

## **SINGAPOREAN FLUE DETECTION WITH EXPERT SYSTEM IN SUPPORT BY JAVA JESS FRAME WORK**

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### **Abstract**

Singaporean Flue is a disease that attacks humans, therefore, an effort to improve people's health is how to cope with this disease, starting from prevention, health improvement, data collection and medication (curative). To widen people's knowledge about health, computer science is required to provide optimal, effective and efficient knowledge. The diagnosis of Singaporean Flue is still a problem now, because the etiology is still uncertain since the early symptoms are not typical, furthermore, it is difficult to distinguish between ordinary flue and Singaporean Flue. To help diagnosing the disease, in case of unavailable specialist, a computer-based system is needed that can provide an initial diagnosis based on symptoms of the disease. The system, which will be designed as a research, is expected to provide conclusions about the disease based on existing symptoms. One system that is widely used is a knowledge-based system. By using an Expert System that will be supported by Java Jess Frame work and forward chaining, a conclusion can be obtained. To strengthen the result, calculation is also done with the certainty factor method. Therefore, a final diagnosis is obtained..

**Keywords: Singaporean Flue, Disease, Expert System, Java Jess Frame**

### **1. INTRODUCTION**

An effort to improve people's health is how to cope with disease, starting from prevention health improvement, data collection and medication (curative). To widen people's knowledge about health, computer science is required to provide optimal, effective and efficient knowledge. The diagnosis of Singaporean Flue is still a problem now because the etiology is uncertain since the early symptoms are not typical furthermore, it is rather difficult to distinguish between ordinary flue and Singaporean flue. To help diagnosing the disease, in case of unavailable specialist, a computer based system is needed that can provide an initial diagnosis based on symptoms of the disease. The system, which will be designed as a research, is expected to provide conclusions about the disease based on existing symptoms. One system that it widely used is a knowledge based system.

KTM disease (foot, hand and mouth) is an infectious disease caused by the RNA virus that enters the family Picarno viridae (pico=small) genus enterovirus (non polio). Diseases that can be caused by this group of viruses include[1]. Based on the explanation above, a research about it is done to diagnose Singaporean Flue.

- 1) Problem Formulation, from the background above, the problems can be formulated as follows: a computer based system is needed to help diagnose Singaporean flue based on its symptoms, this system can be used if specialists who understand the disease are not available, knowledge based systems used to help diagnose the disease need to be developed.

- 2) The Problem is limited into the following things; knowledge is obtained based on expert's knowledge, in this case specialist doctors, as well as books concerning the disease, inference systematics applies forward chaining because it is used to determine the type of disease based on its symptoms., uncertainty method applies the certainty factor (CF) method, both in data and knowledge, and in its inference, beside determining the disease, this systems also provides medication action advice, users of this system are specialist doctors as knowledge engineers, and paramedics as knowledge users.

## 2. MATERIAL AND METHODS

The methodologies applied in this study are:

- a) Conducting a feasibility study: An activity to study documentation and theories of literature related to Singaporean Flue and Forward Chaining Method, Rete Algorithm, Certainty Factor (CF) method and Java JESS Framework from books, journals, papers and internet.
- b) Collecting materials and data: An activity to search and collect valid supporting data about Singaporean Flue and how to treat patients with the disease. The data is medical record data obtained by conducting interviews directly with Health Experts.

Forward Chaining is a search technique that starts with a known fact, then matches the facts with the IF part of the IF-THEN rules. If there are facts that match the IF section, then the rule is executed. If a rule is executed, a new fact (part THEN) is added to the database. Every time matching starts from the top rule. The matching process stops if there are no more rules that can be executed or conclusions have been obtained.

Jess is a rule-based engine and a programming language developed at Sandia National Laboratories at Liver more, California in the late 1990s, written in the Java programming language, making it an ideal tool for adding rule-based systems to systems Java based software [2].

Certainty Factor (CF) shows a measure of certainty about a fact or rule. Certainty Factor Notation [3] are as follows:  $CF [H, E] = MB [H, E] - MD [H, E]$

Where:

CF = Certain Factor in the H hypothesis that is influenced by fact E

MB = Measure of Belief (level of confidence), is a measure of increase in the confidence of hypothesis H influenced by fact E (between 0 and 1).

MD = Measure of Disbelief (level of uncertainty), is an increase of H hypothesis distrust influenced by fact E (between 0 and 1). E = Evidence (events or facts)

Incorporation of uncertainty data trust is used to level hypotheses in the order of importance [4] indicate a number of possible diseases, then diseases with example: If a patient has a certain salary the highest CF becomes first in the test sequence.

