An Application of Heuristic and Meta Dendral Expert System

Ragad M Tawafak[1*], *Ghaliya* Alfarsi[1,2], and *Sohail Iqbal* Malik[1]

[1]Department of Information Technology, AlBuraimi University College, Buraimi, Oman
[2] College of Graduate Studies, Universiti Tenaga Nasional, Information Technology department, Malaysia

Abstract. A mobile application is the best way to reach the largest possible number of users, and it is a smart idea and dealing with it is very easy. In the Corona pandemic, many Mobile applications appeared that helped the community with the necessary precautions, Therefore, we designed an application on the phone to allow patients to book an appointment and choose the appropriate health and medical services, and it also allows for a PCR examination to detect Coronavirus, By making an appointment and going to the patient's home while taking preventive precautions from Corona. Derivation motor is constantly refreshed as new ends are drawn from each new sureness in the learning base which triggers additional rules, heuristics and standards in the inference engine. This paper is going to design and implement an application of expert system, it's first since forever achievement DENDRAL which turned into a stepping stone in the Artificial Intelligence field. The model shows the essential parts of AI and the major icons to do the assessment and treatment within the situation of corona virus. The reveals is this System can be a greatly important expansion of Artificial Intelligence.

1 Introduction

We all go to the hospital to consult the doctor on the way to receive treatment for the diseases that afflict us, bearing upon ourselves the extreme fatigue that we feel and the lack of time [1]. But with the spread of the Covid-19 pandemic, people are unable to meet their appointments and are unable to come to receive treatment in hospitals for fear of catching Covid-19 [2], especially the elderly and children, as they are more susceptible to being infected with the virus Covid-19 and also because of the weakness of their immune system [3]. Therefore, from here we began to design a medical care application during Covid-19, and our application is an electronic platform that seeks to provide all medical services with the best quality and easiest possible ways to process and have all of them healthy and useful as it reduces the percentage of people contracting the virus and exposing their lives to risks so that the user can consult the doctor in a smooth way, and the electronic platform also specializes in providing all services to patients on the health side in the best and easiest way

---

* Corresponding author: raghad@buc.edu.om

possible to maintain the safety of the patient without Putting his life at risk [4]. Figure 1 is an example of using mobile application as a treatment tool effective within COVID-19.

Fig. 1. Effective mobile treatment support

For that, an explicit errand in science was picked: help natural scientific experts in recognizing obscure natural atoms, by investigating their mass spectra and utilizing learning of chemistry. It was done at Stanford University by Edward Feigenbaum. By the pre-entered rule of guideline, The DENDRAL framework can naturally create atomic structures that can decipher unearthly information. The program is a first fruitful program that utilizes the learning of the issue itself as opposed to the Complex hunt innovation. The DENDRAL guides computerized reasoning specialists to understand that the keen conduct depends on impedance strategies as well as on the learning utilized in their Interference. Analysts start to construct the program that utilizes the tenets of the code to speak to the Knowledge to take care of the info issue. [10]

Numerous frameworks were gotten from Dendral, including MYCIN, MOLGEN, PROSPECTOR, XCON, and STEAMER. There are numerous different projects today to tackle the mass spectrometry reverse issue; however, they are never again depicted as 'man-made brainpower', similarly as structure searchers. The name Dendral is an abbreviation of the expression "Dendritic Algorithm". [11]

2 Background

Within computer science the DENDRAL Project. It was the main major enforcement of heuristic programming to test- tall analysis in an empirical science. It has carried out a high level of performance, ago it utilized a considerable measure of knowledge of chemistry. The DENDRAL programs were information driven. DEN- DRAL was the main rule-based system used to a "genuine world" issue. It has been used via, chemists. [10]

