EasyChair Preprint

№ 7468

RoboGuide – an Expert System

Rajiv Khobragade, Pranay Deepak Saraf and Supriya Thakur

February 15, 2022

RoboGuide – An Expert System

Rajiv Khobragade[1], Pranay Deepak Saraf[2], Mrs. Supriya Thakur[3]
1 Research Scholar, Department of Computer Science & Engineering
G. H. Raisoni College of Engineering, Nagpur, India
rajiv.madhav59@gmail.com
2 Assistant Professor, Department of Computer Science & Engineering
G. H. Raisoni College of Engineering, Nagpur, India
pranay.saraf@raisoni.net
3 Supervisor, Corporate Segments Team,
Willis Tower Watson, Mumbai, India
supriya.thakur@willistowerswatson.com

***Abstract* - Robo-Guide is an AI-based application to cater to the needs of guidance, support, knowledge, advice, and counseling of people across the world. To be precise, this application is based on the concept of an Expert System of Artificial Intelligence. However, unlike the expert system, which has the expertise of only one field like medical, design, monitoring, finance/commerce, etc. This system is going to have expertise in multiple fields which common people usually seek help and support. This application could cater to the needs of guidance, support, knowledge, advice, and counseling of people across the globe. It provides reasoned advice at a comparable level to that provided by a human expert. Every individual usually faces some issues and seeks some guidance at every point of time in life. However, for all the queries that he has, he doesn't find a suitable expert in that area who will help him to get the solutions for his problems. RoboGuide fills the gap of unavailability of experts in different domains.**

Keywords—Expert System, Expert, ES, AI, Artificial Intelligence, RoboGuide, Guide

I. INTRODUCTION

1) What is Robo-Guide?

Robo-Guide is an AI based application to cater to the needs of guidance, support, knowledge, advice, and counseling of people across the world. To be precise, this application is based on the concept of Expert System of Artificial Intelligence. However, unlike expert system, which has the expertise of only one field like medical, design, monitoring, finance/commerce, etc. This system is going to have the expertise on multiple fields which common people usually seek the help and support for.

2) What is Expert System?

The expert systems are the computer applications developed to solve complex problems in a particular domain, at the level of extra-ordinary human intelligence and expertise.

3) Characteristics of Expert Systems

- High performance
- Understandable
- Reliable
- Highly responsive

II. LITERATURE REVIEW

A. DENDRAL - a case study of the first expert system for scientific hypothesis formation by Robert K. Lindsay

The DENDRAL Project was one of the first large-scale systems to use comprehensive, task-specific information about a problem domain as a source of heuristics, and to seek generality by automating the acquisition of that knowledge. This literature review outlines the project's significant conceptual contributions and accomplishments. It is an attempt to distil the most valuable lessons from in this study for artificial intelligence research and to offer a record of the work's ultimate state after two decades [1].

The DENDRAL Project is notable in computer science for various reasons. It was the first important use of heuristic programming to experimental analysis in an empirical field, and it solved a significant practical problem. It was one of the first large-scale systems to use comprehensive, task-specific knowledge about the issue domain as a source of heuristics, and to seek generality by automating the acquisition of such knowledge. Because it utilized a significant amount of chemistry knowledge, it was able to achieve a high degree of performance [2].

The DENDRAL programs were knowledge-driven in the sense of today's expert systems, with the knowledge principle—that knowledge is power—being defined for the first time in the context of DENDRAL. They were the first to adopt the concept of a distinct knowledge base that could be modified or redefined for new situations while keeping the same code for interpreting and applying the knowledge. The first rule-based system to be applied to a "real-world" situation was DENDRAL. It has been employed by chemists in the pursuit of their own research goals, in addition to its creators [1].