Singaporean Flue is known as hand, foot and mouth disease (HFMD) or if the term in Indonesian is known as foot, hand and mouth disease (KTM) is a disease caused by a virus with clear clinical signs mouth and lesions (specifically in the lower extremities). The most common cause is coxackievirus, part of the picorna viridae family [5]. KTM disease (feet, hands and mouth) is an infectious disease caused by RNA virus that enters the family Picarna Viridae (Pico=small) genus enterovirus (non polio). Disease that can be caused by this group of viruses include [6]:

1. Vesicular stomatitis dengan exanthem (KTM): Cox-16, EV 71 2)
2. Vesicular pharyngitis (Herpangina)- EV 70
3. Acute lymphonodular pharyngitis- Cox A-10

### 3. RESULT AND DISCUSSION

CODE	SYMPTOMS	CRITERIA	KTM		
			1	2	3
G001	It begins with high fever in 38.3 degrees Celsius for 2-3 days	Clinical	√	√	√
G002	Exathem (eruption on skin) dan enathem (eruption on oral mucosa)	Clinical	√	√	√
G003	Sore throat or pharingitis	Clinical	√	√	√
G004	Loss of appetite	Clinical	√	√	√
G005	Stuffy nose and other flue symptoms	Clinical	√	√	√
G006	Malaise.	Clinical	√	√	√
G007	Small red spots appear inside the mouth and inner cheeks, gums and tongue. Red spots are accompanied by blisters or sores/lesi	Clinical	√	√	√
G008	Papulo vesikel seems reddish but it is not itchy	Clinical		√	√
G009	Macula sizes 3-10mm.	Clinical		√	√
G010	Pain on lateral foot edge	Clinical		√	√
G011	Hiperpireksia; fever above 39 degrees Celcius	Clinical		√	√
G012	Prolong fever	Clinical		√	√
G013	Tachicardia (high speed heart pulse).	Clinical		√	√
G014	Tachipnea or apnea.	Clinical			√
G015	Loss of appetite, vomiting or diarrhea so it lacks flueid (dehydration)	Clinical			√
G016	Lethargi or severe weakness and unsteadiness	Clinical			√
G017	Pain on neck, arms and legs	Clinical			√
G018	Seizure.	Clinical			√

Table 1, which have been sought by Rete network and forward chaining produces a rule as in Table 2.

Table 2.  
Rules

Tingkat	No	Rule
KTM-1	1	<b>IF (G001 OR G002 OR G003 OR G004 OR G005 OR G006 OR G007) THEN KTM-1</b>
KTM-2	2	IF (G008 OR G009 OR G010 OR G011 OR G012 OR G013) THEN G2
	3	<b>IF (G2 AND KTM-1) THEN KTM-2</b>
KTM-3	4	IF (G014 OR G015 OR G016 OR G017 OR G018) THEN G3
	5	<b>IF (G3 AND KTM-2) THEN KTM-3</b>

The table below shows a process of making decisions based on the symptoms that have been set by the rule in table 2.

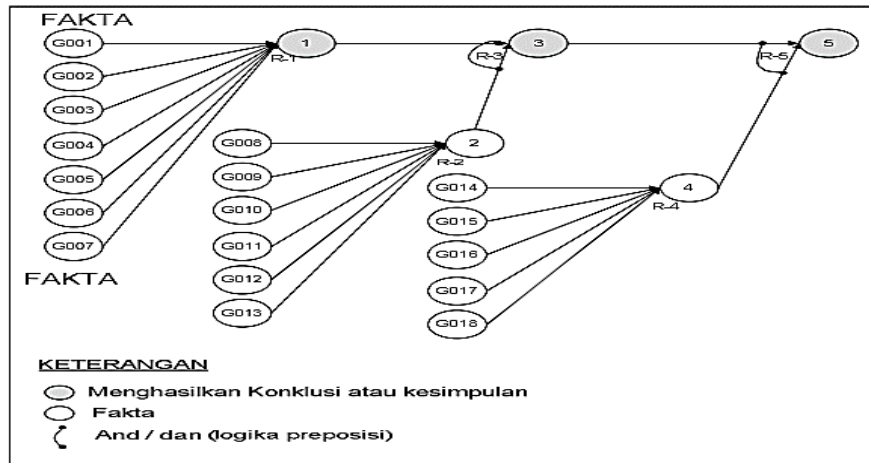


Figure 1. Decision Making Flow

Decision making flow from the Figure 1 above can be implemented using the source code from JESS available in Figure 2.

```
(deftemplate tmp1
(slot idgejala))

(defrule rule_01
(or(tmp1(idgejala "G001"))(tmp1(idgejala "G002"))(tmp1(idgejala "G003"))
(tmp1(idgejala "G004"))(tmp1(idgejala "G005"))(tmp1(idgejala "G006"))
(tmp1(idgejala "G007")))
=>
(assert(tmp1(idgejala "KTM-1"))))

(defrule rule_02
(or(tmp1(idgejala "G008"))(tmp1(idgejala "G009"))
(tmp1(idgejala "G010"))(tmp1(idgejala "G011"))(tmp1(idgejala "G012"))
(tmp1(idgejala "G013")))
=>
(assert(tmp1(idgejala "G2"))))

(defrule rule_03
(and(tmp1(idgejala "G2"))(tmp1(idgejala "KTM-1")))
)
=>
(assert(tmp1(idgejala "KTM-2"))))

(defrule rule_04
(or(tmp1(idgejala "G014"))(tmp1(idgejala "G015"))(tmp1(idgejala "G016"))
(tmp1(idgejala "G017"))(tmp1(idgejala "G018")))
)
=>
(assert(tmp1(idgejala "G3"))))

(defrule rule_05
(and(tmp1(idgejala "KTM-2"))(tmp1(idgejala "G3")))
)
=>
(assert(tmp1(idgejala "KTM-3"))))
```

