

A Design of “Windows 7 Troubleshooting” Software Using Hybrid Intelligence Systems

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ABSTRACT—

This paper describes the integration of two Artificial intelligence technologies, Radial Basis Function networks with expert systems to construct a robust hybrid system. Constructing this proposed hybrid system software is to diagnose the error messages and give recommendations to repair the operating system (Windows 7) problems and troubleshoot the problems that can be repaired. The neural network has unique characteristics which it can complete the uncompleted data, the expert system can't deal with data that is incomplete, but using the neural network individually has some disadvantages which it can't give explanations and recommendations to the problems.

The expert system has the opposite characteristics of Neural Network which is the ability to explain and give recommendations by using the rules and the human expert in some conditions. Therefore, we have combined the two technologies. Software engineering process models is used for constructing the proposed software. The paper will explain the integration methods between the two technologies and which method is suitable to be used in the proposed hybrid system.

Index Terms— Hybrid Intelligence System, Windows, Artificial Intelligent System

INTRODUCTION

An operating system (Windows) is complicated in principle and there are numbers of elements distributed over the plane, so fault phenomenon differs much and fault reasons are difficult to identify, it is necessary to develop corresponding assistant diagnosis system [3].

The main structure of the proposed system is discussed, which includes requirement description, analysis, design and implementation of the proposed hybrid intelligence system to diagnose error messages that faces the users of windows 7 operating system, this system has been coded through the use of Mat lab (R2010a) program language. Section 2 is about the related works, in Section 3 we will discuss the Requirement descriptions, a discussion of fundamental modules is shown in section 4, the analysis and design diagram and the algorithms that are used to construct the system are exhibited in section 5, regarding to how it works and explain the interfaces that the system offers to the users of it. There fundamental topics in this section: analyzing and designing the radial basis function (RBF) network, expert system and coupling modules of the two intelligent techniques. Section 6 is about interface design and section 7, 8 depicts the results and conclusion.

RELATED WORKS

During the last years the integration between Expert Systems and Artificial Neural Networks have received considerable amount of attention in the research community. The researchers Li Chunming and Hu Dawei in (2007) proposed system dependent on Expert Systems and Neural Networks to diagnosis faults of signal circuits [4], when Lizhi Xiao and Dexiang Sun (2010) proposed a hybrid neural expert system to diagnosis UAV system faults [5] and other researchers as Dhanunjaya Y.A. Reddy and Dilip Kumar Pratihari (2011) combined Neural Networks and Expert Systems to predict temperature distributions in electron beam welding process [1].

In this paper we proposed Hybrid System depended on Expert Systems and Neural Networks techniques to diagnosis Windows (operating system) troubleshooting [2].

REQUIREMENT DESCRIPTIONS

The role of requirements for initiating the system is fundamental, extracting these requirements is an important activity in Software Engineering that aims to acquire and understand them. The system needs functional and nonfunctional requirements; they are represented here by using the Use-Case Model as seen in fig. 1. The user observes the main processes of the system; Diagnosing and maintenance with no knowledge of the internal procedures, but from the perspective view of the developer, he has a complete knowledge of the interior procedures of how the system works.

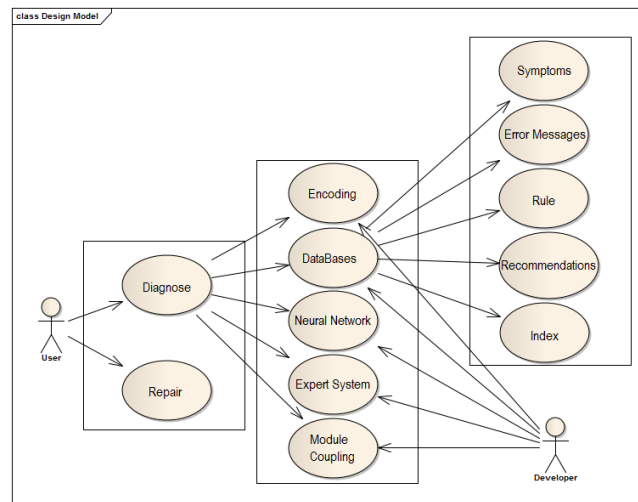


Fig.1 Use-Case Diagram for the Proposed System

After analyzing the requirements through the use of Use-Case Model and understanding the system's outcomes then the functional and nonfunctional requirements will be extracted.

A. Non-Functional Requirements

- Usability, the system must be easy to use for the Computer users.
- Extendibility, the ability to add new problems to the system.
- Performance, the system must be accurate to diagnose the error messages and repair the problems with less effort and cost.
- Reliability, the user must be reliable of the systems results and accuracy.

B. Functional Requirements

- The system should be able to diagnose the problems regarding of its new to the system or not.
- The system has the ability to train data of the problems that has been added stored in the database.
- The system must be able to fix the problems that can be repaired via the system but, according to the problems related to the hardware recommendations of how to fix them is given.

THE FUNDAMENTAL SYSTEM MODULES

The design of any system must consist of three units :

1- Input unit, the input data is text which is the error message (Symptoms) of the problem that is shown to the user of win7 operating system.

2- Process unit, there are two processes that can be applied to input data in the system.

- Diagnose process, the text is taken and converted to a binary code so the Neural Network can deal with and diagnose it, after that deliver to the Expert system to show the user the recommendation to fix the problems.
- Repair process, here the system makes a decision to see if the problem can be fixed or not via the proposed system.

3- Output unit, the output is the error type with the recommendations of how to fix it. The procedure of the system is shown in fig. 2 through the use of Box Diagram.