In Dennett's non-pejorative understanding, DENDRAL is certainly AI in the spirit of engineering gadget: most modern AI systems are as well. While DENDRAL is incapable of playing chess, baking a cake, or diagnosing septicemia, it does embody general strategies enhanced by knowledge that

give it intelligence and the ability to adapt to new information. Other studies have shown that the general tactics, when supplemented with another knowledge, perform well. This is the current perspective on AI, as advanced and represented by DENDRAL. It is possibly the most important legacy of this work [1].

B. An Analysis on MYCIN Expert System by Ritu Bala Rai

MYCIN was one of the foundational master frameworks, capable of performing at the level of a human master and providing clients with complete clarity of its consistent reasoning. MYCIN served as a benchmark for the bulk of master frameworks developed after it. Furthermore, the processes produced for the MYCIN master framework have proven to be the most widely available plan in the many small master framework construction apparatuses. Its purpose was to aid experts in the proper analysis and treatment of bacteremia contaminations. MYCIN was solely for the purpose of testing. The current study provides an overview of MYCIN master framework control application ideas [3].

MYCIN was an early reverse-binding master framework that used computerized reasoning to distinguish microorganisms causing extreme contaminations, such as bacteremia and meningitis, and to suggest anti-toxins, with measurements balanced for the patient's body weight — the name comes from the anti-microbials themselves, and the same number of anti-infection agents have the addition "-mycin". The Mycin framework was also used to investigate diseases that cause blood to thicken. In the mid-1970s, Stanford University produced MYCIN for more than five or six years. Edward Shortliffe's PhD dissertation was written in Lisps under the supervision of Bruce G. Buchanan, Stanley N. Cohen, and others. It was discovered at the lab that had created the DENDRAL master framework previously [4].

MYCIN was never really used in practice, although research revealed that it provided a satisfactory therapy in roughly 69 percent of patients, outperforming the work of irresistible malady specialists who were graded using comparable criteria [4].

MYCIN is a professional framework. We suggest that it is an AI. software that is designed to (a) provide master level answers to complex problems, (b) be justified, and (c) be sufficiently adaptive to efficiently accommodate new knowledge [3].

The literature provides an overview of a portion of MYCIN's control application module. A little image has been included in the paper to show general information and applicability. The study presents general portions of master frameworks, such as MYCIN, with a strong emphasis on govern application.

C. Fifth Generation- Artificial Intelligence and Japan's Computer Challenge to the World by Edward Feigenbaum and Pamela McCorduck

THE JAPANESE are no strangers to technological leapfrogging, or the transition from one technological level to another that is qualitatively superior. Japan's efforts to catch up with the West in the early aftermath of World War II, and even more so after the occupation ended, did not involve modest incremental technological advancements. Rather, it aimed to leapfrog via the process of large-scale imports. The role of the Ministry of International Trade and Industry (MITI) in the process, as well as how priority areas were determined, is a fascinating subject that has been recorded elsewhere. The Fifth Generation Computer Project, which is the subject of the book under review, is yet another huge national project undertaken by the Japanese. The Japanese are working on the fifth-generation computer, which is expected to be in use sometime in the 1990s despite a lack of experience in a number of computer sectors [5].

Importing raw materials and exporting high-quality commodities has proven to be a highly advantageous policy for Japan's resource-scarce economy. She was highly successful in this, causing trade friction on several fronts.
Because Japan relies heavily on foreign trade, a change from commodity exports to technological exports, sometimes known as a "flip from hard to soft exports," was tried. Information is becoming increasingly valuable in today's environment. In the approaching 'new information age,' easy access to a variety of specialized information will be commonplace. All of this implies that information would be a valuable commodity in and of itself. The Japanese want to be prepared to face and exploit this circumstance, which is likely in the not-too-distant future. As a result, the Fifth Generation Project was born. This is essentially what the book's authors express.

Then they display the responses of the United States, the United Kingdom, and other countries. and France, with whom they are dissatisfied and have expressed their displeasure. Various current government initiatives are addressed, including those of the Ministry of International Trade and Industry in taking the lead, bringing together viable parties to collaborate on the project, clear-cut project sharing, and so on. While the authors have detailed current activities in the computer field in Japan, the participation of the government, and so on, one wishes they had gone into greater detail about how the Japanese computer industry came to be in the first place. They are completely mute on the subject.

