyalphabetic compensation code: Beaufort, Vigenere.

c. Multiple encryption:

Encryption can be used by using a regular password, in addition to hiding tables and other objects if the password is exceeded. The code in which the code is written can be hidden, using code that tries to change the code in which it was written. Which makes it difficult for hackers to access or tamper with data, objects or code[14,15].

#### **IV. The Implementation**

In this section we will discuss the applied method of protecting a database selected by the researcher using multiple coding to achieve the research objectives.

##### **1. Database used:**

The program of the examination committee, which is designed according to the Microsoft Access 2010 version, has been selected and used in some formations of the Southern Technical University and for more than three years, used to enter students' data in all stages of study. The program has the ability to provide the examination committee with different reports and calculate the success rates according to the mechanism designed by the programmer depends on the originator of the code, that is, the designer took the language of Visual Basic method of programming the processing and calculation results desired by the beneficiaries, as used designer tools databases to facilitate data entry and mobility within the database as the





program is easy to use by the beneficiaries even if they were not to have sufficient experience in the databases.

Depending on the systems analysis, that the program is designed according to the needs and requirements of the various examination committees, that is, a program that meets the requirements of the scientific section and the program contains a manual for each process in the facades of interfaces in terms of addability and delete and make quick calculations and move between interfaces to the next and previous ones and action correction of data whether grades or personal student data, and is designed with interfaces with color features acceptable to the user.

Figures (1), (2), (3) and (4) explain the interfaces forms of the program selected by the researcher, which can be accessed and viewed using the password:

Fig. 1: Student Data Entry Interface



Fig. 2: Data Entry Interface





Fig.3: The interface of entering the data stages document data of form

الصف الثاني				الصف الأول			
عدد	الصف	عدد الساعات الأسبوعية	عدد الساعات التراكمية	عدد	الصف	عدد الساعات الأسبوعية	عدد الساعات التراكمية
10	3	0	2	4	3	0	2
10	2	0	2	4	2	0	2
10	3	0	2	4	3	0	3
4	3	0	3	4	4	0	0
4	4	0	0	4	3	0	0
4	3	0	0	4	3	0	0
4	0	0	2	12	2	0	1
4	2	0	1	4	0	0	2

Fig.4: Student graduation form

الدرجة	حزون المادة
<input type="checkbox"/>	الميكانيك الهندسي
<input type="checkbox"/>	فهرس المواد
<input type="checkbox"/>	حسوات التمدع
<input type="checkbox"/>	الفرصيات
<input type="checkbox"/>	الرسد الهندسي
<input type="checkbox"/>	تطبيقات الحاسبة
<input type="checkbox"/>	معالر حاسبات
<input type="checkbox"/>	خلق الالاسن والتصفر العفر

The program includes a set of tables, one for the data of the scientific section and two tables for the data of students of each stage of study in addition to a number of queries linking tables, forms and reports.

As for the reports of the exam program, they varied in accordance with the nature of the service required by the examination committees in the scientific departments. It included the student's voucher submitted to the student as a result of the first or second stage, the general score for the results of all students and the names of students completing the courses and courses completed or failed. In addition to the interface includes the names of successful students ranked by descending rate. The program provides the student graduation document that is kept in his profile in the final grades when he successfully passed his studies.

## 2. Proposed Protection Of The Database Selected Using Multiple Encryption:

The use of multiple encryption in the protection of the database selected by the traditional password-protected researcher in the main interface only can be passed by the experienced database, where the same password was retained and the addition of a set of software changes to the database to protect it from unauthorized entry. As follows:

### 3. Protect the database by hiding objects:

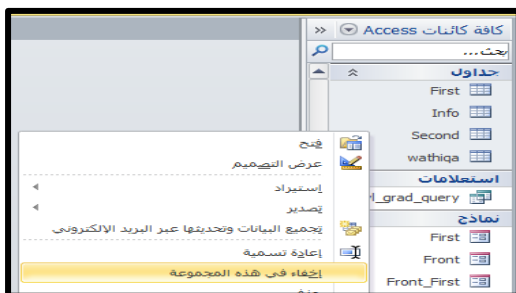
This method can hide the objects of the database of tables, forms, reports and queries, and this method provided by Microsoft to be accessible to the



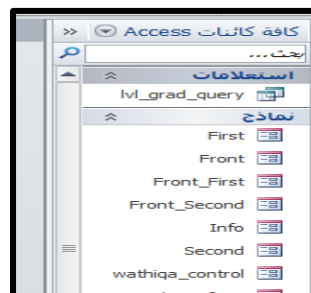
database designer and is one of its tools, but mostly used by designers, as this method prevents hackers from entering the tables contained in the base the data is also prevented from being copied at the time that it prevents them from being imported by Excel users. If they want to import database tables from Excel to Excel, Figure 5 shows how to hide objects:

Figure (5) Method of hiding database tables.

a . Before hiding the set of tables



b . After hiding the set of tables



This is the case with other database components, such as models and reports, which should be hidden so that the database user cannot access, modify or manipulate its components.