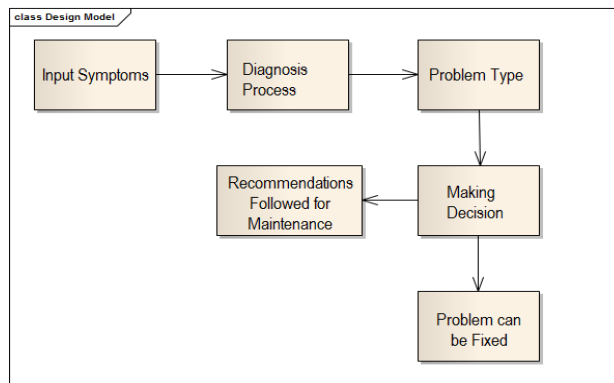


Fig.2 Box Diagram for the proposed System

SYSTEM ANALYSIS AND DESIGN

In the previous sections the system general requirements are known, now the analysis and design phase for the proposed system and knowing the tasks that it can achieve will begin.

The proposed system is a hybrid intelligence system which consists of Artificial Neural Networks and Expert Systems, it diagnosis windows 7 problems using Neural Networks this process is done by inserting the text messages for the symptoms related to a specific problem which is shown to the user via system interfaces the diagnose process is done to identify the error type. After the task of Neural Network is completed and the error type is identified then the data is transferred to Expert system to provide explanations and recommendations about the problems. These recommends are text and stored as a sequence records applied by the user according to the sequence mentioned to give him the ability of fixing the problems by the use of the system. The problems that can be fixed via the system related recommendations will be given for it as well after activating the fix button displayed on the interface.

Incoming paragraphs in this section will declare the process of the used units for initiating the hybrid intelligence system.

C. Encoding System Data

The data entered to the system is a text message of the symptoms that caused the problem, while these data are text then it's a must to encode them to binary code giving each text message a specific code. Encoding the data is done so the system can deal with it and store it in a huge database of symptoms and error messages.

D. Data Construction

Database has important characteristics, which is the ease and flexible access to data that is contained in it; the databases used in the proposed system contain all the data that the system needs to achieve his tasks. Four databases are initiated and used in the system: income database (Symptoms), outcome database (Error messages), recommendations and index database. The application software used to initiate the databases is "Microsoft Office/ Excel".

1) Symptoms

As mentioned above this database contains all the input data (symptoms) in form of text and its binary code. It consists of over than a thousand row (record) and ten columns as shown in fig. 3 and used by the system.

	A	B	C	D	E	F	G	H	I	J	K
1	The file d349.dll is missing	0	0	0	0	0	0	0	0	0	1
2	D349.dll Not Found	0	0	0	0	0	0	0	0	0	1
3	File d349.dll not found	0	0	0	0	0	0	0	0	1	1
4	D349.dll not found	0	0	0	0	0	0	0	1	0	0
5	URL Error	0	0	0	0	0	0	0	0	1	0
6	URL NOT FOUND	0	0	0	0	0	0	0	0	1	0
7	WWW URL	0	0	0	0	0	0	0	0	1	1
8	HTTP URL	0	0	0	0	0	0	0	1	0	0
9	WWW URL NOT FOUND	0	0	0	0	0	0	0	1	0	1
10	URL FILE OR DIRECTORY NOT FOUND	0	0	0	0	0	0	0	1	0	0
11	HTTP URL FILE NOT FOUND	0	0	0	0	0	0	0	1	0	1
12	URL FILE NOT FOUND	0	0	0	0	0	0	0	1	1	0
13	Windows cannot initialize the device driver	0	0	0	0	0	0	0	1	1	0
14	zlib.dll Not Found	0	0	0	0	0	0	0	1	1	0
15	This application failed to start because z	0	0	0	0	0	0	0	1	1	1
16	Cannot find [PATH]zlib.dll	0	0	0	0	0	0	1	0	0	0
17	The file zlib.dll is missing	0	0	0	0	0	0	1	0	0	1
18	Cannot start [APPLICATION]. A required	0	0	0	0	0	0	1	0	0	1
19	zlib.dll Not Found	0	0	0	0	0	0	1	0	0	1
20	This application failed to start because z	0	0	0	0	0	0	1	0	1	0
21	Cannot find [PATH]zlib.dll	0	0	0	0	0	0	1	0	1	0
22	The file zlib.dll is missing	0	0	0	0	0	0	1	0	1	1
23	Cannot start [APPLICATION]. A required	0	0	0	0	0	0	1	0	1	1
24	zlibwapi.dll Not Found	0	0	0	0	0	0	1	1	0	0
25	This application failed to start beca	0	0	0	0	0	0	1	1	0	1
26	Cannot find [PATH]zlibwapi.dll	0	0	0	0	0	0	1	1	0	1

Fig.3Symptoms Database

2) Error Messages

The first part of the system procedure is done and it must diagnose to identify the error type, this database contains all the error messages as a form of text and its binary code for each error. It consists of same number of rows in the symptoms database. The system takes only the text and initiate it to enter the Expert system seen in fig. 4.

