

Hong Kong Student Science Project Competition 2022

Extended Abstract (Invention Design Proposal)

(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: SCBC225

Project Title: D.A.W.P.M.2

Project Type: Invention Design Proposal

To our best knowledge and after thorough literature research, as at 30/06/2022, there are similar works. If there are, the reference links are as below:

https://www.mayoclinic.org/symptom-checker/select-symptom/~link.aspx?_id=A887237762DF46F1A65B1545D96464C9&_z=z
<https://symptoms.webmd.com/>

The enhancement our project has made for the existing related products or research is summarized as below:

Replace decision tree into a multi-phase percentage-sorting hybrid algorithm and integrate the data in a personalized health manager

I. Background

Shortages and retention crises in the therapeutic field have tremendously subsidized the availability of medical professionals on account of the intensive burden applied to them. Due to the extensive pressurized work stress, medicament experts have experienced prolonging burnout and exhaustion over the years, which encouraged resignation. Moreover, in some third world countries, a phenomenon arises in which there are insufficient hands of medical operators due to the benighted education environment and persisting poverty within the country. This causes false diagnosis to the patient which can worsen their condition.

During web-surfing for medical information and advice, some may encounter websites titled “Symptom Checkers” able to perform self-diagnosis via categorization based on the relativeness between symptoms and listed diseases. However, various reliable source of study has shown that the reliability of the diagnosis by these checkers were often poor, with only an average of 30% successful rate. This results in detrimental situations that patients decided not to seek medical assistance, ceasing the most optimum innings for receiving treatment.

In our project, we wish to replace the low accuracy diagnostic checkers by featuring a more complex diagnostic algorithm that can aid self-triage among users. On the other hand, data interpreted will be integrated as personalized medical data in our health management application, which are also able to store schedules and appointments.

II. Objective(s)

Thorough our application, we aim to create a reliable alternative substitute to deflect the immerse pressure to the medical department while also act to cease the ease for users to maintain their health.

III. Methodology

In order to test out the feasibility of the personalized health manager compartment, we may undergo a quantitative investigation to view the effects on medical adherence by the application. This involves three test groups of patients in a clinic, namely group A being reminded by the notifications from the application, group B being reminded by phone calls and Group C, serving as a control group without interference. By comparing group A and C, we can see the effects of application on attendance rate, while difference of group A and B allows a view on particularity of

the application. By using quantitative approach, the objectivity increases when less variables are involved

IV. Design of Invention

The algorithm hybrids the implementation of Fuzzy Logic plus RANSAC instead of usual checker-adapted decision tree. By using the Fuzzy Logic algorithm, approximate reasoning is achieved. As such, they provide toleration for false evaluation and uncertainty from the patient, while also providing comprehensible knowledge interpretation. The algorithm will consist of 3 collaborative formulations, namely the aspectual categorization stage, the homing stage and the ranking stage. In the first phase, questions relating to sensation and intensity of pain will generate a synergistic attribution value to determine which body system the disease takes place in. In the homing stage, specific questions regarding the location of pain, visible body changes will be asked to further deduce the specific organ affected. Finally, the last phase focuses on ranking the potential possibility of certain diseases through prompt response selection.

V. Application / Market Need

As there is an ongoing scarcity of manpower within the medical field, the idea of an advanced algorithm in order to partially brace the understaffed pressure applied towards the therapeutic workforce. The algorithm serves as a self-triage tool which can provide users with comparably more reliable results. As users becomes aware of their potential condition, they will be able to seek immediate medical advice when necessary, boosting their chance of recovery. As it is in digital format, the algorithmic software can be distributed online free of charge, made available to everyone with internet access, which corresponds to the principle of SDG 3, in which medical service should be made for everyone unconditionally to ensure good health and well-being. The personal health manager compartment, on the other hand, is not necessarily specialized for the users only, but also doctors and the medical department. The three features aim to prevent users from experiencing unintentional medical nonadherence due to forgetfulness, while also serve as a medium of information exchange between patients and medical departments, in which doctors can get to know the in-depth conditions of the patient with convenience

In terms of limitation, the algorithm itself is relatively arduous to implement without sufficient knowledge related to the field of computer engineering. The creation of such formulation will take a lot of effort which is beyond our ability to program. On the other hand, since the database embedded within the algorithm enriches itself through self learning experiences from usage, it will take plentiful attempts for trial-and-error developing a stabilized algorithmic system in order to produce reliable results. Sizeable server storages are required to retain information in the database, which could be expensive and unaffordable when the software is free of charge. Moreover, Although the algorithm seeks to maximize accuracy, it cannot guarantee full coverage of all existing diseases as not all known diseases have notable symptoms.

VI. Conclusion

In short, our proposed invention is an enhancement of previous medical checkers which aims to improve accuracy and reliability of algorithmic self-triage with a multiple staged, refined and more complex formulations accompanied by personalized management features. This all intents to contribute to the SDG3 plan, which ensures good health and well being to everyone.