DESIGN AND IMPLEMENTATION OF INFORMATION SYSTEM FOR GENERAL DIAGNOSTIC AND REMEDY OF CASTING DEFECTS

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ABSTRACT:

Casting defects are ones of the important problems occurring in the casting process .The large number of the defects make the diagnosis of them difficult and depend on the inspector experience and his information of the defects property. This diagnostic perhaps being wrong and not accurate. Therefore in this research an inclusive program through information system was designed to diagnose the defects and its causes then put the suggested remedy, this program contains four methods to recognize the defects in castings .The methods are 1.Use selection of the listed property of the defects 2.Benefit from the pictures of defects to diagnose the defect. 3. The questions and answers method .4.Combo box that contains all the defects name .The last method was designed only for the workers having a great experience in this field. It is found after verification that the method of picture is the simplest and rapidly one because the user needs to see the picture that is given to him and compare them with the castings defect. The program was designed by the use of Visual Basic language, which allows making dealing with the methods easy. The arrangement of this number of defects was done by use general classification that classify them to seven groups and these were divided to subdivision groups .The verification was done to check the effectiveness of the program and it gave good results .

الخلاصة

من اهم المشاكل التي تواجه عملية السباكة هي العيوب التي تظهر في المسبوكات .ان عدد هذه العيوب كبير بحيث يجعل تشخيصها صعب ويعتمد على خبرة الفاحص ومعلوماته عن عيوب السباكة .وهذا التشخيص ربما يكون خاطى احيانا او غير دقيق لذلك تم تصميم هذا البرنامج الشامل من خلال نظام معلومات يعمل على تشخيص العيوب ويحدد اسبابها ومن ثم وضع العلاجات المناسبة لها بحيث يحتوي على اربعة طرق من خلالها يتم معرفة العيوب في المسبوكات وهذه الطرق هي 1- استخدام الاختيار لخواص العيوب ضمن قائمة معينة 2- استخدام الصور والاستفادة منها لتشخيص العيوب 3- عن طريق الاسئلة والاجوبة في تحديد نوع العيب 4- عن طريق اسماء العيوب الموجودة جميعها ضمن قوائم مدرجة .ان الطريقة الاخيرة مصممة فقط للعاملين في هذا المجال ولهم الخبرة فيه وقد وجد بعد التطبيق ان طريقة التعرف على العيب عن طريق الصور هي اسهل واسرع الطرق لان المستخدم يحتاج فقط لمقارنة شكل العيوب الموجودة لديه في المسبوكة مع الصور المعطاة له في البرنامج

K. M. Daws	Design and Implementation of Information System
B. B.Jawad	For general Diagnostic and Remedy Of Casting
	Defects

وتحديد نوع العيب. وقد تم تصميم البرنامج عن طريق لغة Visual basic والتي يكون التعامل من خلالها مرن ومفيد جدا مع انظمة المعلومات. لقد تم تصنيف العيوب الى سبعة مجاميع رئيسية وهذه المجاميع قسمت الى مجاميع فرعية ثم ادرجت ضمن الطرق الاربعة. وقد تم اجراء تحقيق للتاكد من فعالية البرنامج ووجد انه يعطي لها نتائج نسبة جيدة من الدقة.

KEY WORDS
Defects, remedy, diagnostic, casting , information

INTRODUCTION

There are many defects that appear in castings products due to some reasons such as the existence of gases in molten metal, the inclusions in metals and mould, the moisture in sand mould and improper pouring temperature (British standered,1956) . Most of these defects appear in sand casting and less in other types of casting. Some defects can be accepted with them because their effects are negligible others are refused that led to losses in time and money for the manufacturer .The methods that available to recognize these defects are slow and randomly and depend only on worker experience. Some literatures survey approach from this subject such us:(Mery ,2002) who make review of methods for automated reduction of casting defects , (Naro,2002) deals with porosity defects in iron casting from mold metal interface reactions .(Mark ,2005) study the analysis and reduction of casting defects . The present work is a practical method for diagnostic because it depends on computer technique to design and implementation information system for general diagnostic and remedy of casting defect. The user can choose one of the methods that designed in the program to get the final result of the search, and this is done by following the steps of every method until reaching the final result which contains the properties of the defect, its causes and the suggested remedy.

 DESIGN OF PROGRAM

The experimental work includes:
1 Design the program contains all casting defects through suitable classification which divides
   the defects into seven groups according to their properties (Technical council,1950)
Group A (Metallic Projections)
Group B (Cavities)

Group C (Discontinuities)

Group D (Defective surface).
Group E (Incomplete casting).
Group F (Incorrect Dimensions and Shape).
Group G (Inclusions or Structural Anomalies).
   These groups were divided to subdivision groups(Groover, 1996)

2 In the program there are four methods **Fig. (1)** designed to diagnose the defect by choosing one of them:

Fig (1) The main window of the program.