Because, despite the fact that the computer industry in Japan is just three decades old, it has only been recognized a priority industry in the last two decades. While other sectors of Japanese industry were liberalized prior to 1976, the computer industry was not. By that time, MITI was actively encouraging Japanese companies to form alliances in order to boost their ability to compete internationally. The admission of IBM into Japan in the early 1960s was contingent on basic patents being made available to Japanese firms.

Various Japanese manufacturers were urged to seek technological assistance from overseas companies. MITI planned large-scale computer projects to produce computers equivalent to IBM's, with other companies being asked to undertake certain sections of the project. Even the purchase of the final PCs was arranged. A variety of incentives were given out. Cartelization was encouraged and the tax structure was made more friendly to the sector. All of these factors become significant when a relatively young industry feels strong enough to enter a

market where even a global behemoth like IBM is afraid to go.

The importance of MITI in the early stages of the industry, as well as in this endeavor, cannot be overestimated. While MITI's foresight and long-term planning helped to shape the Japanese computer industry into what it is today, a clear allocation of sectors for individual manufacturers to specialize in was a critical step in conserving R&D resources.

One would join the writers in praising the Japanese for recognizing and pursuing an area with enormous future potential. However, in their enthusiasm, they appear to be downplaying the seriousness of the issues at hand. This is not meant to diminish Japan's ability to innovate; rather, it is meant to emphasize that previous triumphs in other disciplines should not obscure the gravity of the current difficulties to be tackled. The Japanese, like everyone else, are human and have made mistakes in the past.

While this literature might need some editing and lacks coherence in sections, it is a nice contribution to the few English-language works on the Japanese computer industry.

III. METHODOLOGY

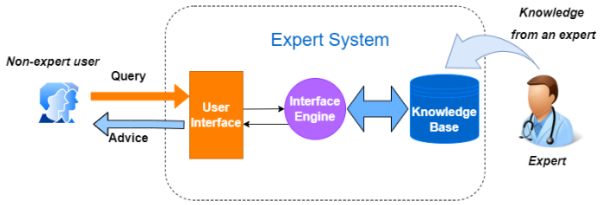

Fig. 1. Architecture of Expert System

A. *Knowledge Base*

- It contains domain-specific and high-quality knowledge
- Knowledge is required to exhibit intelligence. The success of any ES majorly depends upon the collection of highly accurate and precise knowledge.

2 What is Knowledge?

The data is collection of facts. The information is organized as data and facts about the task domain. Data, information, and past experience combined together are termed as knowledge.

B. *Components of Knowledge Base*

The knowledge base of an ES is a store of both, factual and heuristic knowledge.

Factual Knowledge − It is the information widely accepted by the Knowledge Engineers and scholars in the task domain.

Heuristic Knowledge − It is about practice, accurate judgement, one's ability of evaluation, and guessing.

C. *Knowledge representation*

It is the method used to organize and formalize the knowledge in the knowledge base. It is in the form of IF-THEN-ELSE rules.

D. *Knowledge Acquisition*

The success of any expert system majorly depends on the quality, completeness, and accuracy of the information stored in the knowledge base.

The knowledge base is formed by readings from various experts, scholars, and the Knowledge Engineers.

E. *Knowledge Engineer*

The knowledge engineer is a person with the qualities of empathy, quick learning, and case analyzing skills.

He acquires information from subject expert by recording, interviewing, and observing him at work, etc. He then categorizes and organizes the information in a meaningful way, in the form of IF-THEN-ELSE rules, to be used by interference machine. The knowledge engineer also monitors the development of the ES.

F. *Inference Engine*

Use of efficient procedures and rules by the Inference Engine is essential in deducting a correct, flawless solution.

In case of knowledge-based ES, the Inference Engine acquires and manipulates the knowledge from the knowledge base to arrive at a particular solution.

