

Project 3- Prolog Food Expert System



This is all my own work. I have not knowingly allowed others to copy my work. This work has not been submitted for assessment in any other context.

Introduction

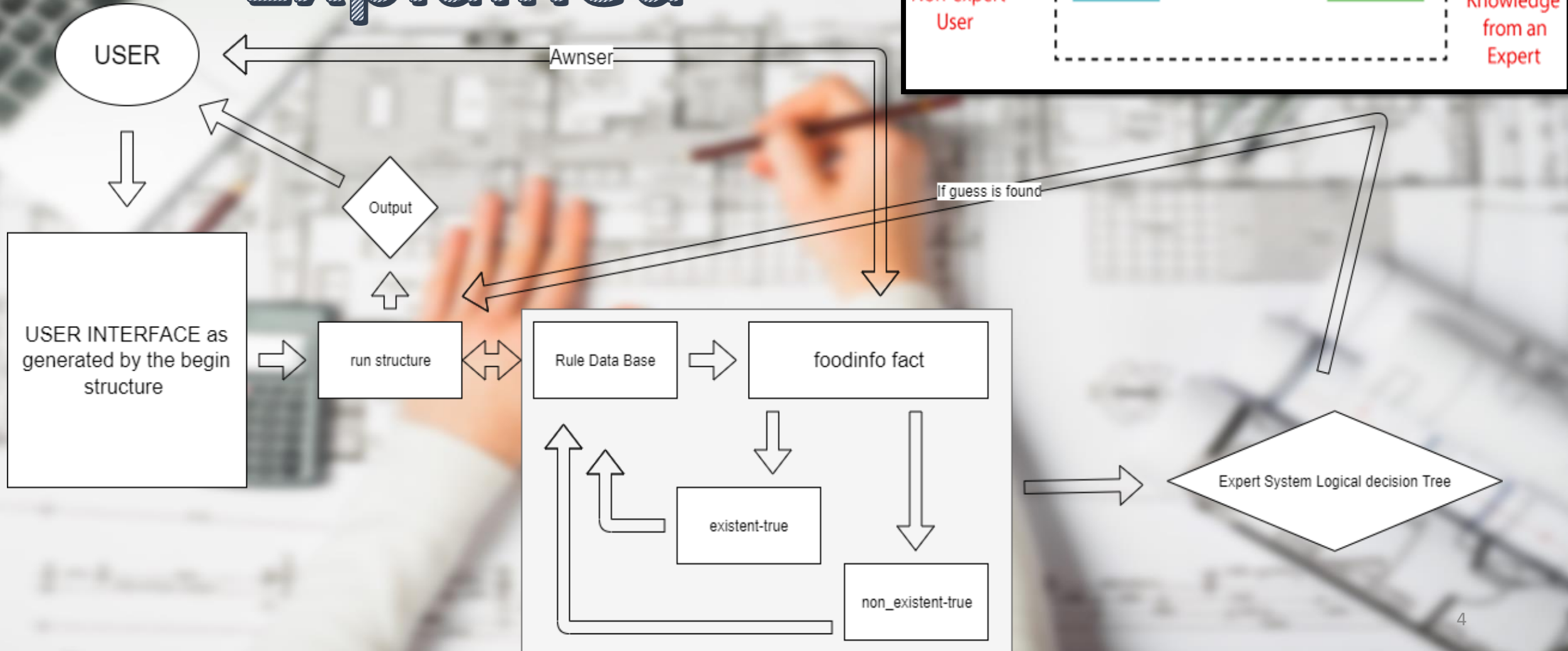


- The aim of this project is to build a new and make working an expert system based on known rules and then evaluate the same expert system.
- The expert system will be built using the logical programming language Prolog. It will be built from scratch. It will be a back chaining system.
- The reason for choosing to build an expert system based on known logical rules is to expand my development skills and try and evaluate and reason a logical decision tree on my own. As well as being interested in AI systems being able to predict or guess our thoughts.

AIS – Explained

- The function of the AIS is simple-guessing your favorite tasty mainstream food dish from a list of options that most people would choose from in a food court in a mall for example.
- The expert system will be **built** upon known expert rules that I will generate (no actual expert is needed for this system due to its simple everyday nature-food, which I have consumed plenty of).
- The expert system through the power of guessing can then be used to suggest food options to the user in relation to the choices.