METHOD OF SELECT

The user can choose this method by click on point (1) in the main window then **Fig. (2)** appear. Now it should select if the defect seem to be external or internal and if it is unknown select (not known), also select if it general (alloy) or (steel), because the program is separately searching these two alloys. In this window the user should choose one of the seven groups because they are all actives, the chosen was done by the user decision when compare its castings defect with them. Now when select one of the groups a window appear that contains all the properties of the external or internal defect according to the previous choice **Fig. (3).** All the properties are actives, but before click on any one and in order to make sure of the choice there is a command (show picture) when click on it, the picture of the selected properties is appear **Fig. (4),** then it can select the right property. It will take to the next window, which includes the mean defect for that property through the general classification of its group. In this classification, the exact defect is only active and appears with the color different from the others defects in the groups which they are non-actives in that time **Fig (5).** When click on the block of this defect the final result will appear which contains the properties of the defect, its causes and the suggested remedy for it, also a small picture for the defect **Fig (6).**
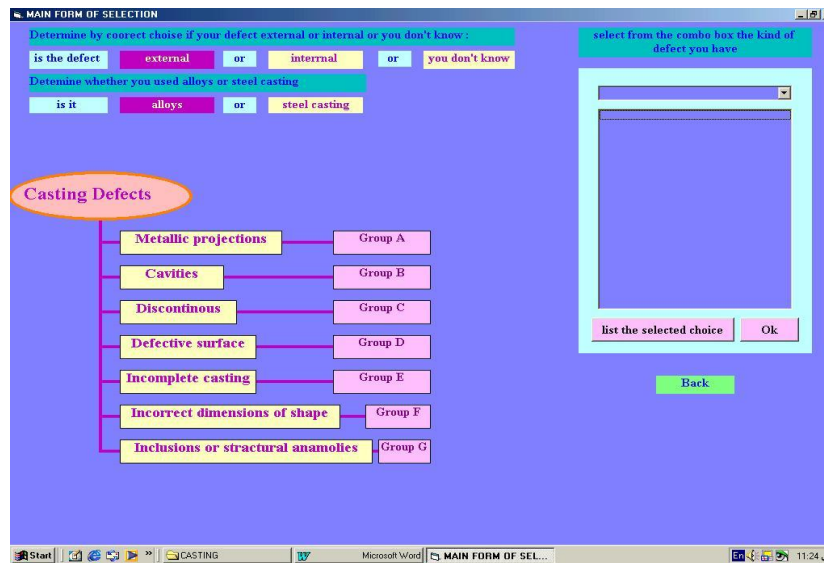
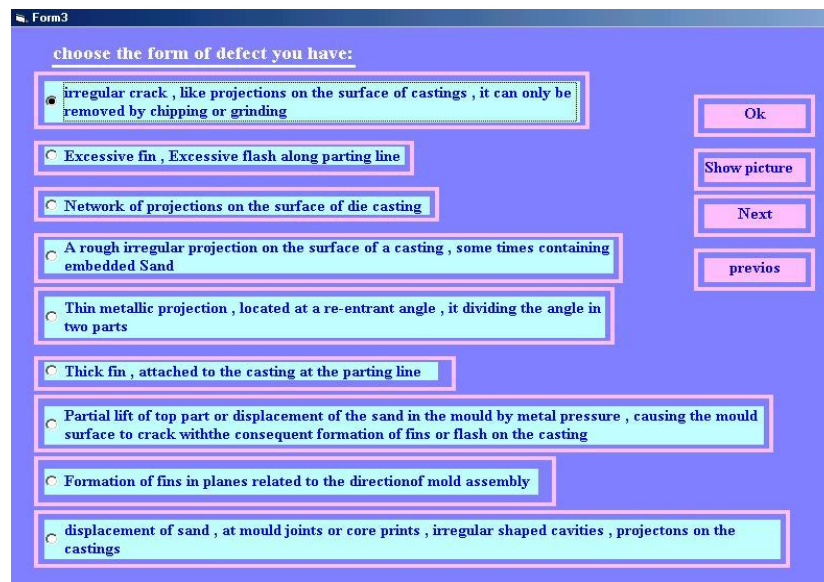**Fig. (2) The selection of the groups with the type of the defect**
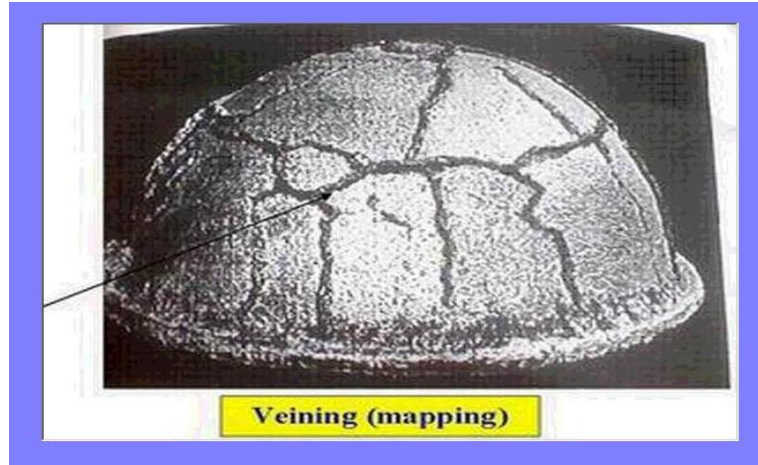

Fig.(3) The Selection of the property

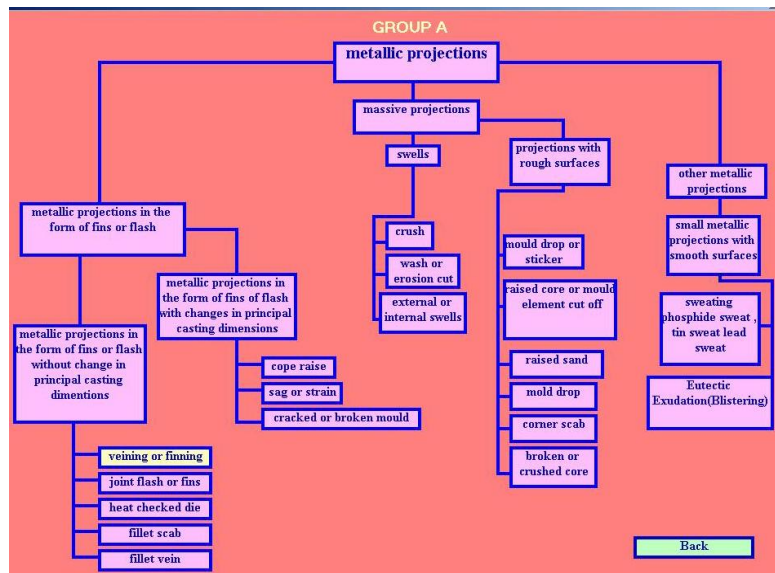**Fig. (4) The picture of the defect of the selected property**
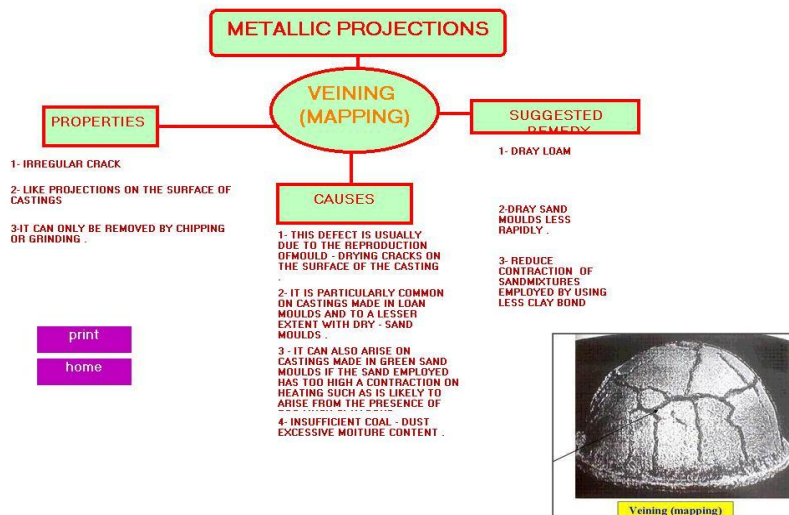