In case of rule based ES, it −

- Applies rules repeatedly to the facts, which are obtained from earlier rule application.
- Adds new knowledge into the knowledge base if required.

Resolves rules conflict when multiple rules are applicable to a particular case.

G. *User Interface*

- User interface provides interaction between user of the ES and the ES itself. It is generally Natural Language Processing to be used by the user who is well-versed in the task domain. The user of the ES need not be necessarily an expert in Artificial Intelligence.
- It explains how the ES has arrived at a particular recommendation. The explanation may appear in the following forms −

  o Natural language displayed on screen.

  o Verbal narrations in natural language.

  o Listing of rule numbers displayed on the screen.

- The user interface makes it easy to trace the credibility of the deductions.

IV. DESIGN & IMPLEMENTATION

A. *Problem Statement*

In today's fast-moving world, everybody is surrounded with a lot of difficulties, problems, issues, and dilemmas. Be it in the field of education, medical, health and fitness, government schemes, personal life or psychological concerns. Every individual in this world needs one or the other kind of guidance and support. Some people are fortunate enough to have their mentors, guide and advisors for every query they have, some simply are aloof of all this. Also, even if people have advisors or guide for them, they must not be apt in all the fields, also, they will not be available all the time.

Additionally, there are a lot of people out there in the world who are experts in their own fields, and they just want to serve the humanity with their knowledge and expertise

B. *Objectives of Robo-Guide*

- To cater to the needs of guidance, support, knowledge, advice, and counselling of people across the world.
- To provide reasoned advice at a comparable level to that provided by a human expert
- To enhance the abilities of leading experts in certain fields and to make a high level of expertise available to less highly qualified practitioners
- To fill the gap of availability of experts in different domains
- To make the lives of people easier
- To make the experts showcase their talent, knowledge, product, and services to the people

C. *Architecture of Robo-Guide*

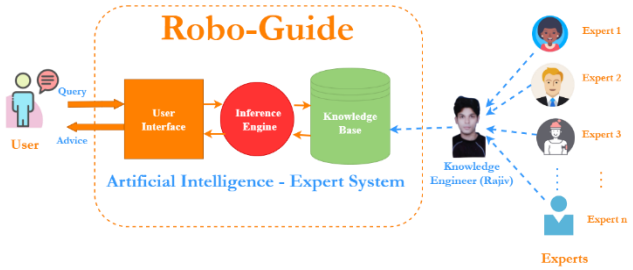

Fig. 2. Architecture of RoboGuide

1. *Experts*

There are N number of experts in the system from the different fields whose knowledge is collected and captured by the knowledge Engineer into the Knowledge base.

2. *User Interface*

All the details of the User Interface mentioned for the Expert system apply to the UI of RoboGuide. Additionally, the User Interface of RoboGuide will be portable and can be integrated with various applications, websites, mobile apps and social media platforms in the form of chatbots.

3. *Knowledge Base*

It contains domain-specific and high-quality knowledge
Knowledge is required to exhibit intelligence. The success of any ES majorly depends upon the collection of highly accurate and precise knowledge.

4. *Components of Knowledge Base*

The knowledge base of an ES is a store of both, factual and heuristic knowledge.
Factual Knowledge − It is the information widely accepted by the Knowledge Engineers and scholars in the task domain.
Heuristic Knowledge − It is about practice, accurate judgement, one's ability of evaluation, and guessing.

5. *Knowledge representation*

It is the method used to organize and formalize the knowledge in the knowledge base. It is in the form of IF-THEN-ELSE rules.

6. *Knowledge Acquisition*

The success of any expert system majorly depends on the quality, completeness, and accuracy of the information stored in the knowledge base.
The knowledge base is formed by readings from various experts, scholars, and the Knowledge Engineers.

