

# Application logic in the Legal World

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**Abstract**—This paper will discuss one aspect of knowledge in discrete mathematics (discrete structures) that logic. Scientific logic is associated with the relationship between the statements of witnesses and suspects. It is very useful to prove the truth of the statements of witnesses or suspects in a legal case. This paper will be a lot of talk about the disclosure of the case of a suspected or accused of a statement he expressed. Both examine the statements of witnesses and other suspects as well as from the evidence available to obtain the actual data. Besides logic also be a basis for making a law or regulation for the truth of the principle of each individual in the community to form a law that will become a law in the society itself.

**Index Terms**— Logic, law, suspects, witnesses, statements, truth.

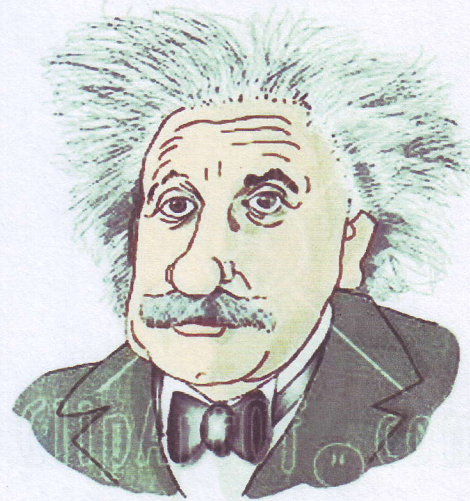
## I. INTRODUCTION

In the legal world, we often get a lot of case law that occurred. Both intentional and unintentional. Usually the suspects who exposed the case was evasive or lie if asked about the truth of what happened. Therefore we have to investigate the alleged statement was true or false. By matching the description of the suspect with existing evidence and testimony from witnesses.



However, witness testimony must test the truth, because it could have been a witness and become a suspect lying or giving false information about the incident. So the statements of witnesses should also be verified by using the principles of logic. Logic born of

Greek thinkers, and, most famously pioneered the science of logic is Aristotle in the fourth century (304-322 BC).



The word comes from the Greek logic is logos, which means that the results of consideration of the mind expressed through words and expressed in the language. That in everyday life we often hear people saying about the logic of the "illogical" that means no sense, and is therefore interpreted as the basics and methods of correct thinking.

Between logic and the law can not be separated, because the law is made based on the truth of thinking that underlie and rules in social life. In the absence of logic and truth there is no law. Instead the law requires logic and evidence to prove the truth and a witness statement in support of evidence and truth.

## II. THE THEORETICAL BASIS

1. **Conjunction:**  $p$  and  $q$   
Notation:  $p \wedge q$ ,
2. **Disjunction:**  $p$  or  $q$   
Notation:  $p \vee q$
3. **Negation** from  $p$ : not  $p$   
Notation:  $\sim p$
4. **Conditional proposition** (conditional or implication)
  - The proposition: "if  $p$ , then  $q$ "
  - Notation:  $p \rightarrow q$
  - Proposition  $p$  is called the hypothesis, antesenden, premise, or condition
  - Proposition  $q$  is called the conclusion (or consequent).

Compound proposition can be said to be a tautology if it is true for all cases. And conversely, would say if he was one of the contradictions in all cases.

The laws of logic

1. law of identity: $-p \vee \mathbf{F} \Leftrightarrow p$ $-p \wedge \mathbf{T} \Leftrightarrow p$	6. absorption law: $-p \vee (p \wedge q) \Leftrightarrow p$ $-p \wedge (p \vee q) \Leftrightarrow p$
2. Legal null / dominance: $-p \wedge \mathbf{F} \Leftrightarrow \mathbf{F}$ $-p \vee \mathbf{T} \Leftrightarrow \mathbf{T}$	7. commutative law: $-p \vee q \Leftrightarrow q \vee p$ $-p \wedge q \Leftrightarrow q \wedge p$
3. negation law: $-p \vee \sim p \Leftrightarrow \mathbf{T}$ $-p \wedge \sim p \Leftrightarrow \mathbf{F}$	8. associative law: $-p \vee (q \vee r) \Leftrightarrow (p \vee q) \vee r$ $-p \wedge (q \wedge r) \Leftrightarrow (p \wedge q) \wedge r$
4. law idempotent: $-p \vee p \Leftrightarrow p$ $-p \wedge p \Leftrightarrow p$	9. distributive Law: $-p \vee (q \wedge r) \Leftrightarrow (p \vee q) \wedge (p \vee r)$
5. Law involution (negation do uble): $-\sim(\sim p) \Leftrightarrow p$	10. De Morgan Law: $-\sim(p \wedge q) \Leftrightarrow \sim p \vee \sim q$ $-p \wedge (q \vee r) \Leftrightarrow (p \wedge q) \vee (p \wedge r)$ $-\sim(p \vee q) \Leftrightarrow \sim p \wedge \sim q$

