

A MOBILE EXPERT SYSTEM APPLICATION FOR SOLVING PERSONAL COMPUTER PROBLEMS

RawaShorshSDEEK¹, Rıdvan SARAÇOĞLU^{1, *}

¹Yüzüncü Yıl University, Electrical-Electronics Engineering Department, Van Turkey
rawaise@gmail.com, *ridvansaracoglu@yyu.edu.tr

Abstract

For the time being, the smartphone is the most popular device in the world a device that is still in development. Today everyone has a personal smartphonedevice. The capability of these smartphones is to run a variety of all kinds of applications, make user's use it most of the time as well as for their daily tasks. The aim of this study is to develop an expert system running on android smartphones in order to solve computer problems. This approach is an accurate method to provide solution to computer problems. Design and implementing this expert system is to detect problem by asking users question and offers solution depending on user's answer. The output solution will provide description with images to be clearer for users to understand what their issue in fact is.

Keywords: Expert Systems, Mobile Application, Rule Based Systems.

KİŞİSEL BİLGİSAYAR PROBLEMLERİNİN ÇÖZÜMÜ İÇİN BİR MOBİL UZMAN SİSTEM UYGULAMASI

Özet

Şu anda, hala geliştirilmekte olan akıllı telefonlar dünyadaki en popüler cihazlardır. Bugün herkes kişisel bir akıllı cihaza sahiptir. Bu akıllı telefonların, kullanıcıların zamanlarının büyük bir kısmında hatta gündelik işlerinde kullandıkları çok çeşitli uygulamalar çalıştırma kabiliyetleri vardır. Bu çalışmanın amacı bilgisayar problemlerini çözmek için android akıllı telefon üzerinde çalışan bir uzman sistem geliştirmektir. Bu yaklaşım bilgisayar problemlerine çözüm sağlamak için doğru bir yöntemdir. Bu uzman sistemin tasarım ve gerçekleştirilmesi, kullanıcılara sorular sormak suretiyle problemleri tespit etmek ve kullanıcıların cevaplarına

dayalı çözümler sunulması biçimindedir. Çıktıyı oluşturan çözüm, kullanıcılar için problemin aslında ne olduğunun anlaşılmasını sağlayan şekilli tanımlayıcı bilgiler sağlayacaktır.

Anahtar Kelimeler: Uzman Sistemler, Mobil Uygulama, Kural Tabanlı Sistemler.

1. Introduction

Mobile applications (commonly referred as “apps”), are considered to be one of the fastest growing trends in Information Systems industry [1]. Users enjoy the variety of features that mobile apps can provide quickly and without introducing unnecessary complexity into their designs. As a result, mobile apps present a more popular interface for interaction with business systems than using web applications via Web Browser [1].

This technology shared between humans rapidly and still in development, there are numerous applications that allow people to do almost everything they want. The widespread penetration of smartphones globally offers tremendous opportunity and synergy with classical understanding of education. In addition, in today’s world we know what addicts people to technology; what makes them check smartphones ten times during dinner. In 2011 *Angry Birds* was the first software application of any kind to reach 1 billion downloads. *Angry Birds* reached a billion devices. By comparison, the total number of televisions in American homes in 1960 numbered just 52 million [2, 3].

Mobile applications (a.k.a. apps) are software systems implemented to run on smartphones and other handheld devices. Apps have different genres, from games to utilities, from productivity tools to browsers and are implemented using a variety of programming languages [4].

2. Materials and Methods

2.1. Expert System

Expert systems (ES) are intelligent software applications that provide advice to its users through a dialog or a conversation conducted between the user and the ES application [5]. Mobiles are no doubt the most widely used means of communication for its ease of use, ease of handling, and increasing capabilities. Most of the mobiles

nowadays are equipped with top edge technologies that enable the user to communicate data in high rates, and provide geospatial services that make the user identify his position on the earth accurately [6]. There are two types of expert systems: rule-based expert systems and knowledge-based expert systems. The main difference between these expert systems is the knowledge representation in the knowledge base. The knowledge representation is more significant in expert system because the approach used to represent knowledge affects the development, efficiency, speed and the maintenance of the system [7-10].