	A	B	C	D	E	F	G	H	I	J
1	D3d9.dll Error Messages	0	0	0	0	0	0	0	0	1
2	D3d9.dll Error Messages	0	0	0	0	0	0	0	0	1
3	D3d9.dll Error Messages	0	0	0	0	0	0	0	0	1
4	D3d9.dll Error Messages	0	0	0	0	0	0	0	0	1
5	404 Not Found error messages	0	0	0	0	0	0	0	1	0
6	404 Not Found error messages	0	0	0	0	0	0	0	1	0
7	404 Not Found error messages	0	0	0	0	0	0	0	1	0
8	404 Not Found error messages	0	0	0	0	0	0	0	1	0
9	404 Not Found error messages	0	0	0	0	0	0	0	1	0
10	404 Not Found error messages	0	0	0	0	0	0	0	1	0
11	404 Not Found error messages	0	0	0	0	0	0	0	1	0
12	404 Not Found error messages	0	0	0	0	0	0	0	1	0
13	Code 37 Error Message	0	0	0	0	0	0	0	1	1
14	Zlib.dll Error Messages	0	0	0	0	0	1	0	0	0
15	Zlib.dll Error Messages	0	0	0	0	0	1	0	0	0
16	Zlib.dll Error Messages	0	0	0	0	0	1	0	0	0
17	Zlib.dll Error Messages	0	0	0	0	0	1	0	0	0
18	Zlib.dll Error Messages	0	0	0	0	0	1	0	0	0
19	Zlib1.dll Error Messages	0	0	0	0	0	1	0	1	0
20	Zlib1.dll Error Messages	0	0	0	0	0	1	0	1	0
21	Zlib1.dll Error Messages	0	0	0	0	0	1	0	1	0
22	Zlib1.dll Error Messages	0	0	0	0	0	1	0	1	0
23	Zlib1.dll Error Messages	0	0	0	0	0	1	0	1	0
24	Zlibwapi.dll Error Messages	0	0	0	0	0	1	1	0	0
25	Zlibwapi.dll Error Messages	0	0	0	0	0	1	1	0	0
26	Zlibwapi.dll Error Messages	0	0	0	0	0	1	1	0	0

Fig.4 Error Messages Database

3) Recommendations

The system extracts a rule for each error, this rule is used so the system can take recommendations from the database and exhibit them to the user for completing the repair process. This database contains all the recommendations that user will follow to fix the problem, which each row (record) has a text message represents the followed recommendations as shown in fig. 5.

	A
1	Restart your computer if you haven't already restarted it at least once after seeing the Code 37 error.
2	Retry the web page by clicking the refresh/reload button or trying the URL from the address bar again.
3	It's also possible that you simply have the wrong URL - entirely. You might be trying to access a webpage that exists as another name.
4	you may want to attempt to contact the webmaster for information on where you might locate the page you're looking for.
5	Assuming the latest DirectX version from Microsoft doesn't fix the d3d9.dll error you're receiving, look for a DirectX installation program on your game or applicator.
6	Delete the UpperFilters and LowerFilters registry values. One common cause of Code 37 errors is the corruption of two registry values in the DVD/CD-ROM Drive.
7	Restart your computer if you haven't yet.
8	Check for errors in the URL. Often times the 404 Not Found error appears because the URL was typed wrong or the link that was clicked on points to the wrong URL.
9	Did you install a device or make a change in Device Manager just before the Code 37 error appeared? If so, it's highly likely that the change you made caused the error.
10	Run the sfc /scannow System File Checker command to scan for, and replace if necessary, missing or corrupt Windows files.
11	If you move all the way up to the website's main page, try to run a search for the information you're looking for.
12	Install the latest version of Microsoft DirectX.
13	Reinstall the drivers for the device. Uninstalling and then reinstalling the drivers for the device is another likely solution to a Code 37 error.
14	Uninstall the game or software program and then reinstall it again.
15	Replace the hardware. If none of the previous troubleshooting has worked, you might need to replace the hardware that has the Code 37 error.
16	Move up one directory level at a time in the URL until you find something.
17	Update the drivers for the device. Installing the latest drivers for a device with the Code 37 error is another possible fix.
18	Restore the d3d9.dll file from the latest DirectX software package.
19	Update the drivers for your video card.
20	Restore zlib.dll from the Recycle Bin.
21	Run a virus/malware scan of your entire system.
22	Use System Restore to undo recent system changes.
23	Reinstall the program that uses the zlib.dll file.
24	Update the drivers for hardware devices.
25	Roll back a driver to a previously installed version.
26	Install any available Windows updates.

Fig.5 Recommendation Database

4) Index

This database is the main and most important database used by the system, it contains rows and columns each cell in it has a number which represents a row in the recommendation database, the content of each row in this database is taken via the rule established for each error. If the conclusion part of the rule as an example is number (3), this number will refer to the row (3) in the index database and gathering its content which includes several cells, fig. 6 shows the index database.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	1	9	6	13	17	10	15						
2	2	8	16	11	3	4							
3	7	12	5	14	18	19							
4	20	21	22	23	24	25	10	26	27	28	29	30	31
5	33	21	22	23	24	25	10	26	27	28	29	30	31
6	32	21	22	23	24	25	10	26	27	28	29	30	31
7	34	21	22	23	24	25	10	26	27	28	29	30	31
8	35	21	22	23	24	25	10	26	27	28	29	30	31
9	36	21	22	37	24	25	10	26	27	28	29	30	31
10	38	21	22	39	24	25	10	26	27	28	29	30	31
11	40	21	22	41	24	25	10	26	27	28	29	30	31
12	42	21	22	43	24	25	10	26	27	28	29	30	31
13	44	21	22	45	24	25	10	26	27	28	29	30	31
14	7	12	46	14	47	19							
15	7	12	48	14	49	19							
16	50	21	22	51	24	25	10	26	27	28	29	30	31
17	7	12	52	14	53	19							

Fig.6 Index Database

E. RBF Network for Diagnosing Error Messages

The first intelligent technique used in the proposed hybrid intelligence system is Artificial Neural Network, it is compatible with incomplete data and ability to train data to display correct results this is the cause of using Artificial Neural Networks, it is applied for diagnosing problems of window 7 operating system.