1.  $\sim(p \wedge q) \equiv \sim p \vee \sim q$
2.  $\sim(p \vee q) \equiv \sim p \wedge \sim q$
3.  $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$
4.  $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$
5.  $p \rightarrow q \equiv p \vee \sim q$
6.  $\sim(p \rightarrow q) \equiv p \wedge \sim q$
7.  $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$   
 $\equiv (\sim p \vee q) \wedge (\sim q \vee p)$
8.  $\sim p \leftrightarrow q \equiv (p \wedge \sim q) \vee (q \wedge \sim p)$

Some of the arguments that have been proven valid:

1. Modus ponens

$p \rightarrow q$   
 $p$   
-----  
 $\therefore q$

2. Modus tollens

$p \rightarrow q$   
 $\sim q$   
-----  
 $\therefore \sim p$

3. disjunctive syllogism

$p \vee q$   
 $\sim p$   
-----  
 $\therefore q$

4. simplification

$p \wedge q$   
-----  
 $\therefore p$

5. addition

$p$   
-----  
 $\therefore p \vee q$

6. Conjunction

$p$   
 $q$   
-----  
 $\therefore p \wedge q$

In addition to these arguments, the validity of a statement can also be checked using a truth table. Where a statement or proposition is said to be valid if each column in a particular row contains all the correct values. So the statement is said to be valid.

In the legal world, we have found evidence to prove a case. In this case, the logic becomes a tool for analyzing arguments, namely the relationship between the conclusions and the evidence or the evidence is given (the premise). Evidence can be in the legal world can be transformed into a proposition that is then formed in a symbol in a mathematical formula such as p, q, r and others. Making it easier to find the truth in a case.

Of the symbols we will find a valid statement. By matching all the statements of witnesses and suspects with no evidence to obtain the truth of the incident.

example:

In the fingerprint evidence are a murderer. In other words, it is alleged killer. Proposition states that the killer was a suspect in the change into mathematical symbols such as P which states that "the suspect had killed his victim". And in the match with a witness in this case a witness stated that "the murderer kills his victims with a sharp weapon" which later changed his testimony in the mathematical formula q.

So based on the above theory, which has been proven valid argument the testimony of witnesses and the evidence was properly using the argument conjunctions. Where p is true and q is true, and the result is correct. So didapatlah a truth that the suspect has committed a crime indeed. It can also be done for evidence and other

witnesses. So it can prove the guilt of the suspect during the trial later.

### III. DISCUSSION

#### A. Checking statements and suspect statements

In the legal world, a description of a suspect is necessary for further investigation. Logic can also be used to reveal the truth of the statement or the statement of a defendant to an event. This can be done by making the statements alleged to be a proposition then the change in mathematical symbols. After a description of the suspect to be a proposition then sought further evidence.

Then the proof is a proposition that will be matched with a suspect statement. And to prove whether the statement is true or false suspects. For example, a suspect said that "I did not commit the murder, but my friend who did it".

Based on the description of the suspect, there should be follow-up we will do is examine her as a witness, and look for evidence of who is at fault. And look for evidence of the statement. Where is the statement of the accused is made into permisalan math by changing proposition "I did not kill" the symbol  $\sim p$  and "my friend who committed murder" with the symbol  $q$ . So the whole statement was obtained in mathematical symbols, namely  $\sim p \sqcap q$ .

And it turns out the police obtain evidence from witnesses that "I did not commit murder because I was out of the country". Later the police also suspect mandapatkan fingerprint evidence on a knife used for the murder, and then the police also confirmed that the witness out of the country when the murder occurred. Based on these data, we denote  $\sim q$  to the statement "I did not murder", and  $r$  for the statement "I was out of the country". Thus made the truth table:

Truth table

p	q	r	$\sim p \sqcap q$	$\sim q \sqcap r$
B	B	B	S	S
B	B	S	S	S
B	S	B	S	B
B	S	S	S	S
S	B	B	B	S
S	B	S	B	S
S	S	B	S	B
S	S	S	S	S

Based on information in the police and can be based on available evidence, it is to get anyone who could use the guilty truth table, by evidence that the witness out of the country when the incident witness statement true for  $\sim qr$ ,  $r$  and the statement is true. Given the evidence that the witness out of the country, the statement of one of the suspects so that the value of  $\sim pq$  wrong. By looking at the

values in the truth table is the value of  $\sim qr = B$  and  $r = B$  and  $\sim pq = S$ , the result is obtained that the suspect is worth the value of  $p$  and  $q$  false witness. So who made the mistake is suspect and witnesses testified that in fact, that the charges against the witness were canceled and impunity.