2.2. Rule based expert system

The rule-based expert system has domain knowledge encoded in the form of rules from a human expert. A rule is a conditional statement that links given conditions to actions. In a rule-based expert system, a knowledge base is usually stored in terms of if-then rules which can be used to reach conclusions. A rule-based expert system is constructed based on an efficient algorithm called the Rete pattern matching algorithm. This algorithm matches facts against the patterns in rules to determine which rules have had their conditions satisfied. Hence it uses a set of rules to analyse information about a specific class of problems and recommends one or more possible solutions [11-13].

2.3. Knowledge based expert system

The knowledge-based expert system encodes heuristics and rules into decision making framework. A knowledge-based system uses artificial intelligence techniques in problem solving methods to support human decision making, learning, and action. The knowledge base of expert systems contains both factual and heuristic knowledge. Factual knowledge is the knowledge that is widely shared, typically found in textbooks or journals, and commonly agreed upon by human experts in that particular domain. Heuristic knowledge refers to an experiential, logical and judgmental knowledge used to speed up decision making. Some applications applied by knowledge based expert systems are: medical treatment, waste management, production management, knowledge management, financial analysis, etc. [14-18].

2.4. Component of an Expert System

ES or the Knowledge Base Systems (KBS) are main branches of Artificial Intelligence (AI). An ES can be defined as an intelligent computer program that uses knowledge and inference procedures to solve problems that are difficult enough to

require significant human expertise for their solutions. The knowledge acquisition, knowledge base, inference engine, explanation facility and the user interface are the main ES components [19, 20] and figure 1 shows the diagram.

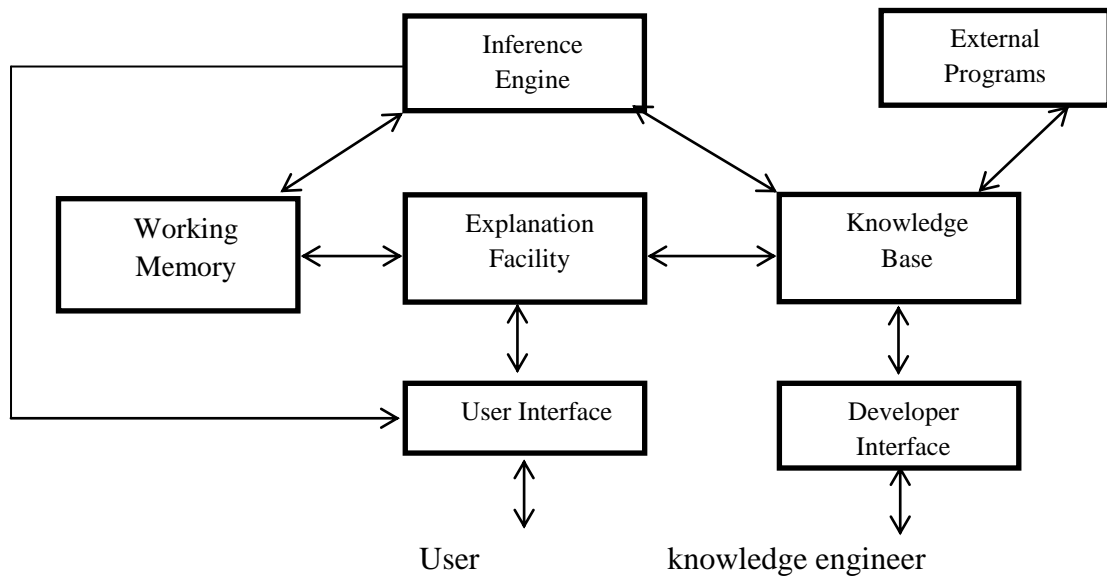


Fig.1 Components of an Expert System

2.4.1. Knowledge base:

A knowledge base is the heart of an expert system; it contains a collection of facts and rules which describe all the knowledge about the problem domain. Therefore, it stores all relevant information, data, rules, cases and relationships used by the expert systems. A knowledge base is not a database system. Figure 2.4 shows sample rule based on knowledge base.