3 History of Dendral

The Dendral Project starts in 1965. Feigenbaum had been searching down an errand situation in which to exchange transaction of experimental acceptance (of models and speculations from information) and had arranged, his reasoning toward finding such an, engagement domain among the exercises that researchers do. Lederberg, a geneticist whose

work in 1965 on exobiology included the mass spectra of ammunition acids, recommended the commitment of examining mass spectra—the development of estimation of natural atomic structure from mass ghostly information. Buchanan joined the exertion presently; his introduction was logic of science mixed with AI, a worry for the idea of logical revelation and the data forms essentiality. DENDRAL work was to a great extent test work. One of the soonest of the trial results was likewise maybe the most critical. That was the information is-control estimation, which has turned into the trademark by which numerous in AI recollect the DENDRAL Project. As we widened the breaking points of DENDRAL's capacities, what we found was that we required, more than everything else, more space explicit information of science and mass spectrometry (having all the more ground-breaking AI critical thinking strategies was valuable yet not urgent to our prosperity; more learning was essential). Toward this end, we join up the arranged stress of Djerassi, a world-class master in mass spectrometry, and with Djerassi his group of particularism, guests, and post-docs. One of our essential early inspirations, look the procedures of hypothesis development (in logical work, and somewhere else) was delayed for quite a long while. We settled on a choice (by and large right) to fulfill trial results and gain setting building background on an increasingly solid issue first: the theory arrangement issue of construing from one lot of otherworldly information one (or a couple) applicant sub-atomic structure(s). A fulfillment with DENDRAL drove us back to the first issue of hypothesis development, which currently showed up in a very explicit and solid frame that was "meta" to DENDRAL (henceforth the task's name, Meta-DENDRAL).[10]

Table 1. Expert System compound structure

Domain	Organic chemistry- mass spectrometry
Task	To distinguish molecular frame of strange complex from mass shadow data
Input	Histogram awarding mass digit
Output	attributes of structure of the compound
Architecture	plan-better -trial with constrained heuristic discussion

3.1 Case Study- DENDRAL

The Dendral venture is a genuine case of the rising development. Dendral was made at Stanford University to investigate chemicals. The endeavor was reinforced by NASA, in light of the way that an unmanned transport was to be dispatched to Mars and a task was required to choose the sub-nuclear structure of Martian soil, in light of the mass unearthly data gave by a mass spectrometer. The project being in 1965. Edward Feigenbaum, Bruce Buchanan and Joshua Lederberg encircled a gathering to deal with this testing issue. [10] Feigenbaum had been searching for a domain in which to look at methods of experimental acceptance, had organized his thinking toward finding such an errand circumstance among the activities that specialists do. Lederberg was a geneticist. He had worked in 1965 on exobiology incorporated the mass spectra of ammo acids, proposed the task of separating mass spectra. Afterward, Buchanan likewise joined the group and he presented the hypothesis of science blended with AI, and his advantage inclined towards the logical revelations and their related data forms. This venture was to a great extent an experimental one. Yet, it turned into a milestone for the Expert System field. [6]

Dendral represents Dendritic Algorithm. It is a procedure for thoroughly and non-repetitively specifying all the topologically distinct arrangements of any given set of atoms, according to the standards of compound valence. The focal issue of chemistry science is to choose the compound structure of atoms. The general issue which the DENDRAL programs apply is a basic, substantive issue in the science and that is structure explanation. Structure clarification is characterized as the procedure of assurance of the structure of a compound. The issue is basic in light of the way that the physical and in addition properties of the mixes are settled not just by quantities of the iotas, anyway by their topological and geometric plans moreover. A couple of observational methods are available for procuring information about the structure of a compound. Observable among these is mass spectrometry and DENDRAL at first kept an eye on the issues related just with this system, regardless of the way that it created to deal with the issues of structure explanation on progressively expansive terms.[10]