Fig. (5)The general classification of the mean defect

Fig. (6) The final result

5154

K. M. Daws	Design and Implementation of Information System
B. B.Jawad	For general Diagnostic and Remedy Of Casting
	Defects

THE METHOD OF PICTURES

The second method is the use of pictures **Fig. (7) (a)** and **(b)** to recognize the defect by comparing the picture of the defect in defective casting with the pictures of all defects listed after choosing the type of defect and the kind of the alloy. Also it should choose one of the seven groups, **Fig. (8).** Then the pictures appear until find the same picture of defect same as of the defect in defective casting. **Fig. (9).** This picture is active in that time, when click on it the general classification of that defect appear**Fig. (10)** .The defect in this classification is the only one active and appears with different color while other defects in the classification are not active **Fig. (11).**

Fig. (7) (a) The choose of the second method

Fig. (7) (b) The start of the second method
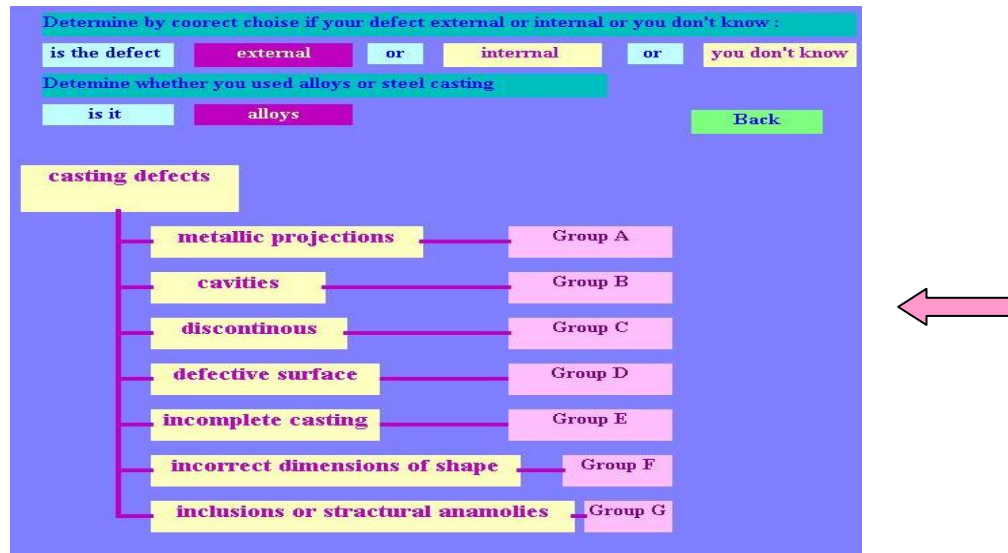
Fig. (8) The choice of types of the defect, the kinds of alloy and the group of defect.

Fig. (9) One of the listed pictures
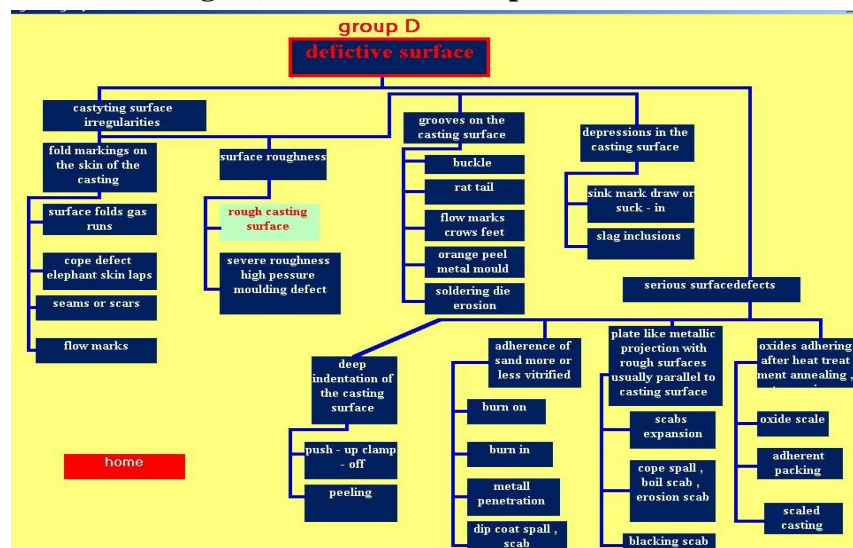
Fig. (10) The general classification of the mean defect

5156

Fig (11) The final result.