Radial Basis Function (RBF) Network is the Artificial Neural Network applied in the proposed system, it has the ability to classify and displaying the results faster than other Neural Networks regarding of the results accuracy. RBF Network consists of one hidden layer which creation and training are done at one stage. The structure of this Neural Network consists of ten (10) nodes at the input layer, the amount of nodes at the hidden layer is same as the amount of error messages contained in symptoms database and the output layer has nine (9) nodes.

Diagnosis process is achieved via Neural Networks, after coding the input data and save it in symptoms database the Neural Network takes the code followed for each problem entered the system and spread it into nodes of the input layer, while the data in database are stored as a row then it must be flipped to a column because Neural Networks deals with data in parallel as shown in fig.7.

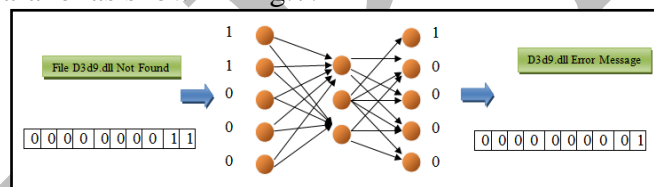


Fig.7 Diagnosis Process

The diagnose process is completed and the error type is identified, the results are initiated to enter the Expert system. Box-Diagram declared in fig. 8 shows a simple design diagram of the Radial Basis Function procedures, it consists of four main stages; first stage is the initial level of the Neural Network which is the hidden layer and the second stage is the output layer, trained data are entered and the output is the net value, training is applied using Sign function and this is done in stage three, saving the optimal weights and inserting them with trained data to achieve the test process is done in the fourth stage then the results are shown.

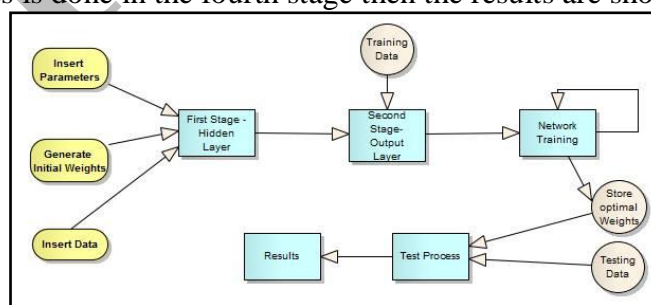


Fig.8 Radial Basis Function Network's Box Diagram

F. The Proposed Expert System to Maintain Win 7

Expert Systems is the second intelligent technique applied in the proposed system, it's used because the ability it owns of giving explanation and recommendations of the error type identified from the Neural Network. The inference engine is the core of Expert system which a new method for the inference engine is proposed instead of the old methods and that's because traditional methods uses blind search process to locate a rule for the error. Traditional methods have many disadvantages such as Complexity of the system is very high and spends a long time to find the required rule. These disadvantages show negative impacts on the system and it's the cause why a new method is proposed for the inference engine.

Proposed inference engine uses database concepts which has the ability of quick and easy access to data contained in the database, it reduces the system's complexity and time spent for the process therefore it increases the system's speed. After identifying the error type a rule for it is generated, condition part of the rule (IF) is the error type and the conclusion part (THEN) is a number, this number takes the row relative to the error in the index database that consists of cells that contains numbers each one is directed to a row in recommendation database. Box-Diagram shown in fig.9 declares the design of Expert system used in the proposed system and it consists of four stages: Inference Engine, Explanation Engine, Generating a Rule for the Error and User Interface).

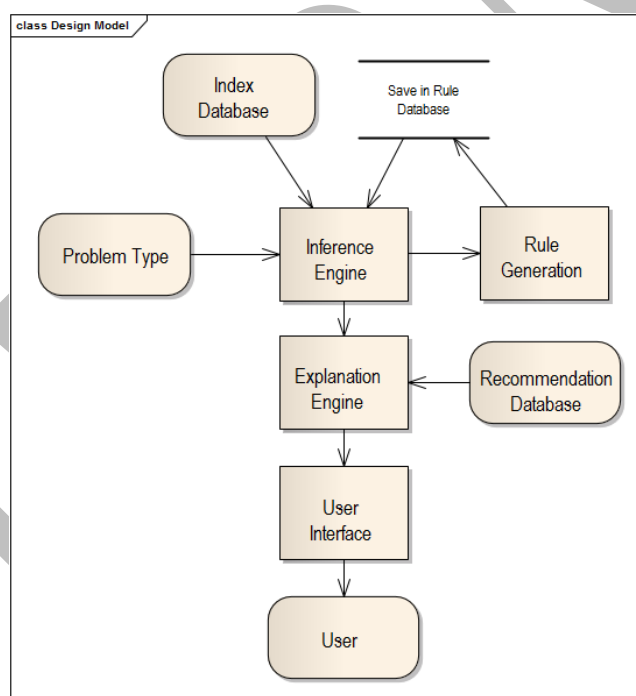


Fig.9 Expert System's Box Diagram

Stage one, error type is inserted to the engine and transfer these data to the rule generation to generate a rule the error this is done in stage two; the data are retrieved to the inference engine which are acquired from index database presented in stage three, the recommendation resulted from the third stage goes ahead to the fourth stage that represents the user interface to be shown in an understandable manner to the users of windows 7 operating system.