4   Types of Dendral

4.1 Heuristic Dendral

Heuristic Dendral is a program that utilizes mass vision or other exploratory information together with learning base of science, to create a lot of thinkable concoction structures that might be in charge of delivering the information. A mass area of a complex is created by a mass spectrometer, and is utilized to decide its sub-atomic weight, the whole of the majority of its nuclear constituents. For example, the compound water (H2O), has an atomic load of 18 since hydrogen has a mass of 1.01 and oxygen 16.00, and its mass range has a top at 18 units. Heuristic Dendral would utilize this info mass and the learning of nuclear mass numbers and valence rules, to decide the conceivable mixes of nuclear constituents whose mass would mean 18. As the load increments and the atoms turn out to be increasingly unpredictable, the quantity of conceivable mixes excess radically. Along these lines, a program that can diminish this number of hopeful arrangements through the procedure of theory development is basic. New chart theoretic calculations were imagined by Lederberg, Harold Brown, and others that produce all diagrams with a predefined set of hubs and association types (compound iotas and bonds) - with or without cycles. In addition, the group had the ability to demonstrate scientifically that the generator is finished, in that it delivers all diagrams with the predetermined hubs and edges, and that it is non-repetitive, in that the yield contains no comparable charts (e.g., perfect representations). The CONGEN program, as it became known, was developed largely by computational chemists Ray Carhart, Jim Nourse, and Dennis Smith. It was useful to chemists as a stand-alone program to generate chemical graphs showing a complete list of frame that satisfy the constraints specified by a user.[6]

4.2 Meta-Dendral

Meta-Dendral is machine learning frameworks that gets the order of conceivable synthetic structures and comparing mass spectra as info, and proposes a lot of standards of mass spectrometry that relate auxiliary highlights with procedures that create the mass spectrum. These principles would be supply back to Heuristic Dendral (in the arrangement and testing programs portrayed beneath) to test their suitability. In this way, "Heuristic Dendral is an execution framework and Meta-Dendral is a learning system". The program depends on two critical highlights: the arrangement produces test worldview and information building.

Plan-Generate-Test Paradigm: The arrangement produce test worldview is the sectional association of the critical thinking technique, and is a typical worldview applied by both Heuristic Dendral and Meta-Dendral systems. The generator (later named CONGEN) creates potential answers for a specific issue, which are then communicated as substance charts in Dendral notwithstanding, this is achievable just when the quantity of applicant arrangements is negligible. At the point when there are fundamental quantities of conceivable arrangements, Dendral needs to figure out how to put imperatives that discounts extensive arrangements of competitor solutions. This is the essential point of Dendral organizer, which is a "speculation development" program that utilizes "errand explicit learning to discover requirements for the generator". Last yet not slightest; the analyzer breaks down each proposed hopeful arrangement and discount of those that neglect to satisfy certain criteria. This component of plan produce test worldview is the thing that holds Dendral together. [21]

Knowledge Engineering: The primary point of learning designing is to accomplish a beneficial connection between the accessible information base and critical thinking techniques. This is conceivable through advancement of a strategy in which a lot of errand explicit data is encoded into heuristic projects. Thus, the principal fundamental segment of learning building is an extensive "information base." Dendral has explicit learning about the mass spectrometry system, a lot of data that frames the premise of science and diagram hypothesis, and data that may be useful in finding the arranging of a specific concoction frame illustration issue. This "information base" is utilized both to scan for conceivable compound structures that coordinate the info information, and to learn new "general guidelines" that assist prune seeks. The advantage Dendral gives the end client, even a non-master, is a limited arrangement of conceivable answers for check physically. [22].

5   Conclusion

Colossal commitment to the different territories has been made by the master framework from the most recent fifteen years. Master framework will keep on assuming an undeniably imperative job in the different fields. In this assessment, we have recognized and talked about the Expert Systems with its design and contextual fulfillment of its first achievement DENDRAL. Master System can be a greatly important expansion of Artificial Intelligence.

References

1. AlFarsi, Ghaliya., & ALSinani, M. Developing a Mobile Notification System for AlBuraimi University College Students. International Journal of Information Technology and Language Studies(IJITLS), 1(1). (2017).

2. Malik, S. I., Mathew, R., Tawafak, R. M., & Khan, I. GENDER DIFFERENCE IN PERCEIVING ALGORITHMIC THINKING IN AN INTRODUCTORY PROGRAMMING COURSE.

3. Tawafak, R. M., & Romli, A. B. Ruzaini bin Abdullah Arshah, and Sohail Iqbal Malik." Framework design of university communication model (UCOM) to enhance continuous intentions in teaching and e-learning process.". Education and Information Technologies, (2019).1-27.

4. Mathew, R., Malik, S. I., & Tawafak, R. M. Teaching Problem Solving Skills using an Educational Game in a Computer Programming Course. Informatics in Education, 18(2), (2019).359.

