

Blood Donor Assistance Software

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Project 1 - EXPERT SYSTEMS / FUZZY LOGIC

Introduction and Background

- The project I have designed is intended to help guide and assist in the physical examination of a potential blood donor. This design is to be incorporated and used at a local blood bank. The program goes through a list of questions that a Nurse should ask a potential blood donor during a pre-donation physical exam. While some questions go through some basics, some questions do require the nurse to take physical measurements in order to determine if that donor is healthy enough to donate.

- The motivation that I have behind choosing a project like this are both the safety aspect it provides as well as the usability and potential it can have in a growing technological era. I wanted to choose something that is unknown to me, and with my brother doing it for a career, it made this selection a good choice for me.

Knowledge Engineering

- The expert I chose was my Brother, Brian Hulsebus. He currently has a Nursing Degree and works at blood donation center called Blood Source. He has been a Nurse at Blood Source for about 2 years now.

- To go about the knowledge engineering portion of this project, I arranged a time where both my brother and I could sit down and discuss the subject. Before talking to him I knew very little about what the process is like before being cleared to give blood. He was able to provide some key information on what the process is like for handling donors, and also what disqualifies someone from donating.

- I made a few constraints to the application that I wrote. With a few of the readings that I ask for the Nurse to take. I found that I needed to ask if the readings, like weight for example, were either above or below a certain weight. My reasoning for this is that incorporating a FAM for this and other data caused too much variation in the output. Overall, it worked out better having certain things being asked as simple questions.

Expert System Design

- I first wrote down a tree structure to lay out all the steps I needed to go through and each variation that steamed from it. From this I went over the required readings needed to determine if someone can donate. I examined what data would do well in a Fuzzy Matrix Set. From here I constructed my FAM's by hand on paper to ensure that they were constructed properly.

- The rules I incorporated first start out as “yes” or “no” questions ensuring the pre-assessment information is fully covered before the Nurse begins the actual examination. Other rules exist within my FAM’s that help assist in fuzzifying and defuzzifying. I also have some rules that execute a print statement after checking if another rule has executed. Having this be an interactive design, I have no defacts incorporated. For inputs, at the beginning there are just “yes” or “no” questions that are asked, but then this leads into my two FAM’s which include 4 inputs total. As for outputs, I have responses on most rules giving some explanation to the user on what occurred.

- I applied fuzzy logic to two parts of my project. The first introduces a Fuzzy Associative Matrix that takes in two values to determine blood pressure. The first input takes in the top number taken from a blood pressure reading, for example (120 / 80) takes 120. The second input is the lower number, for example (120 / 80) takes 80. These two numbers are fuzzified, analyzed and defuzzified in an output from ranges 160 – 240. For example, if my output came back as 200 it would mean I am in the good range and have a normal blood pressure. The second area I applied fuzzy logic was for Hemoglobin Levels and Body Temperature. I took the first input for hemoglobin level between values 12 and 18, along with the second input of body temperature between 97 – 100. Both inputs after the fuzzifying/defuzzifying process will give a range from 109-118. A good output would be in the middle at 113.5. Note, going over or under and of these numbers is an automatic disqualification for the donor. This applies for both FAM’s.

Conclusion

- I feel like my approach to this project was successful. I was able to implement most of what I wanted to with the results I intended for.
- No unresolved issues found from my finished deliverable.
- If any input value is above or below the acceptable range of the matrix inputs, it results in an automatic disqualification for the donor.

APPENDIX A (installation guide)

- Step one: Download FuzzyCLIPS.zip from:
<http://athena.ecs.csus.edu/~gordonvs/180/180homework.html>
- Step two: Extract the downloaded file.
- Step three: Open the extracted file and go to the folder pc-prjct and then go to borland. From here, run the executable file CLIPSedt.exe. This will start your FuzzyCLIPS application.
- Step four: Once the application is running, go to the top right of the window and click on File, and then click on the Load Construct button. Choose the file that is named BloodDonor.clp (this file will be included with this) This will then load the code into fuzzyCLIPS.
- Step five: Now with the code loaded, go to the command line in CLIPS and type (reset).
- Step six: Next type (run). This will launch the code that has been loaded in.
- Step seven: To run the program again, type (reset) and the (run) to relaunch the code again.

APPENDIX B (user's guide)

- At the beginning, the questions will be “yes” or “no” type questions. These questions must be formatted correctly by using lower case letters and no spaces in the inputs. From these questions it will lead into some specific inputs that will be taken from patient measurements. These specific inputs involve Blood Pressure, Hemoglobin Levels, as well as Body Temperature. The input for these should be numbers. The numbers can involve decimal places. As for the output, this will be displayed as a number. To interpret this output number, a print statement will follow the data that specifies what that number means. If an input is not excepted, the program will stop. This means that the number was not in an acceptable range, therefore the potential donor is not allowed to proceed with their donation.

References

- My expert, Brian Hulsebus, is my Brother who is a Nurse for Blood Source. He has worked for Blood Source for almost 2 years now.
- The Donation Process. (n.d.). Community Blood Center of the Carolinas. Retrieved September 20, 2018. <http://www.cbcc.us/donate-blood/blood-donation-101/the-donation-process>