METHOD OF QUESTIONS AND ANSWERS

There is method of diagnose the defect in the defective casting by using the questions and choose answers that give the exact result. First it should take point three in main window **Fig. (12)** then the next window appear to choose the types of the defect and the kinds of casings **Fig. (13)** After that the starting window of the method appears **Fig. (14)** .In that time many questions related to the properties of the choosing types appears **Fig. (15),** the questions can changed by clicking (No) for the question that not give the right property until reach to the question give the property similar to the defect in the castings. When click (Yes) to that property, the general classification of the mean defect appear with the different color between the other defects in this classification **Fig. (16)**.Clicking on the mean defect give final result **Fig. (17)**.
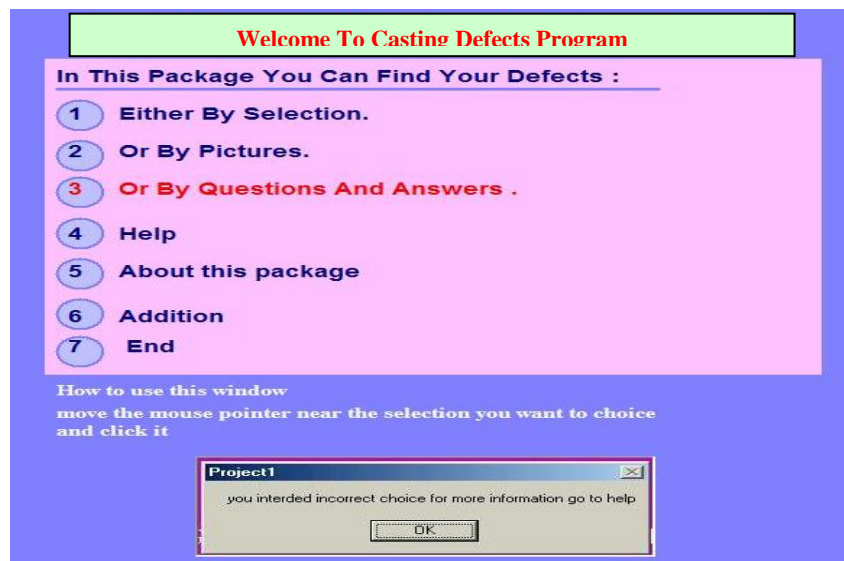
Fig (12) Selection of third method

5157
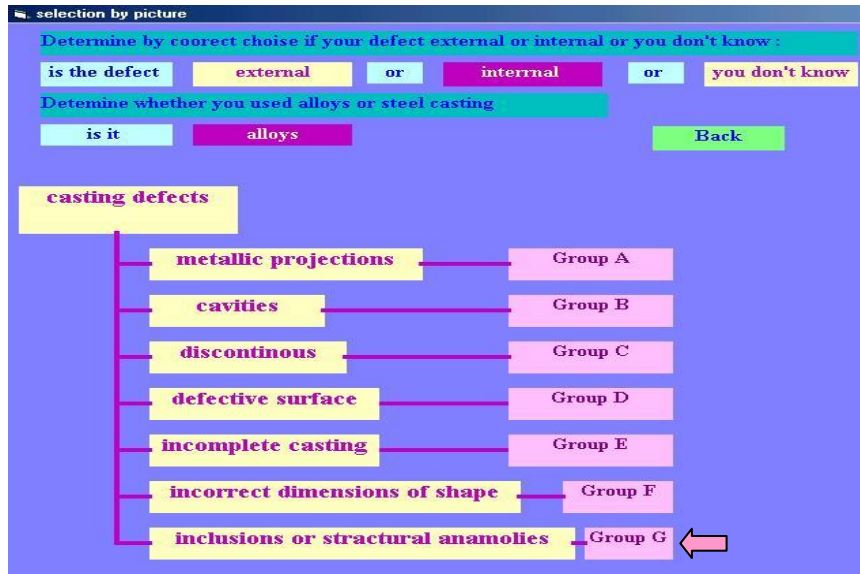
Fig (13) Choose the types of defect and the kind of casting
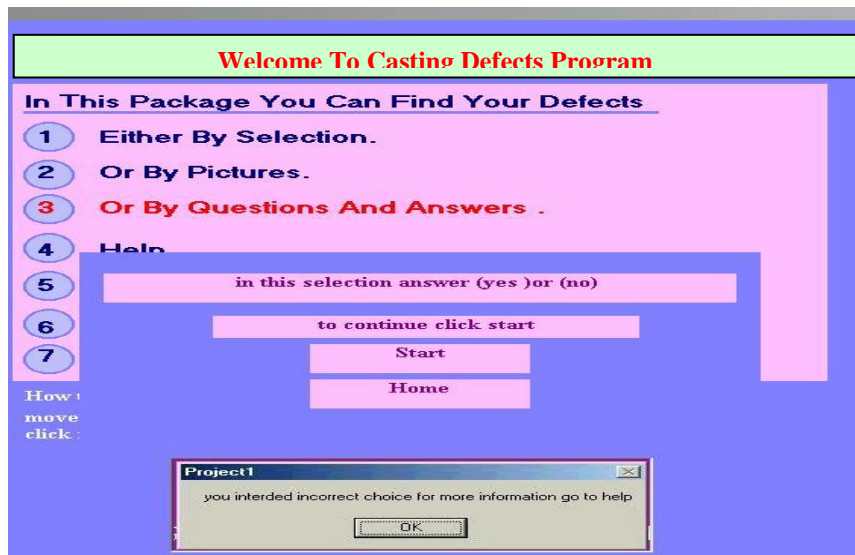
Fig (14) The starting of third method
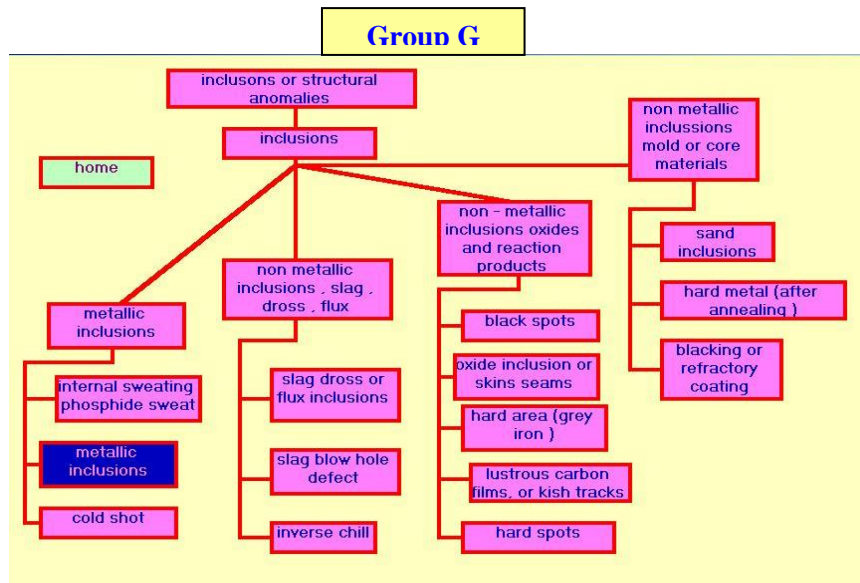