Architecture Explained



Challenges overcome to make working the AIS

To learn Prolog code sufficiently to even understand example AI systems made with Prolog.

To firmly understand how Prolog functions and how it's workflow is organized, because it is quite different from conventional programming languages such as Java and Python.

Develop rule ideas accordingly to the Prolog code and accordingly to the system goals and solve tricky logic problems within the system.



Knowledge Engineering-Elicitation

Of great help in understanding expert systems and their specifications/attributes was the lecture by Jocelyn Ireson-Paine and the explanations of instructor Dr.Brooks + the reviewing of several articles for background knowledge (references are included in the references section)

- I studied the Prolog language through the official Prolog site, University lectures, YouTube videos and the GNU Prolog site (references are included in the references section). Stack Overflow and GitHub or similar forums and sites helped me to solve my coding problems and give me ideas.
- In regards of building the expert system I reviewed Prolog systems and coding we have previously worked on and on forums.
- In regards of building the expert system rule database, I thought of it myself, considering I can somewhat qualify to be a food expert for the listed dishes, having tasted/consumed them all.

NO EXTENSION WAS MADE

```
system(made).  
new_knowledge_provided(no).  
source_code(created).  
extension_made :- system(downloaded); source_code(sourced), new_knowledge_provided(yes).  
extension_made. > Output:FALSE.
```

The actual expert logical rules will be a concept that I develop and implement logically, thus I am building the system, so no extensions are needed.



V&V Evaluation

, operators
to ;

Adding \+ to
statements

- **Mutation testing** - I did several rounds and combinations of code mutation on logical operators and then checked them using the UI accordingly. I did this in the source code to ensure the software will be able to detect the changes and so it did. I changed logical operators from and to or and added negations to statements.
- **Manual code inspection** - I inspected the code manually and ran a lot of manual tests to evaluate its consistency. I will try a different combination of inputs to see the results and their consistency, meaning if the same input is put several times in the same exact order, will the same result be given or will there be a logical flaw.

Task-Oriented Evaluation



ONLY
HUMAN

- The task-oriented evaluation was done through human examinations. The evaluation was done through evaluation by human discrimination by letting the people be the users who run the program-system. Then asking them how believable the output is and if the system has guessed their idea and how precise it was (i.e., Based on their answers, if the correct food is guessed from the database and if their food dish was able to be guessed at all). The people that were asked were my collage colleagues.
- Most people chose simple dishes like burgers/fried chicken/doner kebab which is in the database, even though some of them confused the system with a lot of inputs it still managed to guess their dish in general. Although if they had a complicated or specific dish in mind or were not able to correctly asses the questions the system did get confused.

Conclusions

- This rule based system is quite basic with only a few rules and a very simple UI. It can resemble a guessing game or an eventual suggesting system. In the future for it to be deployed as a suggestion system, the database must be extended widely with a lot more food options being available as well as a lot more rules for each specific food option to be selected. The system could be put into widespread use as a game or if extended and further developed as a nutrition guide and suggester according to diet preferences or restricts.



References

- Brock, D. C. (2018). Learning from Artificial Intelligence's Previous Awakenings: The History of Expert Systems. *AI Magazine*, 39(3), 3–15. <https://doi.org/10.1609/aimag.v39i3.2809>
- Mijwil, M. M., Mutar, D. S., Filali, Y., Aggarwal, K., & Al-Shahwani, H. (2022). Comparison between Expert Systems, Machine Learning, and Big Data: An Overview. *Asian Journal of Applied Sciences*, 10(1). <https://doi.org/10.24203/ajas.v10i1.6930>
- Tan, H. (2017). A brief history and technical review of the expert system research. *IOP Conference Series: Materials Science and Engineering*, 242, 012111. <https://doi.org/10.1088/1757-899x/242/1/012111>
- <http://www.gprolog.org/>
- <https://www.swi-prolog.org/>
- http://alumni.cs.ucr.edu/~vladimir/cs171/prolog_2.pdf
- <https://medium.com/analytics-vidhya/learn-prolog-language-by-creating-an-expert-system-d46a811c58e8>
- <https://www.youtube.com/watch?v=SykxWpFwMGs&t=753s>
- https://www.youtube.com/watch?v=z-9rhL5T2Xc&list=PLEJXowNB4kPy3_qhGksOO8ch_Di7T8_9E&index=12
- <https://www.youtube.com/watch?v=dFEWzUqU5lo>