

Classification of Medical Online Helpdesk Users

Solomiia Fedushko^[0000-0001-7548-5856], and Yuriy Syerov^[0000-0002-5293-4791]

Lviv Polytechnic National University, Lviv, Ukraine

`solomiia.s.fedushko@lpnu.ua`, `yurii.o.sierov@lpnu.ua`

Abstract. Medical online help desk is authoritative and popular service for the online communication concerning medical issues. In critical situations people often rely on online services to get medical-related information and answers. Because of the possible risks, it is highly important that they do not receive or use false information. That's the reason to filter false, unreliable or commercial information and discover forum-users that provide such information. On the other hand it would be positive thing to determine users that give competent and adequate advices. Such users' classification will help online community's administration to moderate community and will help users to get correct information. This method of classification of medical online help desk users was tested on medical online communities.

Keywords: Help Desk, Medical-Related Information, Medical Online Communities, Users' Classification, Medical Online Helpdesk.

1 Introduction

In critical situations people often rely on online services to get medical-related information and answers. Because of the possible risks, it is highly important that they do not receive or use false information. That's the reason to filter false, unreliable or commercial information and discover forum-users that provide such information. On the other hand it would be positive thing to determine users that give competent and adequate advices. 48% internet users trust the information that is posted in a web-community.

2 Research Aims

- develop the method of classification of medical online help desk users
- determine medical online helpdesk users that give competent and adequate advices
- method of classification of medical online help desk users tested on medical online communities

Copyright © 2019 for this paper by its authors. Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0) IREHI 2018 : 2nd IEEE International Rural and Elderly Health Informatics Conference

3 Classes of Medical Online Helpdesk Users

The membership of the users in one of the 5 classes: Patient, Professional, Disruptive, Medic, Critic, Reader.

Such users' classification will help medical online community's administration to moderate community and will help users to get correct information. This method of classification of medical online help desk users was tested on medical online communities.

The development of methods for behavioral classification of users of medical online helpdesk in the scheme is presented.

Modern research on social processes in the WWW covers the following areas are: users' needs satisfaction, communication systems and formation and management of medical online helpdesk.

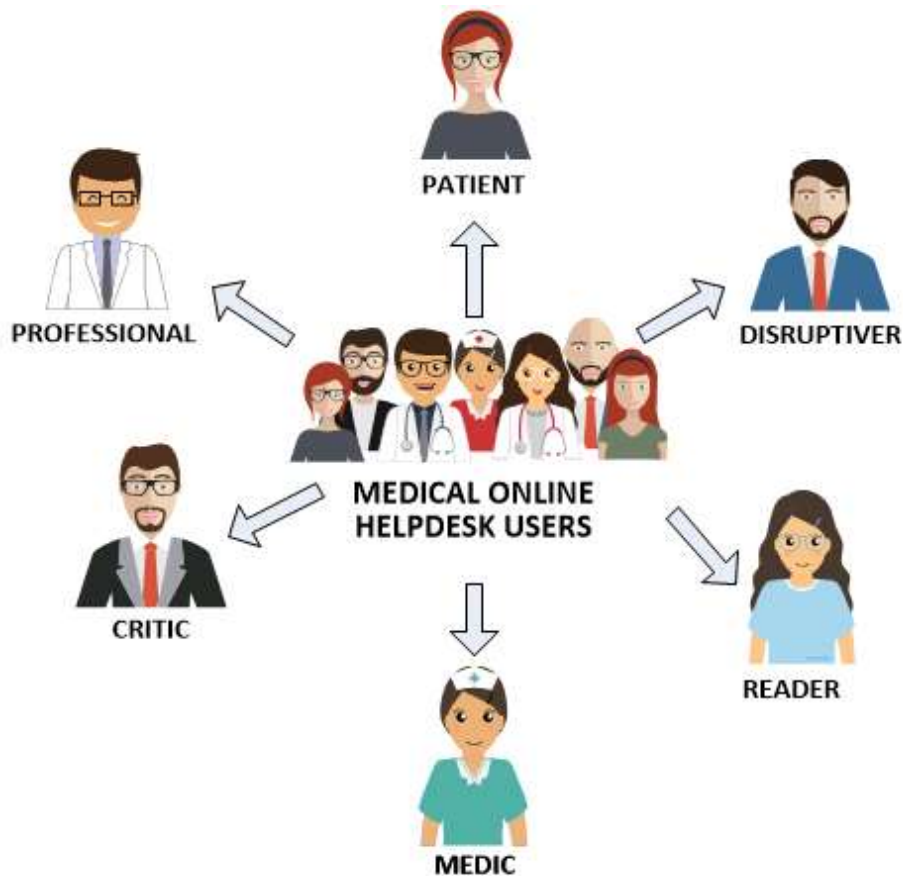
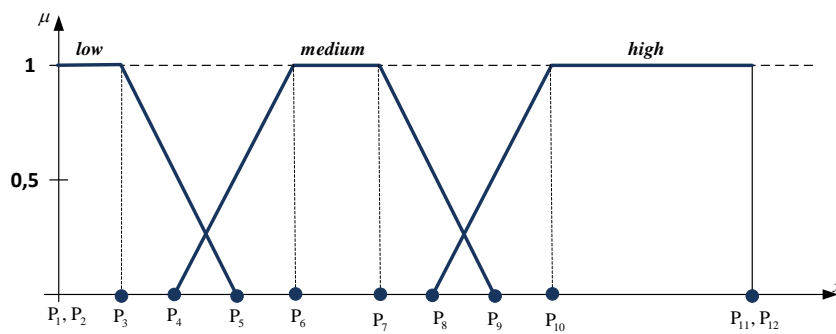