#### B. Checking statements and witness statements

Testimony of a witness is required to match the results of a statement by the suspect. Furthermore, we will look for evidence of witnesses relating to a statement from a suspect. Examples of information that the suspect claimed he was corrupt when his corruption, then further action is taken by calling as a witness the suspect friends. And information obtained from witness testimony that he was not corrupt but corruption suspects. A statement from the suspect was "my witness corruption if corruption" written as  $p \rightarrow q$  with  $p$  and  $q$  are witnesses of corruption is suspected of corruption.

Then the statement of the witness was "not corrupt but I suspect that corruption" is written to  $\sim p \sqcap q$ . From the statements of witnesses and suspects still can not be concluded due to still need more evidence to determine who is at fault. Then the Commission received evidence that the defendants had a 1 billion rupiah currency of witness evidence in the form of cash payments in the account. Based on these data is the truth table of events, namely:

Truth table

p	q	$p \rightarrow q$	$\sim p \sqcap q$
B	B	B	S
B	S	S	S
S	B	B	B
S	S	B	S

Based on the data obtained by the Commission, then the false witness statements and suspect statements true. And both are corrupt, so the conclusion is obtained that guilty suspects and witnesses. And the witnesses examined further to be a suspect. In other words, the science of logic can be applied in the legal world to obtain the truth.

#### C. Changing the evidence into a proposition

After police found evidence of a case, it will be used as material evidence to prosecute a suspect or defendant in court. This can be done by making the statements alleged to be a proposition then the change in mathematical symbols. After a description of the suspect to be a proposition then sought further evidence.

Then the proof is a proposition that will be matched

with a suspect statement. And to prove whether the statement is true or false suspects. For example, a suspect said that "I did not commit the murder, but my friend who did it".

Based on the description of the suspect, there should be follow-up we will do is examine her as a witness, and look for evidence of who is at fault. And look for evidence of the statement. Where is the statement of the accused is made into permisalan math by changing proposition "I did not kill" the symbol  $\sim p$  and "my friend who committed murder" with the symbol  $q$ . So the whole statement was obtained in mathematical symbols, namely  $\sim p \sqcap q$ .

Evidence such as fingerprints found on the knife belonged to the suspect. So the proof is in the science of logic can be changed to  $p$ . That stated tersangkatah murder. And so on with the other evidence that there are many propositions that have niali right and wrong. Then from all of these propositions, will be done case analysis associated with the words of witnesses and suspects of the events that occurred so as to obtain results using the truth tables truth.

#### D. Match the description of suspects, witnesses, and evidence

Once able to take the information from the statements of suspects, witnesses and look for evidence of an event, it will be easier if all the statements the suspect made a proposition, a proposition made witness statements and evidence at the Make the proposition that will strengthen or weaken keterangan suspects or witnesses later that then be in check with the truth table of a thing that has happened. Then after knowing the incident happened, and then we change the proposition symbols into a sentence pernyataan was right or wrong.n.

The principle of logic or the logic of science is very useful to know any statements or any evidence that could be made in one-on-one proposition is false and true. Making it easier to find the truth terjadi. Then, after changing everything into and then to turn it into a search and matching results need to be made truth table.

Case in point:

A suspect said that "I did not commit the murder, but my friend who did it".

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B	B	B	S	S
B	B	S	S	S
<b>B</b>	<b>S</b>	<b>B</b>	<b>S</b>	<b>B</b>
B	S	S	S	S
S	B	B	B	S
S	B	S	B	S
S	S	B	S	B
S	S	S	S	S

Based on information in the police and can be based on available evidence, it is to get anyone who could use the guilty truth table, by evidence that the witness out of the country when the incident witness statement true for  $\sim q$ ,  $r$  and the statement is true. Given the evidence that the witness out of the country, the statement of one of the suspects so that the value of  $\sim pq$  wrong. By looking at the values in the truth table is the value of  $\sim qr = B$  and  $r = B$  and  $\sim pq = S$ , the result is obtained that the suspect is worth the value of  $p$  and  $q$  false witness. So who made the mistake is suspect and witnesses testified that in fact, that the charges against the witness were canceled and impunity.

It is an example to match all of the statements of witnesses, suspects, and evidence available. So that we can also obtain the conclusion of the truth of what happened.E. Mengambil kesimpulan berdasarkan teori

#### V. CONCLUSION

From the above discussion we can draw some conclusions, which are:

1. Logic can be applied in the legal world.
2. Logic is able to prove the truth of the testimony of a defendant or of a witness.
3. Logic can solve problems that often occur in the legal world.
4. Logic was able to reach a difficult problem to overcome.
5. Logic can search for truth

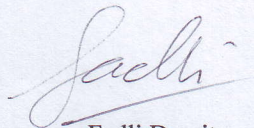
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## PERNYATAAN

Dengan ini saya menyatakan bahwa makalah yang saya tulis ini adalah tulisan saya sendiri, bukan saduran, atau terjemahan dari makalah orang lain, dan bukan plagiasi.

Bandung, 19 Desember 2012



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