G. Module Coupling

The two artificial intelligent techniques Neural Networks and Expert Systems are combined together to exploitation the benefits that they offer and discard the disadvantages which will generate a robust Hybrid Intelligence System with no lack or bugs. The proposed system consists of modules that's why tightly coupled is used. Because databases applied for the system are not only for access data but they communicates by sharing its contents.

The design of Radial Basis Function Network and Expert system is accomplished, both techniques can be merged and the design phase of Hybrid Intelligence System can be done, the cause of combining them is that Expert system can deal with incomplete data but it requires time and with low performance because it needs to ask some questions to the user and then continue its work and so on until the data is completed. Therefore, Artificial Neural Network is combined with it, it has the ability to deal with this kind of data and the outcome is a completed data without any ambiguous. They are also merged to acquire speed and high accuracy of the system's outcome, the fig.10 shows the flowchart of the Hybrid Intelligence System. Now the system is ready to diagnose Win 7 problems with high performance. Moreover, the user can insert the symptoms and receive the recommendations of how to repair it or fix it using the software facilities.

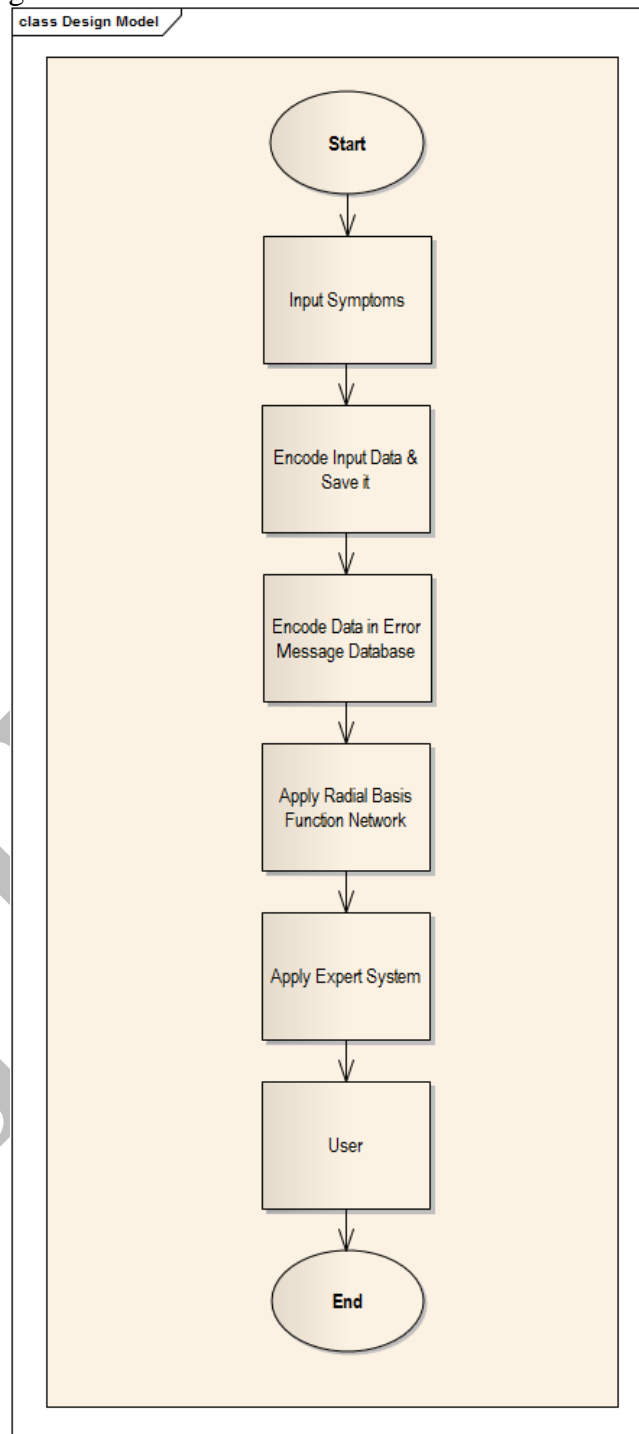


Fig.10 Flowchart of the System

INTERFACE DESIGN

Interfaces reflects the system's procedures and tasks, that is why the usability attribute must be high in other words it must be easy and understandable to the user. Interface design process is the last level of designing the system; Computer Aided Software Engineering Tools (CASE Tools) is applied to do the design using one of its tools which is Enterprise Architect (EA) that has flexible characteristics in the design phase. A design of two interfaces is done for the system, the main interface as shown in fig.11 and a secondary interface as in fig.12.

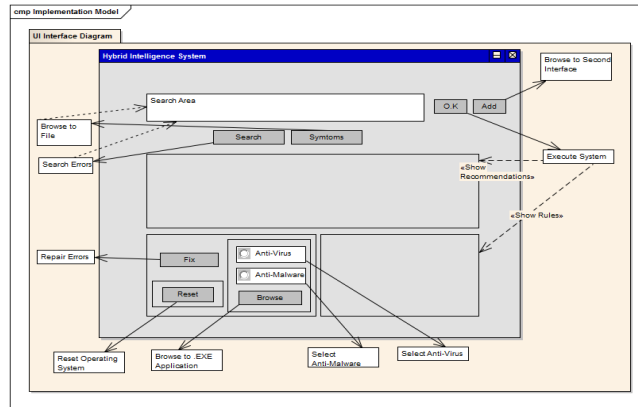


Fig.11 Design of the main Interface

During the execution of the proposed Hybrid Intelligence System (Windows 7 Troubleshooting) the main interface of the system appears see fig.13, this interface consists of four areas: Search Area, Rule Extraction Area, Recommendations Area and Support Tools Area regarding to the Cause of Problems button and Exit button.