2.4.2. Working memory:

Working memory is comparable to a relational database system. It contains information that is supplied by the end user. This information is used to evaluate antecedents in the knowledge base. A change in the knowledge base results in creation of new values, thus the working memory will update its old values.

2.4.3. Inference engine

An inference engine implements the reasoning process of artificial intelligence; it is an analogy to human reasoning. Its role is to work with the available data from the system and the user to derive a solution to the problem. The purpose of inference engine is to seek information and relationship from the knowledge base and to provide answers.

2.4.4. User interface

The user interface controls the dialog between the user and the system. Thus, it is an intermediary that allows communication between the user and the system. The purpose of the user interface is to ease the usage of expert system by developers, users and administrators.

3. Related studies

Makhubele designed and developed a knowledge-based expert system that aims to provide the patients with medical advice and basic knowledge on diabetes[21].

Liu improved client performance in client/server mobile computing systems, to identify which of the techniques are most promising and can be adapted to a tourist application (map viewing on small handheld devices, or other information like buses, menus, and theatre agendas, traffic and weather, etc.) [22].

Clarke et.al.mentionedtwo emerging technologies that are being incorporated into organizations at ever-increasing rates are expert systems and multimedia. Thesetechnologies have been developed independently [23].

Semertzidis produce a new mobile learning application which offer direct communication between teacher and student, and enhanced patterns of mobile interface design and tactics for solving common mobile development problems [24].

Minelli implemented SAMOA, A tool that extracts and visualizes software facts from the source code of apps. The tool provides a catalogue of views, at ecosystem or single-app granularity, to examine apps from different perspectives [25].

Perssonand Andersson redesign and development of the iPhone application Crew Alert. The application is intended for use by pilots as a tool for assessment, logging and reporting of fatigue, to increase safety in the air. It also keeps track of the user's schedule, and sleep pattern [26].

Albayrak et.al.designed an ES that make the determinations of hardware errors of the computers with a rule basic approachis designed and developed Delphi7.0 programming language is used for the developmentof the system.This system provided a help for solving the problemsof thecomputer users in the mostrapidlyand easily [27].

Carse designed a Veterinary Diagnosis Expert System for remote use on mobile phone, the system given the limitations of screen resolution, processing ability, and the limited advantage-set of their browsers, as well as in areas with weak cellular coverage. Under testing, the system could diagnose a series of hypothetical test cases, and avoid diagnosing a patient under conditions in which it could not confidently do so [28].

4. Implementation

4.1. Used rules in expert system

This ES application designed by android studio platform, the rule that has been used in this application are the knowledge base data stored in cloud server and in android studio these knowledge bases are called and presented to users through user interface, for each result from user if user result is (Yes or No) the value will be update. The rules used in ES is represented in Fig 2.

```
if (Does power flow to your computer ? ,YES) { value = Does screen turn on? }  
else if (Does screen turn on? ,YES){ Does your computer restart immediately? }  
else if (Does your computer restart immediately? ,NO) { Does screen show blue screen or  
error message? }  
  
if( Power flow to your computer ? ,NO) {Try to use another power adapter}  
    else if (Try to use another power adapter:does this helpful?, NO) { Try to reseal your RAM }  
        else if (Try to reseal your RAM: does this helpful?, NO) {Try turn on computer without  
battery }
```

Fig 2. Rules based on expert system on mobile android sample

At the beginning of starting the expert system user will go through some filtration such as “user’s problem is with laptop or desktop?” or “which operating system user have installed?” and “in which section you have problem (Hardware, Software, or Network)?”.