Fig (15) The questions of properties of defects

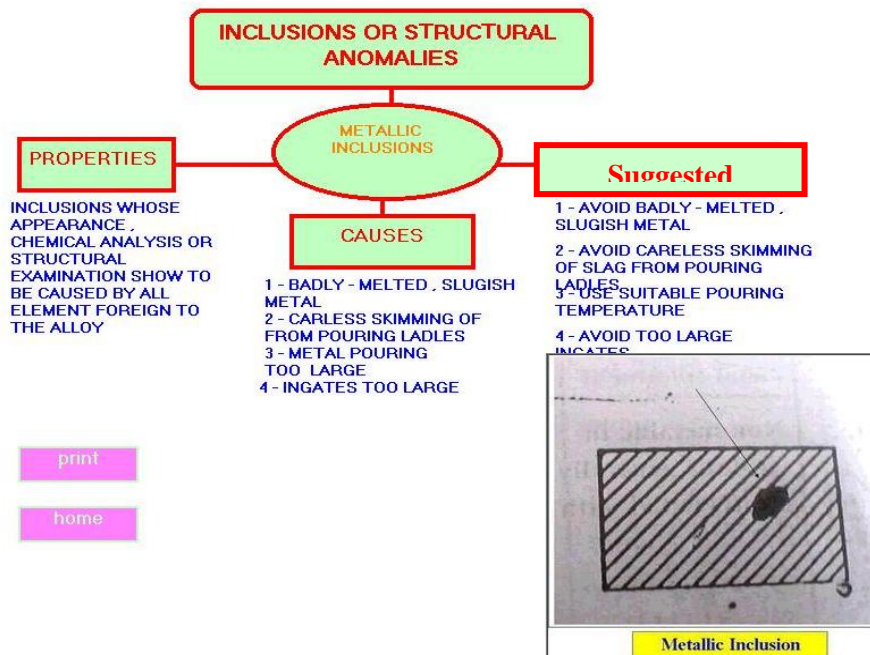**Fig. (16) The classification of the defect**

Fig. (17) The final result

RESULTS AND VERIFICATION

In order to check the results of the program and its accuracy, verification was done by casting three castings with planning to create many particular defects that appointed premature. Therefore three samples were taken, the first one include a (Flash) defect. It is aluminum alloy cast with sand casting method, the second achieved with existence of (Shift) defect by intending no corresponding between the upper part of the mould with the lower part, while the third defect which is(blow holes) create by preventing the gases in the molten metal to exit through the mould, and make the molten metal exposed to the atmospheric gases. Then the diagnoses for these defects

were done by applying the program step by step to check its effectiveness in work with properly form to recognize the defect.

Application Of First Method To Find (Flash) Defect
The defective parts appear in **Fig.(18)**, they are used to make verification to the first method of information program was done .By using selection of properties of the defects to find the defect it is seen that this sample has defects seems to be additional metals from the side of the part. At the first it have to distinguish the general properties of this defect, it is external defect with aluminum alloy and it is suitable with first group of defects (Metallic projections).when following the steps of the method with **Fig.(19),Fig.(20) , Fig.(21) ,Fig.(22)** the final results will appear in **Fig.(23), Fig.(24)**Which explain that this defect is (Metallic
projections) in the form of fins called(flash) with all his causes and suggested remedy.

Fig (18) The first samples for first defect

Fig .(19) Choice of the first method

Fig .(20) Choice of the types of the

Fig .(21) Choice the right property

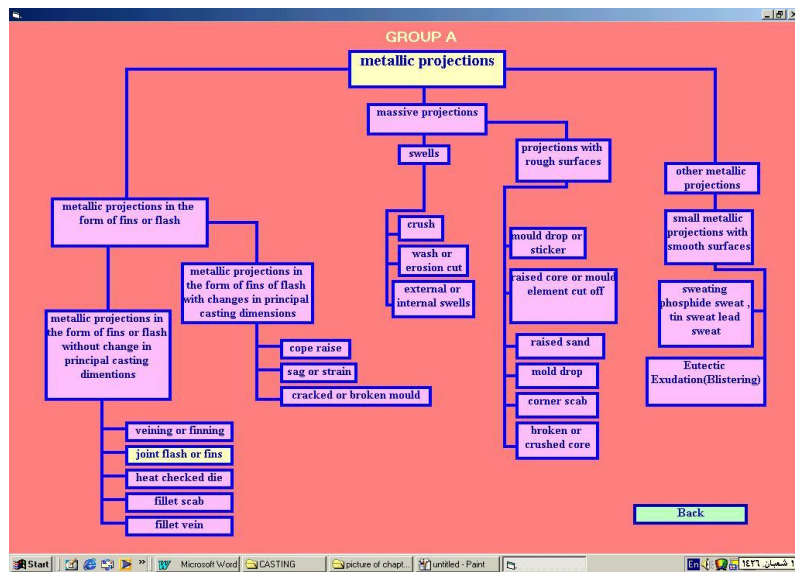**Fig (22) The Picture of the selected property**