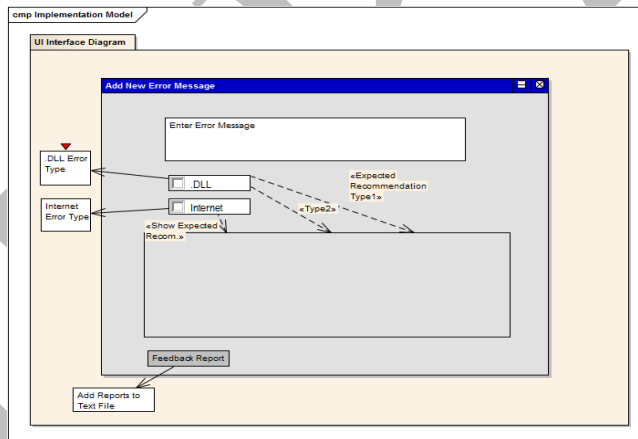


Fig.12 Design of the Secondary Interface

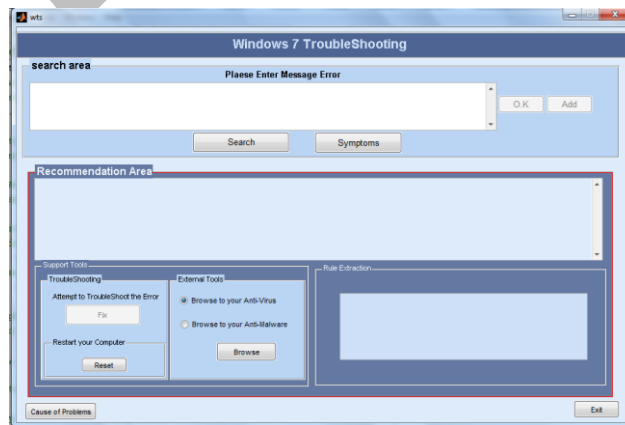


Fig.13 the Main Interface

Search Area includes the following in fig.14:

- Text Box, to enter the symptoms it's located in the middle of the area.
- Search Button, placed under the text box when clicking it searches for the symptoms contained in symptoms database.
- O.K Button placed to the right.
- Add Button, a secondary interface shown to the user will popup when clicking it.
- Symptoms Button contains a file of all the symptoms entered to the related Database.
-

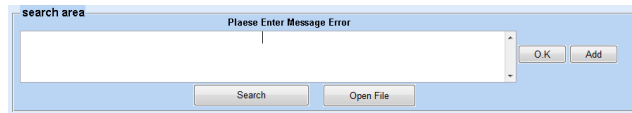


Fig.14 Search Area

The symptoms to be diagnosed is entered by user into the text box dedicated for that, user can insert the symptoms through writing it, copy and paste or clicking the symptoms button and selecting the specific one from the file as in fig.15.

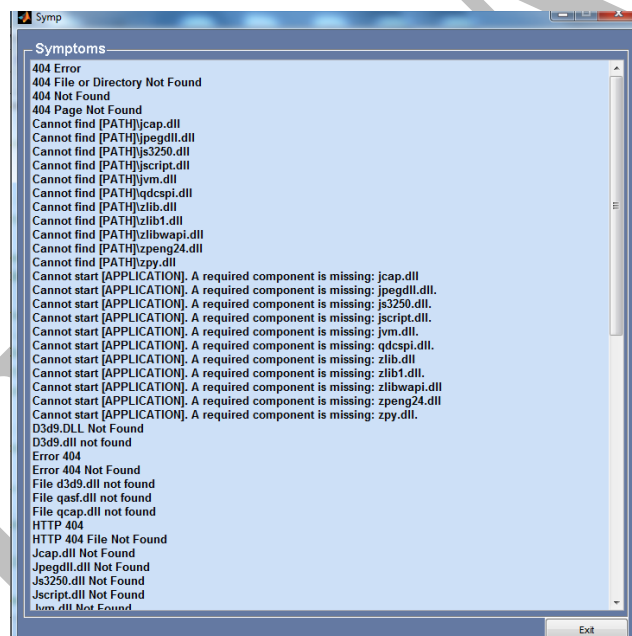


Fig.15 Symptoms File

Now, user clicks the search button for finding the symptoms and to be sure that its within the system's databases, if it is then click o.k button to start the diagnose process and if not the add button is activated and the secondary interface will appear, this shall be mentioned later.

Rule extraction area includes a blank space dumps into it the rule extracted from the Radial Basis Function network results and used through the expert system to give the recommendations this is declared in fig.16 .



Fig.16 Rule Extraction Area

The recommendation area is for showing the recommendations related to the system and displayed as a text in a sequence manner of how to fix it, as shown in fig.17.

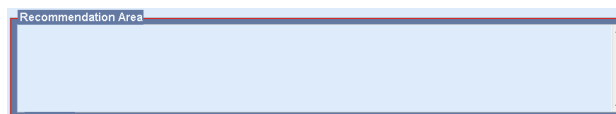


Fig.17 Recommendation area

Support tools area includes two fields as shown in fig.18 :

H. External Tools field:

- Radio check button, to select the Anti-Virus software or the Anti-Malware, located in the top-left of the area.
- Browse button, to search for the Anti-Virus or Anti-Malware installed in the personal computer, this button is placed in the bottom of the field.