In the application there is a part from ES called “Symptoms” which contain ready answers stored in local SQLite database user will select symptoms according to their problems until they will reach to their solution. This is provided if user does not have internet access on their mobile except only in the first time when they install the

software this database will be download then they can use it as offline. Figure 4 shows the sample of symptoms.

Fig 3.shows filtration process before starting ES.

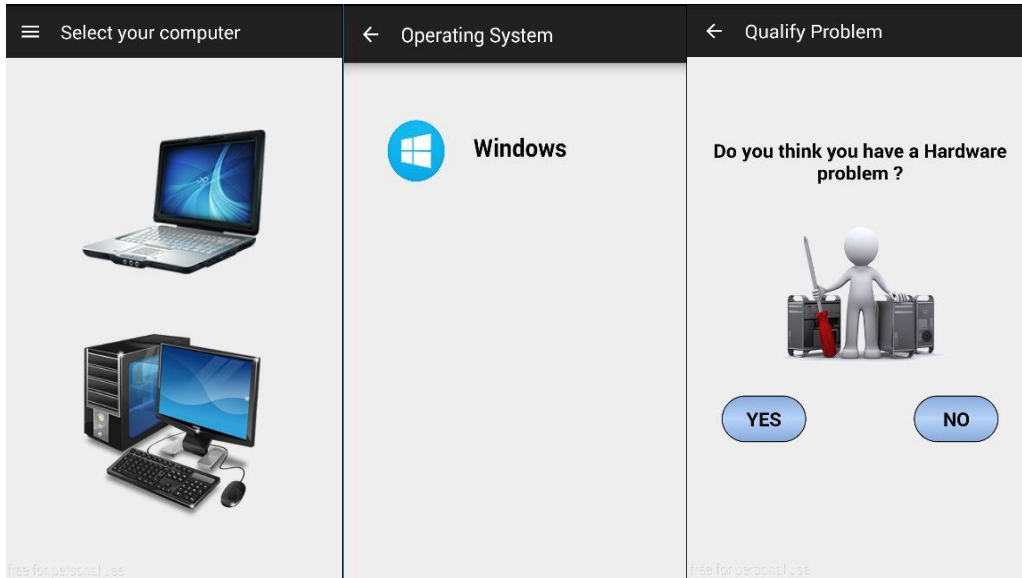


Fig 3. User filtration before starting expert system

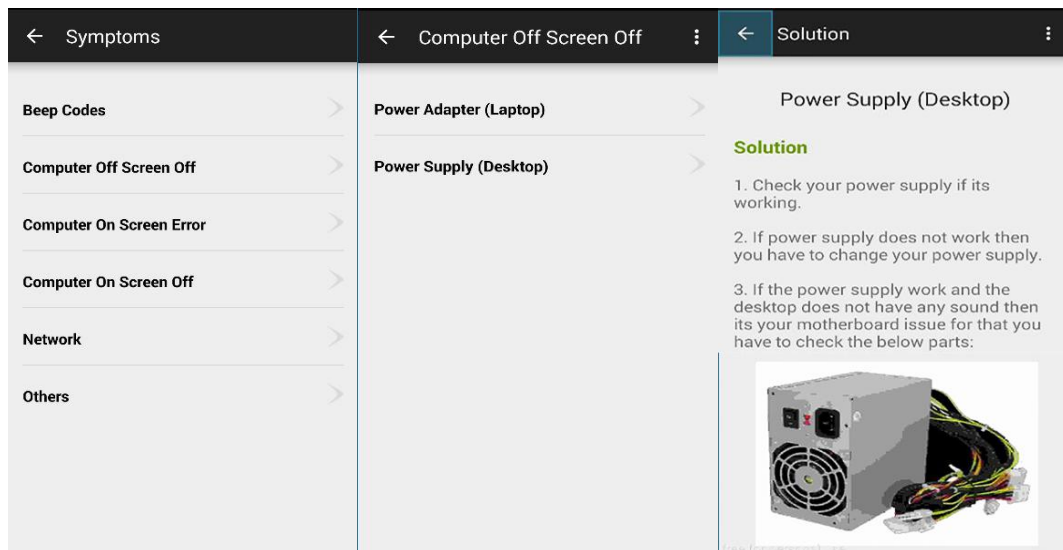


Fig.4. Offline symptoms

Parameters that I used in this expert system application are:

- Android studio platform (java)
- Parse server
- SQLite database

The application has two interfaces and figure 5 shows the first interface ES hierarchical structure.

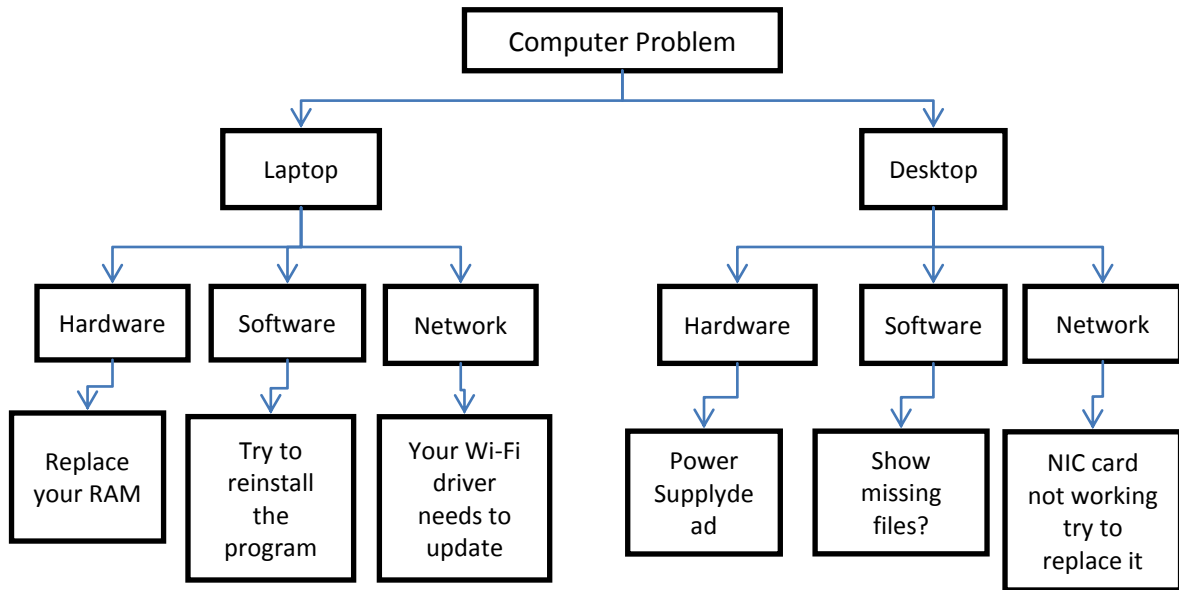


Fig.5. the hierarchical structure of our expert system application.

The second interface shows symptoms, table 1 and table 2 show the available symptoms for computer problems in this study.

Table 1: Main Problem symptoms

Computer On Screen Off
Computer On Screen Error
Computer Off Screen Off
Beep Codes
Blue Screens
Network
Others

If user did not find the solution, then the ES request from user to upload the problem with snap which take by mobile camera then a new problem will be send to public view mode which is all members can see and according to the knowledge of each member they can help user's problem to find a solution. Figure 6 shows the implementation of Mobile Expert System for solving computer problems.