Figure 2. JESS Source code

Thus, if some symptoms are inserted in the system, it will produce a decision that will be inferred by the system and the result is in the form of a conclusion whether the symptoms are included in the category of Singaporean flu or not. Result and testing of expert system

Pilihan Gejala	Hasil Seleksi Gejala	Gejala	Pilihan
G001	<input checked="" type="checkbox"/>	Diawali dengan demam dengan suhu 38,3 derajat Celcius dengan durasi 2-3 hari	<input checked="" type="checkbox"/>
G002	<input checked="" type="checkbox"/>	Exathem (erupsi pada kulit) dan enathem (erupsi pada mukosa oral)	<input checked="" type="checkbox"/>
G003	<input checked="" type="checkbox"/>	Nyeri pada saat menelan atau pharingitis	<input checked="" type="checkbox"/>
G004	<input checked="" type="checkbox"/>	Kehilangan nafsu makan/Tidak ada nafsu makan	<input checked="" type="checkbox"/>
G005	<input checked="" type="checkbox"/>	Pilek dan gejala seperti flu	<input checked="" type="checkbox"/>
G006	<input checked="" type="checkbox"/>	Malaise.	<input checked="" type="checkbox"/>
G008	<input type="checkbox"/>	Papulo vesikel tampak kemerahan dan tidak gatal pada kulit	<input type="checkbox"/>
G009	<input type="checkbox"/>	Macula berukuran 3-10mm.	<input type="checkbox"/>
G010	<input type="checkbox"/>	Nyeri pada pinggir Kaki Lateral	<input type="checkbox"/>
G011	<input type="checkbox"/>	Hiperpireksiasuhu lebih dari 39 Derajat Celcius	<input type="checkbox"/>
G012	<input type="checkbox"/>	Demam tidak turun-turun (prolong fever).	<input type="checkbox"/>
G013	<input type="checkbox"/>	Tachicardia (jantung berdenyut cepat).	<input type="checkbox"/>
G014	<input type="checkbox"/>	Tachipnea atau apnea.	<input type="checkbox"/>
G015	<input type="checkbox"/>	Nafsu makan hilang, muntah atau diare sehingga kekurangan cairan atau dehi...	<input type="checkbox"/>
G016	<input type="checkbox"/>	Lethargi atau lemah dan kesadaran menurun.	<input type="checkbox"/>
G017	<input type="checkbox"/>	Nyeri pada leher, lengan dan kaki.	<input type="checkbox"/>
G018	<input type="checkbox"/>	Kejang.	<input type="checkbox"/>

Figure 2. Diagnosis Processing

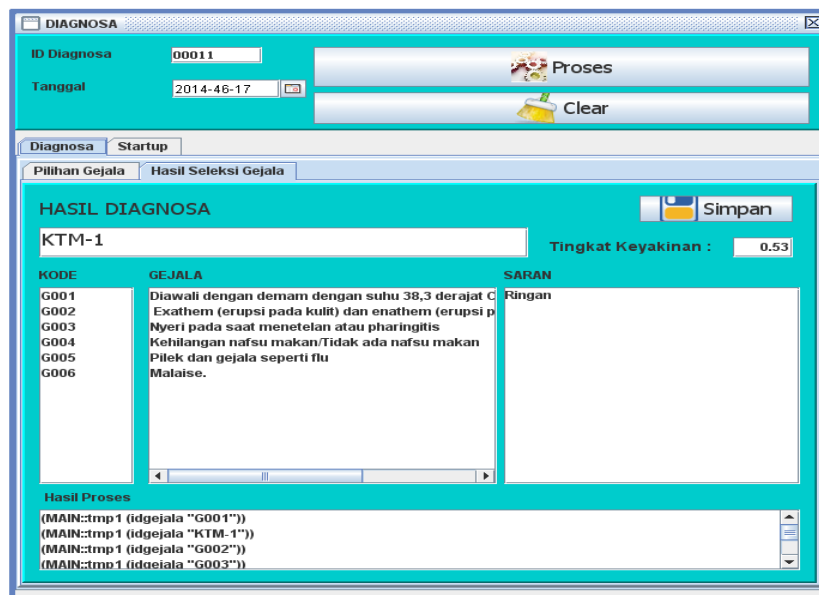


Figure 3. Diagnosis

#### 4. CONCLUSION

This research produces a system that can diagnose Singaporean Flue (KTM) with the following conclusions:

- 1) Expert systems with Forward Chaining and Certainty Factors by utilizing Java Jess Framework can be used to diagnose KTM disease and produce a level of validity based on the calculation of the Certainty Factor (CF). From several case tests, the same diagnosis results are obtained using the system and the manual calculation.
- 2) By implementing the KTM expert system, it generally can help people to know the symptoms and level of risk of Singaporean Flue before having an examination by a specialist/

#### 5. ACKNOWLEDGMENTS

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