I. Troubleshooting field:

- Reset button, to restart the windows 7 operating system.
- Fix button, to maintain the problem entered into the system.
-

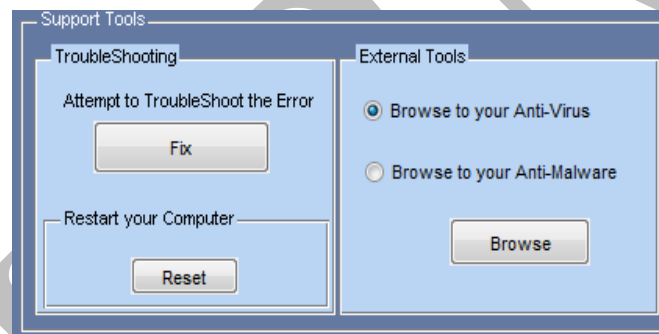


Fig.18 Support Tools

The user reads the recommendations and applies them according to its sequence, if the first recommendation was restarting windows 7 operating system then user pushes the reset button to fix the problem and check to see if it was fixed. The second recommendation is applied when the error is not fixed; while it might be scanning the operating system for viruses then the Anti-Virus radio check button will be enabled and clicks the browse button to search for the software installed in the personal computer its extension is (.EXE) after selecting it the Anti-Virus software will execute the scan process. If the error is not repaired the third recommendation shall be applied, which includes scanning the operating system for malware this process is achieved as the same way as applying the previous recommendation but the only difference is that the user selects Anti-Malware radio check button instead of the Anti-Virus. The fourth recommendation perhaps includes a scan process of all the protected systems registers and it's done by executing (DOS) as an administrator CMD and writes the instruction (sfc/scannow) this will scan and repair the windows 7 operating system registers, if the error is still there then the next recommendation shall be applied and so on.

The purpose of designing the Support tools into the "Win7 Troubleshooting" software such as; Anti-Virus, Anti-Malware and reset button is to ease as possible as can the repair process for user, achieve the Usability attribute and make it friendly.

According to the fix button its activated when the problem can be fixed using "Win7 Troubleshooting" software and the error is related to (.DLL) error type such as (d3d9.dll error message) after that the fix button is clicked, the mechanism after clicking it is the software searches a folder contains all the (.DLL) files and when the specific file is identified it will be copied and pasted to the (System32) folder if the operating system was (x86) or to the folder (sysWOW64) if it was (x64).

The work procedures of the software and interfaces has been discussed in the previous sections Moreover, there is some details to explain such as: Cause of Problems and Exit buttons.

- Cause of problems button is designed to give the reason of problem occurrence appeared to the user of Windows 7 Operating System, when pressing the button a file will display containing causes of all the problems and the user might read it for avoiding them.
- Exit button for exiting from "Win7 Troubleshooting" software.

As mentioned earlier that when a user clicks the add button a secondary interface will appear as shown in fig. 19 which includes:

- Text box for the new symptoms.
- Two check-box buttons first is allocated for (.DLL) errors and the other one is for (Internet) errors.
- Free space for showing expected fixing recommendations.
- Feedback Report button, pressing it will create a (.PDF) file that contains all the new entered symptoms and their expecting recommendations.

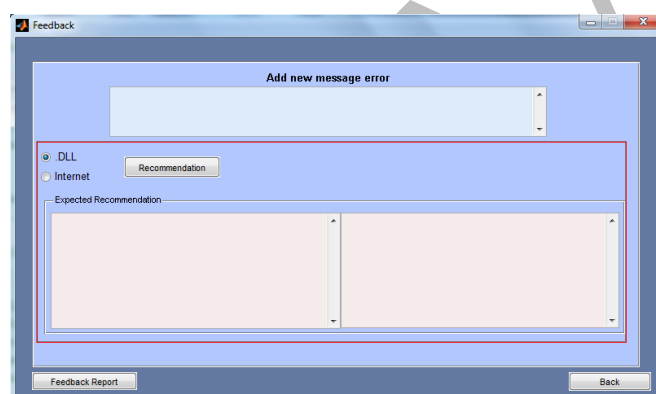


Fig.19 The Secondary Interface

The procedure of second interface works as inserting the new symptoms through text box then selecting the error type if it was (.DLL) two kinds of expecting recommendations appears to the user or selecting the other check box which is (Internet) error type, regarding to the error type, next step is pressing the Feedback button to store the new symptoms and its recommendations, this will help the developer to make the software up-to-date.

RESULTS

This section includes the practical implementation of "Win7 Troubleshooting" software and its results. This is a completion for constructing the software; the results are shown in two levels:

- Radial Basis Function Network Training Results . Training the neural network is an important stage of designing the software and it is the first diagnose process, which the results depends on its accuracy and gain an optimal weights as shown in fig. 20 that declares the RBF training curve using learning algorithm, one of its advantages is the creation process and train are done in same stage. RBFN Results are:
 - Target (0.000221557), Mean Square Error.
 - 75 Epochs.
 - Time Elapsed (11.3887) s.

