Covid-19 Series: A rule-based decision support system for analysis behavior of people while working from home

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Abstract. COVID-19 makes the community must carry out activities such as school, work, and worship at home. However, the long-running activities from home make people experience boredom which can lead to stress. On the other side, the entertainment obtained by the public through smartphones by reading articles by their interests can reduce boredom. This paper proposed a rules-based decision support system to help the people to make choices of their activities from home while COVID-19 e rules-based approach for make an application decision support system. Ruled base used in application to selected process through characteristics following the interests of the community. This decision support system is implemented in mobile web applications. The system can display articles based on interests by questions or statements through the front end system. The results showed that most users of the application in a happy condition while working from home.

Keywords: Covid-19, rule base, decision support system

1. Introduction

Coronaviruses are non-segmented non-segmented RNA viruses that belong to the family Coronaviridae. It is widely distributed in humans and other mammals [1]. An outbreak of pneumonia caused by the coronavirus only occurred in Wuhan, at the risk of a continuing pandemic [2]. The most common symptoms at the onset of COVID-19 disease are fever, coughing, and fatigue, while other symptoms include phlegm production, headaches, hemoptysis, diarrhea, dyspnoea, and lymphopenia [3]. The rapid spread of COVID-19 led the government of Indonesia to implement a Large-Scale Social Restrictions (PSBB) policy. The PSBB policy is to establish community activities to study, worship, and work at home to minimize the spread of COVID-19. However, limited community activities can cause boredom which is feared can trigger stress. The emergence of stress is believed to trigger the decline in body...
immunity, stress is defined as a bad condition that disrupts the body's homeostasis and activates the adaptation response.

Among the many pathways and mediators involved, neuropeptide Y (NPY) is prominent because of its unique stress-relieving, anxiolytic and neuroprotective properties. Exposure to stress changes the NPY biosynthesis in different brain regions, the magnitude and direction of this effect varies with the duration and type of stress [4]. The decrease in body immunity caused by stress is also quite alarming because one way to avoid COVID-19 is to have a strong immune system. People need entertainment in anticipation of reducing the potential for stress. According to the search results from the hashtag #StayAtHome the community entertained themselves while at home with some interests such as: games, movies, music, and cooking. This way can minimize the potential stress that will arise.

However, if people only search for articles that fit their interests through Google, they will meet with other articles that don't even match their interests. So, the formulation of the problem that must be solved through this research is how to design an application decision support system based on rule-based to overcome boredom during #StayAtHome. It can be accessed through a mobile web application by the user and can display articles that are following the user's interest. A decision support system is an information system or application that supports a single decision-maker or group of decision-makers in making more effective decisions when dealing with unstructured or semi-structured problems. It can support decision-makers in ongoing decision situations or can prepare decision-makers to perform better in the future through decision training [5]. And, we used a rule-based system approach. A rule-based system that has traditionally been useful in energy efficiency, implementing energy management and control systems, even when newly divided by the smart network [6].

2. Related Work

There are some researches have published about rule-based approach. They are, including the research that using a rule-based system as decision support taken from existing records and relevant legal requirements [5], a system for evaluating the performance [7], smart attendance system [8], decision support for male migrant workers’ [9], research about an expert system for supporting the assessment of learning outcomes [10], and about determines the types of roads construction [11]. But, we use Forward Chaining because it is by the needs where the final results in the form of conclusions will be determined through the facts that have been collected.

Forward Chaining is a method with the reasoning that starts from the facts gathered to get conclusions from these facts. Forward chaining method is a search method that starts or starts with facts that are already known up to the IF part of the IF_THEN rule [10], [12], [13]. In the forward chaining method if there are facts that match the IF section, then the basic rules are executed or followed. When the ground rules are executed, new facts after that the section (THEN) will be added and each basic rule can only be run once.

In the model of the forward chaining rule [14], in the first step is to enter a series of facts data that are already known into working memory, and then obtain new facts based on rules whose premise matches the previously known facts [15], [16]. Forward Chaining Algorithm operation starts from combining known facts, then after matching them with facts that were previously made, if there are suitable facts that will emerge based on new facts that are known to match before. But, the method of forward chaining has simplicity and follows the requirements of rules or rules that are made, there are or conclusions based on data or facts that lead to conclusions [17].

The types of systems that can use the tracking forward chaining technique are, the system represented by one or more conditions, for each condition (the system looks for some rules in the knowledge base that correspond to the conditions in the if section), each rule can produce new conclusion conditions that are requested at that time, and all conditions added to the system for processing. If it encounters a
condition, the system will return to step each condition and look for some rules in the base knowledge back. If there are no new conclusions, this session is over [16]. Knowledge-based component in this research is similar to the approach in the other research using rule base [6], [8], [9], [17], [18].

The facts collected in this study are in the form of user-chosen interests. Users will be given a choice of what they are interested in, such as food, makeup, DIY, games, health, photography, film, skincare, sports. From the several choices, the things chosen by the user that will come out will be the conclusion. To analysis the interest knowledge, we search through the hashtag #DirumahAja using Google Trends. The results of the analysis state that games, movies, music, recipe and cooking are the most sought after by users. So, the authors conclude that these interests can be implemented in the application.

3. Proposed Modelling

3.1 Flowchart System

The flowchart system process has several stages, among others in determining the facts that we know before, then matching facts with IF rules that exist in the flowchart system process [19]. In our study, if there are facts that match the IF rules, then those rules will be executed. When the rules are executed, a new fact will emerge added and each rule can only be run once Figure 1.