7. *Knowledge Engineer*

The knowledge engineer here is me, Rajiv Khobragade, hopefully, with the qualities of empathy, quick learning, and case analyzing skills.
I am acquiring information from different subject experts by recording, interviewing, and observing them at work, etc. I am then categorizing and organizing the information in a meaningful way, in the form of IF-THEN-ELSE rules, to be used by interference machine. I am also development and monitoring this whole ES.

8. *Inference Engine*

Use of efficient procedures and rules by the Inference Engine is essential in deducting a correct, flawless solution.
In case of knowledge-based ES, the Inference Engine acquires and manipulates the knowledge from the knowledge base to arrive at a particular solution.
In case of rule-based ES, it −

- Applies rules repeatedly to the facts, which are obtained from earlier rule application.
- Adds new knowledge into the knowledge base if required.

Resolves rules conflict when multiple rules are applicable to a particular case.

D. Features of RoboGuide

- Provide quick and fast human like chat experience
- Multiple sources of knowledge base
- People can get the advice at free of cost
- Source of knowledge and advices at your pocket
- Can be embedded with social media platforms
- Unemployed experts can feature their services and products.

E. Hardware & Software Requirements

Table I. Hardware Requirements for RoboGuide

Sr. No	Hardware Requirements		
	Processor	***RAM***	***Display***
1	1.9 gigahertz (GHz) x86- or x64-bit dual core processor with SSE2 instruction set	2-GB RAM	Super VGA with a resolution of 1024 x 768

Fig. 3. Hardware Requirements.

Table II. Software Requirements for RoboGuide

Sr. No	Software Requirements
	Options
1	Microsoft Edge (latest publicly released version) running on Windows 10, Window 8.1, Windows 8, Windows 7
2	Mozilla Firefox (latest publicly released version) running on Windows 10, Windows 8.1, Windows 8, or Windows 7
3	Google Chrome
4	Apple Safari

Fig. 4. Hardware Requirements.

V. CONCLUSION

Thus, the RoboGuide is going to be the most useful application in the upcoming years to solve the issue of unavailability of guide, mentor, or advisor in various phases of life.

It will help the experts showcase their talent, knowledge, product, and services to the people thereby enhancing the abilities of leading experts in certain fields and to make a high level of expertise available to less qualified practitioners or the general people seeking advices and knowledge in different fields.

ACKNOWLEDGMENT

I feel very much delighted in expressing the sense of gratitude to my Project guide, Prof. Pranay Saraf, for his timely help during the planning and development of the project, and for his constant encouragement and valuable guidance.

I am very thankful to my industry guide, Mrs. Supriya Thakur, for giving the opportunity to do the project and providing me necessary facilities to carry our project. The development of this project would not have been possible without the firm support of these two guides.

I would like to express sincere thanks to my course coordinator, Dr. Prasad Lokulwar, who helped me in my project materialization and gave me valuable suggestions whenever and wherever required.

I wish to Express my gratitude to all my Principal, HOD, faculty members, and friends who have helped me directly and indirectly in completing my project.

REFERENCES

[1] "D E N D R A L : A case study of the first expert system for scientific hypothesis formation" by Robert K. Lindsay - University of Michigan, 205 Zina Pitcher Place, Ann Arbor, MI 48109, USA; Bruce G. Buchanan - Computer Science Department, University of Pittsburgh, USA; Edward A. Feigenbaum -Knowledge Systems Laboratory, Department of Computer Science, Stanford University; Joshua Lederberg - Rockefeller University, New York, NY 10021-6399, USA; Received April 1991; Revised June 1992rt K., 2Pitcher Place, Ann Arbor

[2] "On Generality and Problem Solving - A Case Study Using the DENDRAL Program" by E. A. Feigenbaum, B. G. Buchanan and J. Lederberg, Computer Science Department, Stanford University

[3] The MYCIN expert system by Edward H. Shortliffe

[4] An Analysis on MYCIN Expert System by Ritu Bala Rai

[5] Fifth Generation- Artificial Intelligence and Japan's Computer Challenge to the World by Edward Feigenbaum and Pamela McCorduck.