Table 2: Sub Problem according to main problem

Computer On Screen Off	Ram not working	
	VGA cable Desktop	
	Power Cable Desktop	
	Monitor Cable in Laptop	
	Graphic card not working	
	Monitor itself damage	
Computer On Screen Error	Boot MGR Missing	
	Boot Device Not Found	
	Windows Failed to start	
	Windows could not start because the following file is missing or corrupt <Windows root>\system32\hal.dll	
	Windows could not start because the following file is missing or corrupt \Windows\System32\Config\System	
Computer Off Screen Off	Battery	
	Cable Connection for Desktop	
	Power Supply Desktop	
	Power adapter	
	Power button	
Beeps	AMI: 1 short	DRAM refresh failure
	AMI: 2 short	Parity circuit failure
	AMI: 3 short	<u>Base 64K RAM failure</u>
	AMI: 4 short	<u>System timer failure</u>
	AMI: 5 short	<u>Process failure</u>

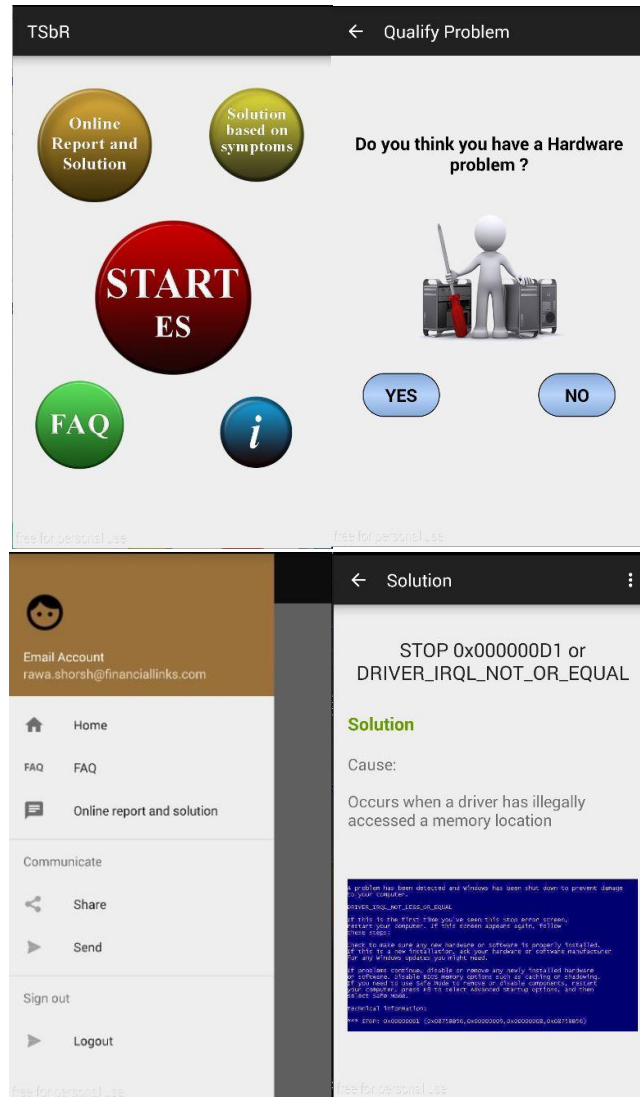


Fig.6. Expert System on android mobile application for solving computer problems

5. Conclusion

This study presented an expert system for solving computer problems and faults running on android smartphones. The system supports reasoning on knowledge using an inference engine and a rule-based encompassing troubleshooting production rules, in addition to a user and an admin interfaces that simplify operating and managing the system. The ES has two interfaces: the first one is the expert system which is decision making question and answer till user reach to its solution, the second interface is symptoms which is solved computer problem user can select symptoms according to their problems and find their solution, The ES allows the diagnosis of faults arising in computers in an accurate, rapid, systematic, efficient, and automated manner.

relieving human technicians from theburden of regularly scheduled maintenance tasks and routine support issues.

Acknowledgments

TheauthorsaregratefulforthesupportprovidedbyYüzüncüYılUniversity.

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