![Flowchart System](image)

**Figure 1.** Display of COVID-19 Monitoring Application

3.2 Rule-based

Based on the data collection that has been determined as facts show that there are six categories of city nine categories of interest and eight feelings that can represent the user's feelings when they are at home during work from home. To develop the rule base, we use the data from the users who live in six cities. They are in Jakarta (C001), Bogor (C002), Depok (C003), Tangerang Raya (C004), South Tangerang (C005), and Bekasi (C006). We also use nine interest categories, food (I01), movie (I02), DIY (I03), health (I04), games (I05), skincare (I06), photography (I07), sport (I08), and makeup (I09). And seven feeling category, happy (F001), calm (F002), bored (F003), stress (F004), angry (F005), fear (F006), and worry (F007). Based on the criteria and facts about interest category and feeling category, we develop eight rule-based that shown in Table 1.
In Table 1, the rule-based decision support system to analyze people's behavior while they work from home during the Covid-19 period in this research has eight rules. This based rule will be a standard criterion or measure of the success of the application that will be made in this research. The rule is: the first can be interpreted if the user chooses the city where the user lives, this must be filled in because if the user does not fill in the message "user must fill in the city", then the user fills in how he feels, same as before the user must fill in his feelings to get to the next stage after that users fill in what their interests are and at least two interests that they must fill in and after the user chooses at least two interests will appear two category articles based on user interest, the user is free to choose which articles to read; in the second rule can be interpreted if the users choose Bogor city, calm feelings because in this application has seven categories of feelings then the user chooses three interest categories and the system will display three categories of articles based on user interests.

| No. | Rules                                                                 | Result                        |
|-----|-----------------------------------------------------------------------|-------------------------------|
| R1  | If C001 And F1 And I1 And I2 Then                                     | how 2 category of Article     |
| R2  | If C002 And F2 And I2 And I3 And I4 Then                               | how 3 category of Article     |
| R3  | If C003 And F3 And I1 And I2 And I3 And I4 then                        | how 4 category of article     |
| R4  | If C004 And F4 And I1 And I2 And I3 And I4 And I5 then                 | how 5 category of Article     |
| R5  | If C005 And F5 And I1 And I2 And I3 And I4 And I5 And I6 then          | how 6 category of article     |
| R6  | If C006 And F6 And I1 And I2 And I3 And I4 And I5 And I7 Then          | how 7 category of article     |
| R7  | If C003 And F7 And I1 And I2 And I3 And I4 And I5 And I7 And I8 then   | how 8 category of article     |
| R8  | If C001 And F002 And I1 And I2 And I3 And I4 And I5 And I7 And I8 And I9 then | how 9 category of article     |

The third rule can be interpreted if the user chooses Depok city, choose bored feeling and choose four interest categories and the system will display four categories; in the fourth rule can be interpreted if the user chooses Tangerang city, choose stress feeling and choose five interest category, the system will display five categories of article based on user interest; in the fifth rule can be interpreted if the user chooses Shout Tangerang city, choose angry feeling and choose six interest categories.

4. Result and Discussions

While working from Home during the Covid-19 pandemic, there are some interests that the author gained when searching for trends on Google, and found the following categories: Games, Films, Music, Recipe, and Cooking. The following are some examples of application views for analyzing the behavior of people during work from home based on interest divided into several categories of interest and the author also adds the user's home town from then how the current user feels shown in Figure 2. Based on the rules that have been made and defined above then implemented into a rule-based decision support system to analyze the behavior of people while undergoing the work from home during the covid-19. The screen input and output forms from applications are shown in Figure 3.

In the Figure 2 and 3, a decision support system flow starts with choosing (a) where the user lives and what the user feels at home, the user interface is very user friendly so that the user can easily understand what needs to be done, (b) then the user chooses the interest, where there is a picture according to the interest listed, so the user does not need to imagine what the movie interest looks like, and so on, (c) the picture c looks very clear when the user finishes selecting what their interests are, then the article page directly open and the results are based on only the interest the user has chosen, (d) in the picture d shows that when the user presses the save button on the article. Then, after the rules-base are implemented into
the application to analyze the behavior of people while undergoing work from home during the Covid-19 period created. And evaluate applications that are created and tested by distributing them to people affected by work from home and located in six cities in Indonesia.

In this research, we collect the data about interest from 224 users who used the application. Our study found that the interest of user are 24.1% chose food, 18.7% chose movie, 10.3% chose DIY, 9.3% chose health, 8.9% chose games, 8% chose skincare, 7.6% chose photography, 7.1% sport, and 5.8% chose makeup. So, it is declared that the behavior of people was obtained during the Covid-19 pandemic where the most widely chosen interest was food and media rankings were movie, and the third was DIY.

And the users who have used the application that developed of teal obtained their feelings were 49.2% chose happy, 20.6% chose calm, 25.4% chose bored, 4.8% chose stress, and none user chose anger, fear and worry. These results inform that people are more likely to feel calm and are followed by a sense of bored of the users in this application. It concludes that users feel fine and some still feel boredom.

5. Conclusion

In this paper, a rule-based decision support system has been developed for the Covid-19 Series application that based on the interest the user chooses. The application uses data collection methods to determine what interests the user will choose. Forms of application logic are explained through rule-based and then converted or implemented into the application system. Based on the results of testing, the decision support system in this research can be concluded that the system can be considered very good, because it has obtained the results of user analysis with the condition 49.2% chose happy, 20.6% chose calm, 25.4% chose bored, 4.8% chose stress. This research concluded that users in the application are partly fine feeling enjoy with work from home in pandemic Covid-19.

6. References

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