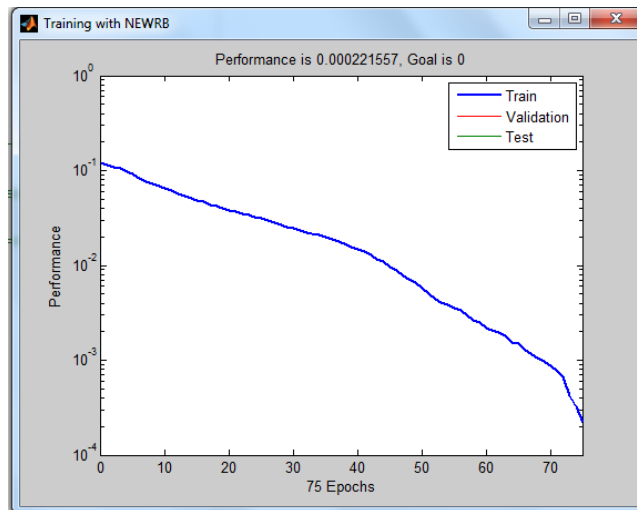


Fig. 20 : RBF-training curve

- In this stage the software has been tested using Data selected randomly, the amount of data samples is (15) symptoms as shown in table 1.

TABLE 1 : SYMPTOMS CODES AND ERROR MESSAGES

No.	Symptoms	Encoding	Error Message
1	The file d3d9.dll is missing	0000000001	d3d9.dll Error Messages
2	Zlib.dll Not Found	0000001110	Zlib.dll Error Messages
3	Qdv.DLL Not Found	0001001110	Qdv.dll Error Messages
4	Qcap.DLL Not Found	0001000101	Qcap.dll Error Messages
5	HTTP 404 File Not Found	0000001011	404Not Found error messages
6	The file zlibwapi.dll is missing	0000011011	Zlibwapi.dll Error Messages
7	Cannot find [PATH]zpeng24.dll	0000011111	Zpeng24.dll Error Messages
8	Zpy.dll Not Found	0000100010	Zpy.dll Error Messages
9	Js3250.dll Not Found	0000110001	Js3250.dll Error Messages
10	Cannot find [PATH]jcap.dll	0000101001	Jcap.dll Error Messages
11	Cannot find [PATH]jscript.dll	0000111000	Jscript.dll Error Messages
12	D3d9.dll not found	0000000100	D3d9.dll Error Messages
13	404Error	0000000101	404Not Found error messages
14	The file qasf.dll is missing	0001000000	Qasf.dll Error Messages
15	Jvm.dll Not Found	0000111011	Jvm.dll Error Messages

For showing the user interface results (the file zlib.dll not found) is chosen see fig. 21.

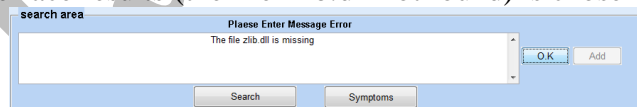


Fig. 21 : Search area contains Symptoms

After generating the rule, recommendations are acquired and they differ from problem to another see fig.22 and fig.23.



Fig. 22 : Rule extraction Area and expert rules

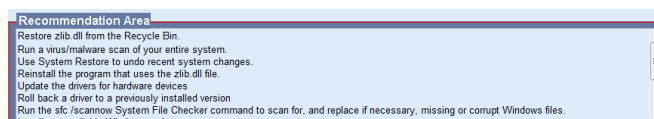


Fig. 23: Recommendation area contains repairing recommends

The rules are extracted through the software and it represents a completion of hybridizations between RBFN and proposed Expert system, table 2 shows the rules extracted using the "Win7 Troubleshooting".

No.	Symptoms	Rule
1	The file d3d9.dll is missing	If D3d9.dll Error Messages Then 1
2	Zlib.dll Not Found	If Zlib.dll Error Messages Then 4
3	Qdv.DLL Not Found	If Qdv.dll Error Messages Then 17
4	Qcap.DLL Not Found	If Qcap.dll Error Messages Then 15
5	HTTP 404 File Not Found	If Not Found error messages404 Then 2
6	The file zlibwapi.dll is missing	If Zlibwapi.dll Error Messages Then 6
7	Cannot find [PATH]zpeng24.dll	If Zpeng24.dll Error Messages Then 7
8	Zpy.dll Not Found	If Zpy.dll Error Messages Then 8
9	Js3250.dll Not Found	If Js3250.dll Error Messages Then 11
10	Cannot find [PATH]jcap.dll	If Jcap.dll Error Messages Then 9
11	Cannot find [PATH]jscript.dll	If Jscript.dll Error Messages Then 12
12	D3d9.dll not found	If D3d9.dll Error Messages Then 1
13	404Error	If Not Found error messages404 Then 2
14	The file qasf.dll is missing	If Qasf.dll Error Messages Then 14
15	Jvm.dll Not Found	If Jvm.dll Error Messages Then 13

TABLE 2 : RULES GENERATED VIA SOFTWARE

CONCLUSION

We concluded through the analysis, design and implement the "Win7 Troubleshooting" software for diagnosing error messages, some important things such as; firstly, using the proposed Inference Engine within expert system that depends on Database concepts has huge advantages which reduced the systems complexity and increased the process speed instead of using blind methods. Secondly, applying the RBFN increased the diagnosing process because it consists of on hidden layer. Thirdly, the hybridization that merges the artificial neural network with expert system gave more accurate results. Fourthly, the software can maintenance the Windows 7 operating system problems of the type (.DLL). Fifthly, the software can diagnose all problems and addition to that it has the ability to add new errors and give expected recommendations via dealing with dynamic databases.

A conclusion that we came to is that closed source operating system is more complex and ambiguous to the user which raises the need of designing software that maintenance this kind of operating systems.

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