5. Clustering, A. S. International Arab Conference on Information Technology (ACIT). Higher Education, 165, 170. (2019)

6. Tatnall, A. Editorial for EAIT issue 2, 2020. Education and Information Technologies, 25(2), (2020). 647-657.

7. Tatnall, A. Editorial for EAIT issue 2, 2019. Education and Information Technologies, 24(2), (2019). 953-962.

8. Tawafak, R. M., Romli, A. B., Abdullah, R., Alfarsi, Ghaliya., Jabbar, J., Esbai, R., ... & Abdelhameed, W. Competitiveness & Quality.

9. Tawafak, Ragad M., Awanis M. Romli, and Maryam Juma Alsinani. "Student Assessment Feedback Effectiveness Model for Enhancing Teaching Method and Developing Academic Performance." International Journal of Information and Communication Technology Education (IJICTE) 15, no. 3 (2019): 75-88.

10. Tawafak, Ragad M., Awanis BT Romli, and Maryam Alsinani. "E-learning system of UCOM for improving student assessment feedback in Oman higher education." Education and Information Technologies 24, no. 2 (2019): 1311-1335.

11. Tawafak, Ragad M., Awanis BT Romli, and Ruzaini Bin Abdullah Arshah. "Continued Intention to use UCOM: Four factors for integrating with a technology acceptance model to moderate the Satisfaction of Learning." IEEE Access 6 (2018): 66481-66498.

12. Alfarsi, Ghaliya, Jasiya Jabbar, Ragad M. Tawafak, Sohail Iqbal Malik, Abir Alsidiri, and Maryam Alsinani. "Using Cisco Packet Tracer to simulate Smart Home."

13. Tawafak, Ragad M., Muamer N. Mohammed, Ruzaini Bin Abdullah Arshah, Mohanaad Shakir, and Vitaliy Mezhuyev. "Technology enhancement learning reflection on improving students' satisfaction in Omani universities." Advanced Science Letters 24, no. 10 (2018): 7751-7757.

14. Tawafak, Ragad M., A. B. Romli, Ruzaini bin Abdullah Arshah, and Rana A. Saeed Almaroof. "Assessing the impact of technology learning and assessment method on academic performance." EURASIA Journal of Mathematics, Science and Technology Education 14, no. 6 (2018): 2241-2254

15. Tawafak, Ragad M., Muamer N. Mohammed, Ruzaini bin Abdullah Arshah, and Awanis Romli. "Review on the effect of student learning outcome and teaching Technology in Omani's higher education Institution's academic accreditation process." In Proceedings of the 2018 7th International Conference on Software and Computer Applications, pp. 243-247. 2018.

16. Buchanan, B. G., & Duda, R. O. (1983). Principles of rule-based expert systems. In Advances in computers (Vol. 22, pp. 163-216). Elsevier.

17. O'Keefe, R. M., & O'Leary, D. E. (1993). Expert system verification and validation: a survey and tutorial. Artificial Intelligence Review, 7(1), 3-42.

18. Goita, Y., & Sidibe, M. (2021, March). Towards a Comprehensive Expert System for Coronavirus Disease. In 2021 7th International Conference on Information Management (ICIM) (pp. 18-23). IEEE.

19. Suppe, F. (2021). Artificial Intelligence and Computer Approaches to Clinical Medical. Logic of Discovery and Diagnosis in Medicine, 223.

20. Al Farsi G, Yusof AB, Romli A, Tawafak RM, Malik SI, Jabbar J, Bin Rsuli ME. A Review of Virtual Reality Applications in an Educational Domain. International Journal of Interactive Mobile Technologies. 2021 Dec 11;15(22).

21. Tawafak R, Malik S, Mathew R, Ashfaque M, Jabbar J, AlNuaimi M, ElDow A, Alfarsi G. A Combined Model for Continuous Intention to Use E-Learning System.

22. Tawafak RM, Alsewari AA, Malik SI, AlFarsi G. A Tool Model Group (TMG)
    Development to Enhance Student Performance. In2021 International Conference on
    Intelligent Technology, System and Service for Internet of Everything (ITSS-IoE)
    2021 Nov 1 (pp. 1-5). IEEE.