Fig. 1. Classes of Medical Online Helpdesk Users

4 Fuzzy Logic Approach

Data fusion techniques, namely fuzzy logic, are employed to process the captured data to increase the trust level of classification. Fuzzy logic has been used in applications that are amenable to conventional control algorithms on the basis of mathematical models of the system being controlled. However, fuzzy logic has a particular advantage in areas where precise mathematical description of the control process is impossible and is thus especially suited to support medical decision making. A fuzzy logic-based approach to the automatic classification of helpdesk users. Fuzzy logic plays an important role in some medicine areas is developed. For example:

- To predict the response to have treatment with citalopram in alcohol dependence;
- To analyze diabetic neuropathy;
- To detect early diabetic retinopathy;
- To improve decision-making in process



Point	P ₁	P ₂	P ₃	P ₅	P ₄	P ₆	P ₇	P ₉	P ₈	P ₁₀	P ₁₁	P ₁₂
Value	0	0	0,1	0,22	0,16	0,35	0,6	0,8	0,7	0,9	1	1
	low			medium				high				

Fig. 2. Fuzzy Logic Approach

	PATIENT	PROFESSIONAL	DISRUPTIVER	MEDIC	CRITIC	READER
ACTIVENESS	medium, high	medium, high	medium, high	low		low
PROFESSIONALISM	low, medium	medium, high	low	medium, high	low	low
AUTHORITATIVENESS		medium, high		high	low, medium	low, medium
REACTIVENESS	low, medium				medium, high	low
REPUTATIVENESS		medium, high	low	medium, high		

5 Rules for Classifying Medical Online Helpdesk Users

The membership of the users in one of the classes (Patient, Professional, Disruptive, Medic, Critic, Reader) based on its characteristics (Activity, Creativity, Attraction, Reactivity, Loyalty) is represented by production rules and table. It is important to determine the characteristics of medical online helpdesk users at the thematic level of the entire helpdesk.

1.	<i>If</i> $Activeness(User^{MedHD}) \in \{ "medium", "high" \}$ and $Professionalism(User^{MedHD}) \in \{ "low", "medium" \}$ and $Reactiveness(User^{MedHD}) \in \{ "low", "medium" \}$ <i>then</i> $User^{MedHD}$ - Patient.
2.	<i>If</i> $Activeness(User^{MedHD}) \in \{ "medium", "high" \}$ and $Professionalism(User^{MedHD}) \in \{ "medium", "high" \}$, and $Authoritativeness(User^{MedHD}) \in \{ "medium", "high" \}$ and $Reputativeness(User^{MedHD}) \in \{ "medium", "high" \}$, <i>then</i> $User^{MedHD}$ - Professional;
3.	<i>If</i> $Activeness(User^{MedHD}) \in \{ "medium", "high" \}$ and $Professionalism(User^{MedHD}) = "low"$ and $Reputativeness(User^{MedHD}) = "low"$, <i>then</i> $User^{MedHD}$ - Disruptive;
4.	<i>If</i> $Activeness(User^{MedHD}) = "low"$ and $Professionalism(User^{MedHD}) \in \{ "medium", "high" \}$ and $Authoritativeness(User^{MedHD}) \in \{ "medium", "high" \}$ and $Reputativeness(User^{MedHD}) \in \{ "medium", "high" \}$, <i>then</i> $User^{MedHD}$ - Medic;
5.	<i>If</i> $Professionalism(User^{MedHD}) = "low"$ and $Authoritativeness(User^{MedHD}) \in \{ "low", "high" \}$ and $Reputativeness(User^{MedHD}) \in \{ "low", "high" \}$, <i>then</i> $User^{MedHD}$ - Critic;
6.	<i>If</i> $Attractiveness(User^{MedHD}) = "low"$ and $Professionalism(User^{MedHD}) = "low"$ and $Authoritativeness(User^{MedHD}) \in \{ "low", "average" \}$ and $Reactiveness(User^{MedHD}) = "low"$, <i>then</i> $User^{MedHD}$ - Reader;