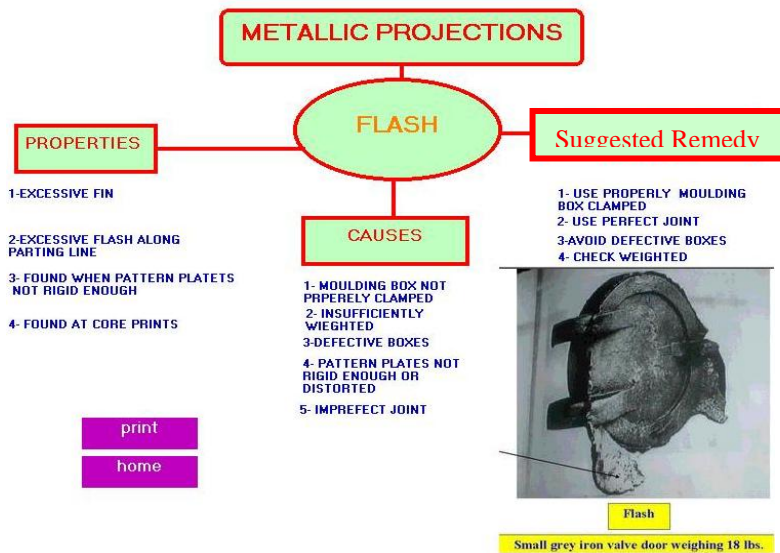**Fig (23) The general classification of the mean defect**

Fig (24) The final result of the mean defect

Application Of The Second Method To Find (Shift) Defect :

The second defective sample **Fig.(25)** is used to make the verification on the second method of the program which is used pictures to recognize the type of the defect choosing all the conditions of this defect and following the steps of the second method **Fig.(26)** ,**Fig.(27), Fig.(28)**it is seen that this defect is classify to (group f)**Fig.(29)** which is called incorrect dimensions of shape with sub division(casting shape incorrect overall or in certain locations)and his name is (shift)or (mismatch) or (cross joint).Final results appear in **Fig.(30)** .the defect ,its properties,causes,and Remedy.

Fig. (25) The samples of the second defect

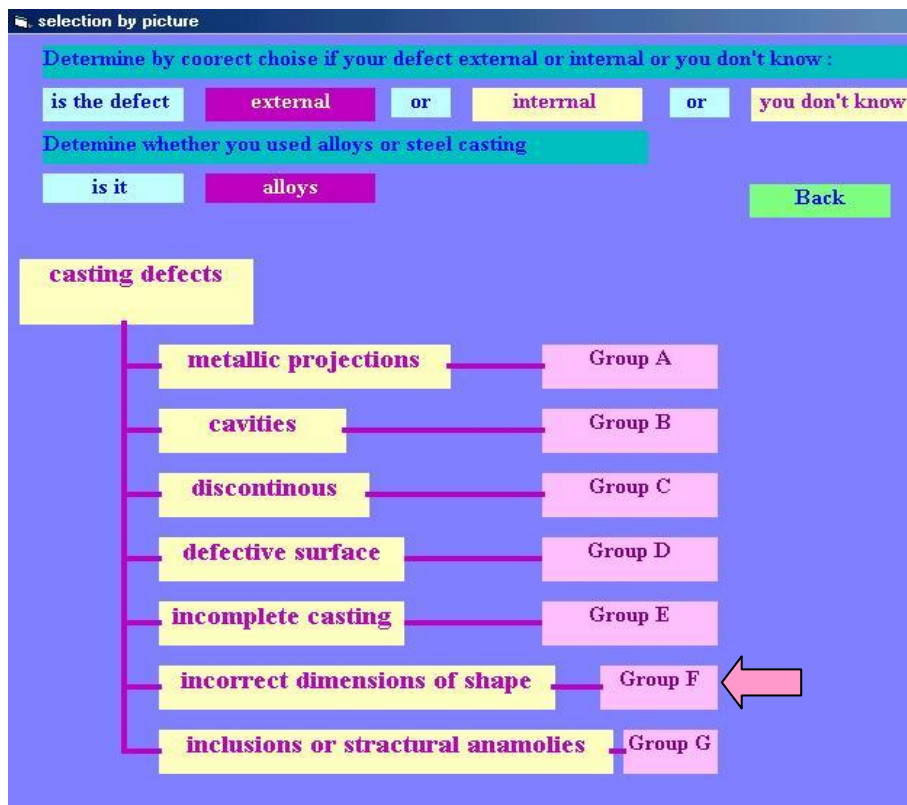**Fig. (26) The samples of the second defect**

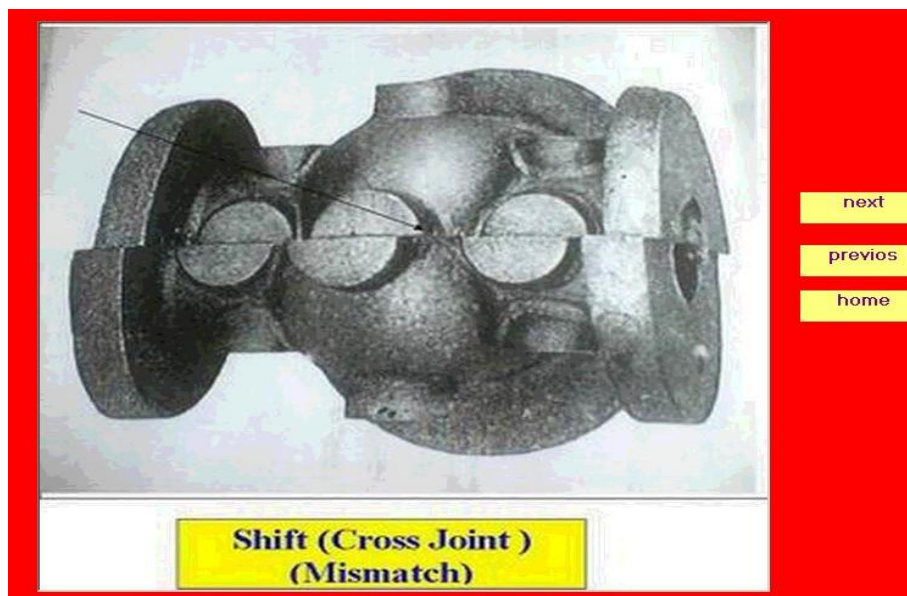**Fig. (27) The choice of the type of defect and castings**