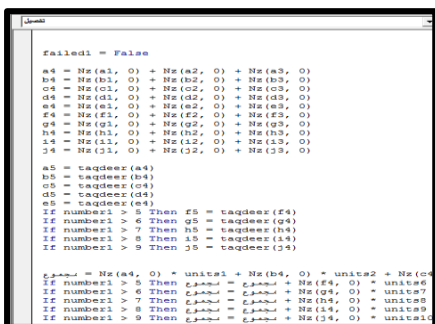
#### 4. Protect The Database By Hiding The Code:

The code is the application from which the event originates, for example, all calculations, since the program can not perform calculations without the existence of the code generator, and in the access databases, the code generator is one of the Visual Basic applications in the databases. And the most dangerous components of the database, as access to the code represents a significant risk in changing all the data and results obtained from the database, and in order to protect the code and language and text in which these instructions were written, the following software steps were used Illustrated in Figure 6.

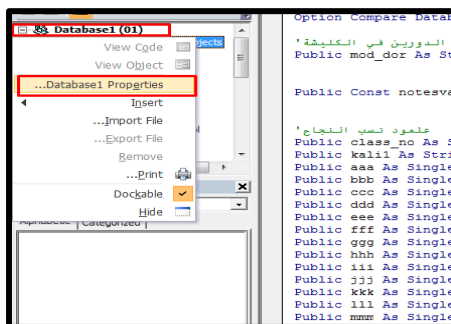
It is a code encoded with a new password for the designer different from the password when entering the program:

Figure (6): Steps to encrypt the code in the code generator with a new password.

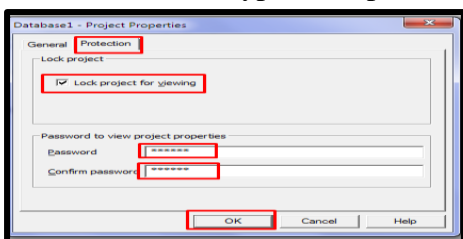
a . Pre-encryption



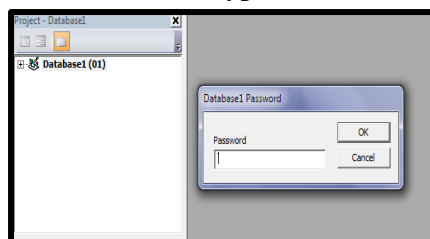
b . First encryption step



c. The second encryption step



d . After encryption





### **5. Protect The Database Using The Programming Language:**

The programming language in which the code was written can be understood by specialists and experts when they wish to change or modify or steal their proprietary rights. It is therefore necessary that the scripts be converted from explicit texts into encrypted or adaptive texts that can not be understood by programmers.

## **V. Conclusions and Recommendations:**

### **1. Conclusions:**

The researcher reached the following conclusions:

1. Databases still need more protection by using methods and programs to be out of the reach of hackers and hackers who aim unintentionally tampering or who intend to steal property rights or have illegal targets in their use.
2. Microsoft, which produced the Office suite has left the protection option open to designers each according to the way and nature of use, so it was thought to create software help the database of evidence by designers to protect them in accordance with the nature of the purpose for which the database was created.
3. Different protection methods can be used for databases, especially in the Office suite, such as the use of traditional protection with passwords composed of characters or symbols, or both, including the creation of models that act as initial interfaces of the database containing coded texts that the user understands with the consent of the designer.
4. You can use the blindness or concealment of database objects to prevent the intrusion of the user to enter objects and tampering with their content.
5. The use of encryption for the nature of the code would protect the database from manipulating the user experienced in the events resulting from the application of the code.



## **2 - Recommendations:**

Through the methods used to protect the databases, especially the database in the Microsoft Access package according to the conclusions above, the researcher recommends the following:

1. Use the current research process to find other ways to protect the databases in the Fox Pro.
2. Research the protection of databases operating on the International Information Network such as the Central Admission Program of the Ministry of Higher Education and Scientific Research.
3. Use the programming methods contained in the current search to protect the database of the ration card.

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