6 Algorithm of Classifying Medical Online Helpdesk Users

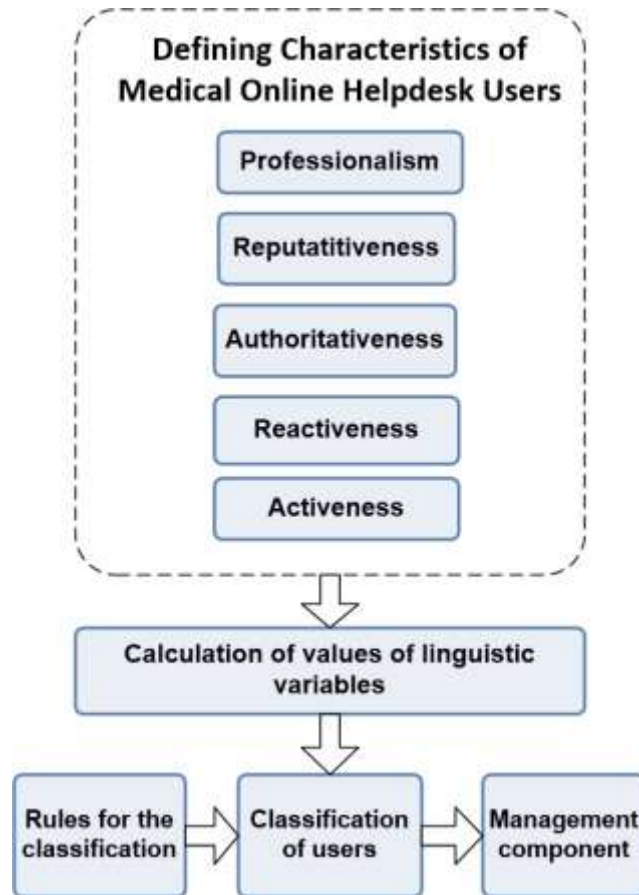


Fig. 3. Algorithm of Classifying Medical Online Helpdesk Users

7 Entity Relationship Diagram of Medical Online Helpdesk

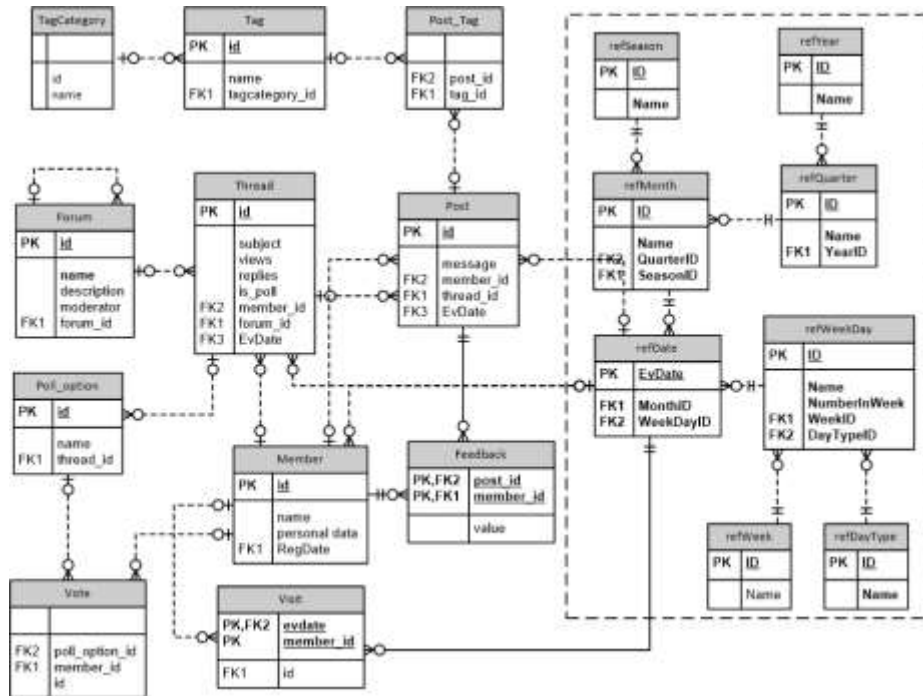


Fig. 4. Entity Relationship Diagram of Medical Online Helpdesk

8 Scheme of the Classifying Users in Medical Online Helpdesk

Available research methods are reduced to a fragmentary solution to the problem, they are theoretical and the results of these studies are mostly not tested in practice.