Fig. (28) The picture of the same defect

K. M. Daws
B. B.Jawad

Design and Implementation of Information System
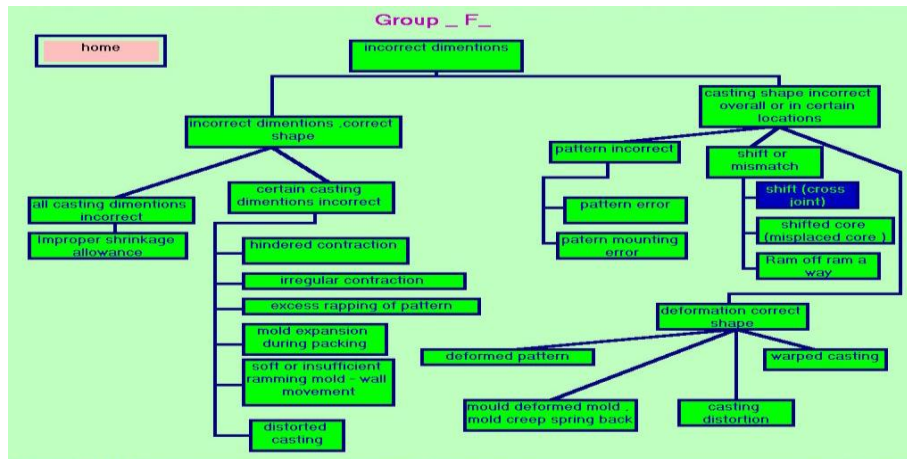For general Diagnostic and Remedy Of Casting
Defects

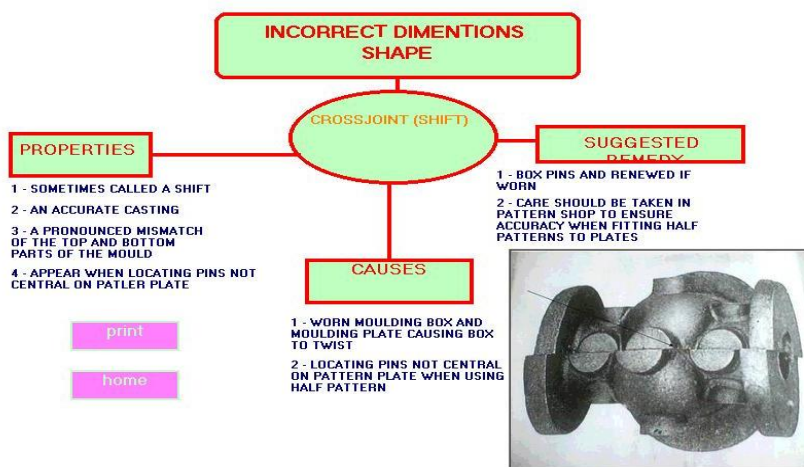**Fig. (29) The general classification of the mean defect**

Fig. (30) The final result of the mean defect

Application Of The Third Method To Find (gas holes) Defect

The third method is used to find the defect in third sample **Fig.(31).** This method depend on questions and answers **Fig.(32)** ,according to the steps of program and by choosing the group of defect between the seven groups listed **Fig.(33).**It is seen that the group is (B) called cavities ,when following the questions related with the properties of defects **Fig.(34),Fig.(35)** ,the results appear in **Fig.(36)** with the classification of this defect .It is cavity with generally rounded smooth wall internal and called (Blow holes pin holes) ,finally **Fig.(37)** give the properties, causes and suggested remedy.
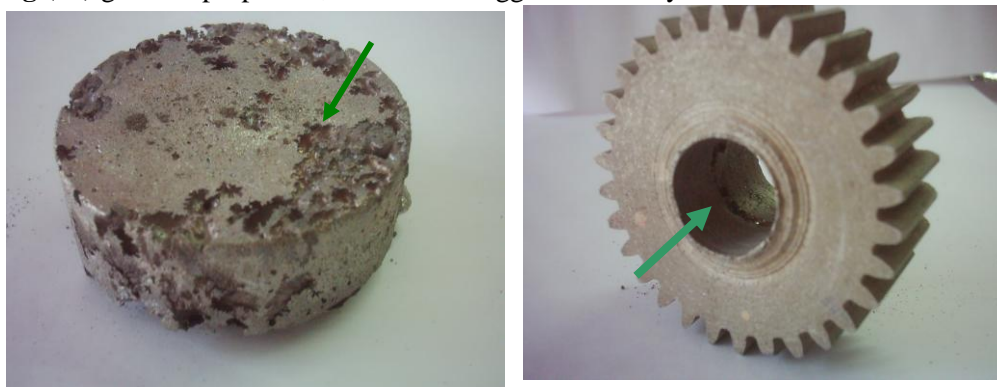