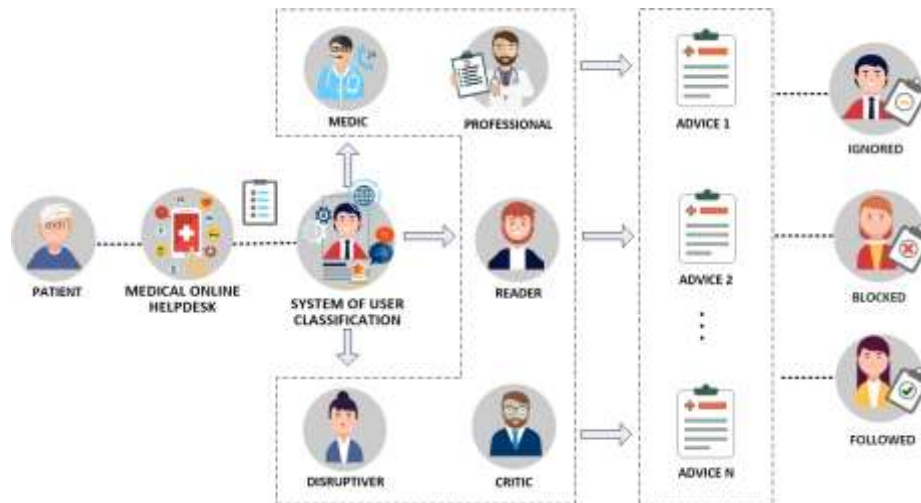


Fig. 5. Scheme of the Classifying Users in Medical Online Helpdesk

9 Results of Classification Medical Online Helpdesk Users

So, we set the main characteristics of the users within the entire helpdesk. Defining these characteristics allows users to classify the user of medical online helpdesk and based on this classification, build community management methods and algorithms to remove unwanted helpdesk users from the creators, which will ensure its improvement.

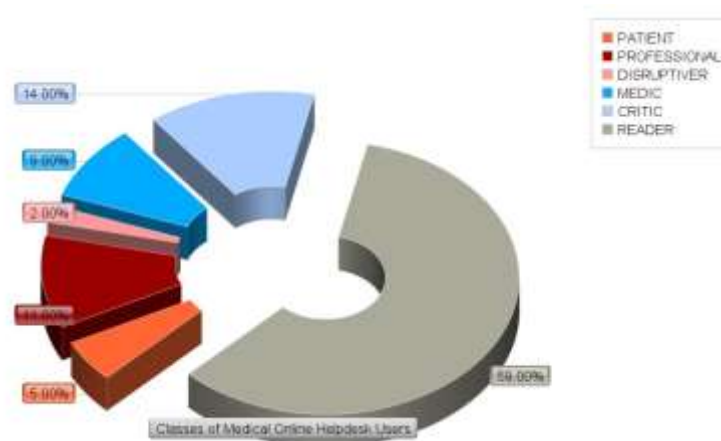


Fig. 6. Results of Classification Medical Online Helpdesk Users

The key idea of this study is modelling the behavior classification of users of medical online helpdesk by using fuzzy logic approach. Implantation of mathematical concepts based on fuzzy logic is a solution to complex problems in all areas of science as it method of human reasoning and decision making. The fuzzy logic approach is acceptable for the problems that required high accuracy.

Conclusion

Developed methods for determining the main characteristics of the users of the medical online helpdesk:

- professionalism;
- reputatitiveness;
- attractiveness;
- reactiveness;
- activeness.

The classes of users of medical online helpdesk are allocated and the rules of classification of users are formulated.

References

1. Fedushko S., Shakhovska N., Syerov Yu. Verifying the medical specialty from user profile of online community for health-related advices. CEUR Workshop Proceedings. Vol. 2255: Proceedings of the 1st International workshop on informatics & Data-driven medicine (IDDM 2018) Lviv, Ukraine, November 28–30, 2018. P. 301–310.
2. Fedushko S., Syerov Yu. Classification of Medical Online Helpdesk Users. IREHI 2018. <http://iee-rural-elderly-health.com/2018/wp-content/uploads/2018/12/IREHI-Programm-1.pdf>
3. Shakhovska, N., Vovk, O., Kryvenchuk, Y.: Uncertainty reduction in Big data catalogue for information product quality evaluation. Eastern European Journal of Enterprise Technologies, Volume 1, Issue 2-91, 12-20 (2018).
4. Vitek, C. R. R., Nicholson, W. T., Schultz, C., Caraballo, P.: Evaluation of the use of clinical decision support and online resources for pharmacogenomics education. Pharmacogenomics, 16(14), 1595-1603 (2015).
5. Qassas, M. A., & et al.: ArgMed: A Support System for Medical Decision Making Based on the Analysis of Clinical Discussions. Real-World Decision Support Systems. Integrated Series in Information Systems, vol 37. Springer, pp. 15–41 (2016).