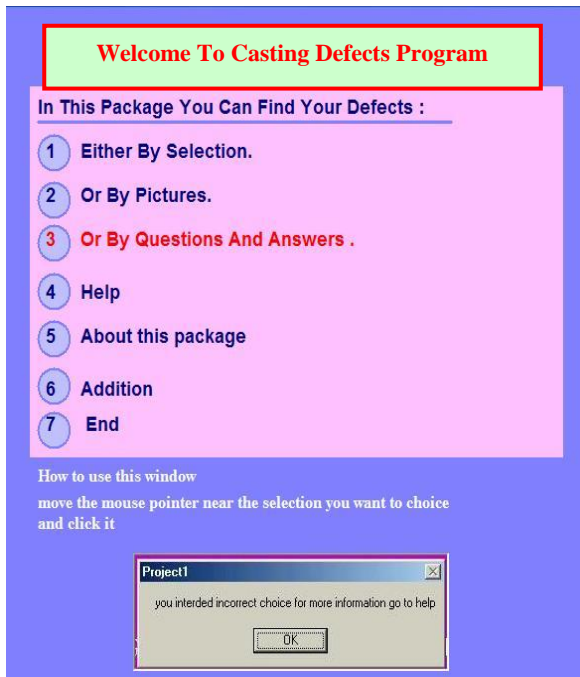**Fig. (31) The samples of the third defect**
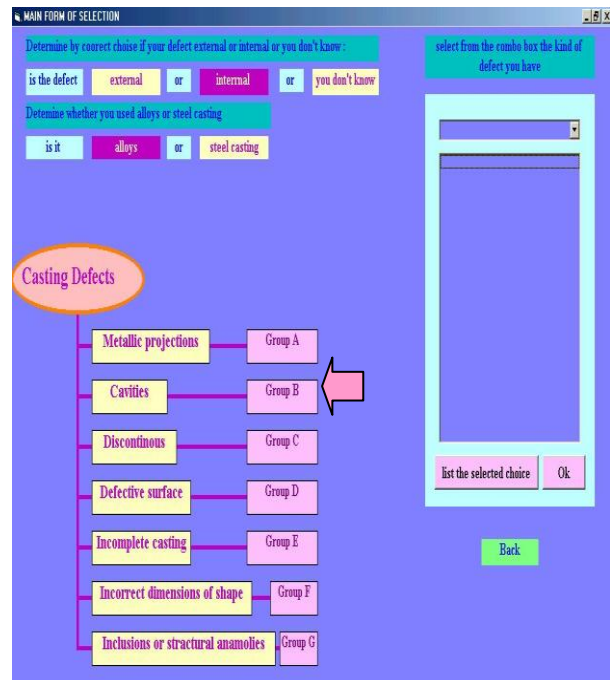
Fig. (32) The choice of third method

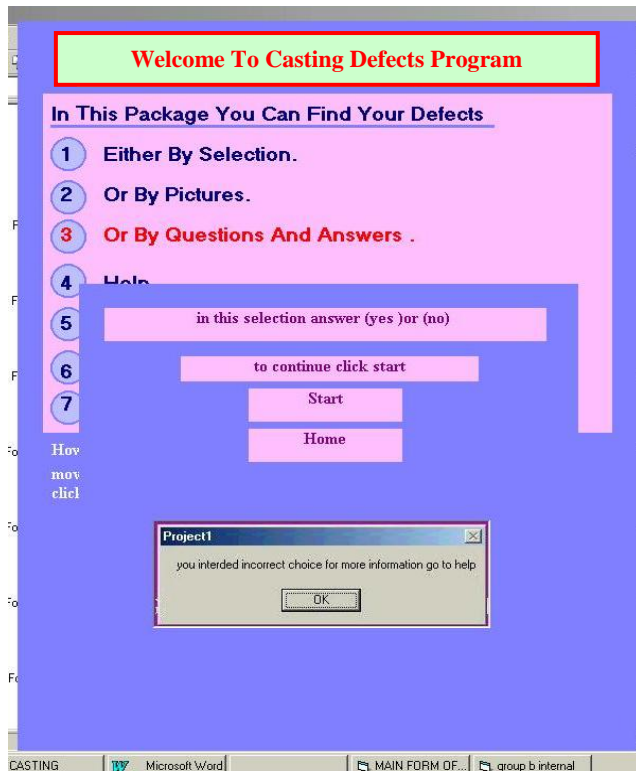**Fig. (33) The choice of the types of the defect and castings and the groups**
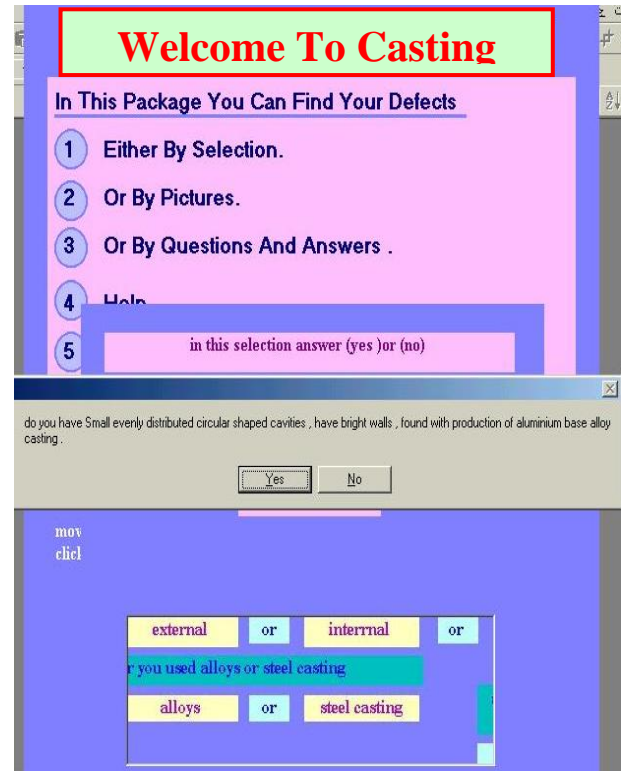

Fig. (34) The starting of third method

Fig. (35) The questions of third method

DISCUSSION

It is seen after this verification to the program that it is useful in diagnostic the defects. It is save time for the user and manufacturer by reduce the time of searching because it give the limitations of properties of the defects in different castings with simple search when following the steps in every method. Although the program contains large number of defects but the classification that put and the methods of diagnose make the program useful and practically . The program helps to give right results for large number of defective castings in order to help the user to reach to properly process of casting and then for less-defective castings. It is clear from the previous applications that the diagnostic of the defect by this information system among this number of defects is with good accuracy and speed.

CONCULUSIONS

- There are a great need to make useful program to deal with the large number of casting therefore in this research an information system is design by use visual basic language in order to put these defects in suitable classification to make a methods for diagnostic.

- The program is with high speed for diagnostic of casting defects when compared with diagnostic from the experts that require long time and perhaps being wrong.

- The program information is a result of long experiences with hard work on casting defects, from many companies, in this program the information are assembled from large references then put them in information system.

- The program use general classification of defects then it is divided to sub division. The user can choose one of the four methods established to give him the path that he led to the final result.

- It is seen that the method of picture is the simplest one because it need only looking and make comparison.

- The methods of diagnostic in this program are simple to give the user final results of searching about the defects properties, causes and remedy without need a great experience to deal with it.

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