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Application of the automated teller machine (ATM) card digit validation algorithm as a credit card fraud detection system

Khairul Muttaqin [a], ***Rudi Mulya*** [b]

[a]*Department of Informatics Engineering, Universitas Samudra, Jl. Prof. Dr. Syarief Thayeb, Langsa and 24415, Indonesia*

[b]*Department of Electrical Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Padang and 25131, Indonesia*

[1]Corresponding author: khairulmuttaqin@unsam.ac.id

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ABSTRACT

An Automated Teller Machine (ATM) card is a type of credit card that is a transaction tool, especially in trading. Payment activities can be done at various service providers because banks have multifunctional ATM cards. Payment transactions can be done through the internet today, but it can cause problems of crime in both the real world and the virtual world. To solve this problem, the ATM card number is designed to be verified first before the related bank verification number. The method is called the check method on a combination of numbers known as the check digit algorithm. This study uses the Luhn Algorithm to prove the validity of the ATM card used as a transaction. The goal is to find out the authenticity of the digit number of an ATM card and avoid fraud such as counterfeiting the digit number of an ATM card. Based on the tests conducted, it is concluded that the Luhn algorithm can be used as an effective input data validation technique. This is an initial check before users make transactions using ATM cards to avoid misuse and fraud of ATM card data by irresponsible parties.

ABSTRAK

Kartu *Automated Teller Machine* (ATM) merupakan salah satu jenis kartu kredit yang menjadi alat transaksi khususnya dalam perdagangan. Aktivitas pembayaran dapat dilakukan pada berbagai penyedia jasa layanan karena bank telah memultifungsikan kartu ATM. Transaksi pembayaran dapat dilakukan melalui internet saat ini, namun dapat menimbulkan masalah terjadinya kejahatan baik di dunia nyata maupun dunia maya. Untuk mengatasi masalah tersebut, nomor kartu ATM dirancang untuk diverifikasi terlebih dahulu sebelum nomor verifikasi bank terkait. Metode disebut metode cek pada kombinasi angka yang dikenal dengan algoritma cek digit. Penelitian ini menggunakan Algoritma Luhn untuk membuktikan keabsahan kartu ATM yang dipakai sebagai transaksi. Tujuannya adalah untuk mengetahui keaslian nomor digit dari sebuah kartu ATM dan menghindari penipuan seperti pemalsuan nomor digit dari sebuah kartu ATM. Berdasarkan pengujian yang dilakukan menyimpulkan bahwa Algoritma Luhn dapat digunakan sebagai sebuah teknik validasi data masukan yang efektif. Ini sebagai awal pengecekan sebelum pengguna melakukan transaksi menggunakan kartu ATM untuk menghindari penyalahgunaan dan penipuan data kartu ATM oleh pihak-pihak yang tidak bertanggung jawab.

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1. Introduction

The Automated Teller Machine (ATM) card is a type of credit card that is used as a transaction tool in trade. An ATM card is a card issued by a certain bank to its customers [1]. An ATM card is not mandatory for every customer, but when viewed from the point of view of the benefits, this card has provided many conveniences in accessing various bank facilities, for example with an ATM, customers can withdraw cash and perform various payment transactions or transfers at any time at several ATMs spread across Indonesia. Then the time required by customers who have ATMs is also fast and there is no need to queue in front of the teller.

The use of an ATM card provides several advantages to its customers [2], including first security, when we carry large amounts of cash, of course, there is a very big risk, for example, lost or a robbery occurs, then using an ATM card is safer because even though this card is lost, because of the digital signature

and or photos customer and the password on the ATM card, so that other people cannot make transactions with the card arbitrarily. Second, it is efficient, with just a plastic card the size of a telephone card, we can have funds of up to tens or even hundreds of millions of rupiah. Imagine hundreds of millions of cash that must be carried in a suitcase or bag, which of course is not practical. For people who do not have large savings, it is also not a problem, because banks lend ready-made funds. Third, avoid the risk of counterfeit money. This is the advantage of a credit card for shop owners or merchants. By accepting payments by credit cards, you can prevent counterfeit money that is always threatening and avoid receiving damaged, ugly, and even shabby money. The four helpers when unexpected, such as when we are traveling we have an accident and do not have enough money to fix it with the help of an ATM card, everything will be resolved.

The technology that is developing today, especially in the trade sector related to payment techniques using ATM cards, has been multifunctional by the bank, where customers can carry out payment activities in various supermarkets, supermarkets, shops, or service providers who accept payments using ATM cards [3]. The development of information and communication technology also has an impact on the existence of ATM cards. Currently, through the internet, payment transactions can be made with an ATM card, where as a result of this development there are also frequent crimes against the use of ATM cards, both in the real world and in cyberspace [4].

The process of payment transactions at supermarkets or on the internet using an ATM card involves a very necessary process, namely authentication, this is a process to prove that the credit card number entered is correct and the person who enters it is entitled to use the card [5]. It looks very simple, a program can directly connect to the bank's server and check immediately, but it must take a long time. What if the card number entered is wrong? All connections to bank servers, all data searches, etc. are of course worthless.

To solve the above problem, the ATM card number has been designed in such a way as to allow an initial check before the relevant bank will check the number. This check is a check digit combination commonly known as a check digit algorithm [6]. For this reason, the research conducted is to apply one of the check digit algorithms, namely the Luhn Algorithm to prove the validity of the ATM card used as a transaction (Luhn Check Digit Algorithm) [7]. This study aims to apply the Luhn Algorithm for checking ATM card digits which is useful for determining the authenticity of the digit number of an ATM card and avoiding crimes that occur on ATM cards such as forging digit numbers from an ATM card.

2. Methodology

2.1. Authentication

Authentication is a process to determine whether someone or something is by what it claims or what it states. There are 5 (five) methods in authentication [8]: 1) something the claimant knows, 2) something the claimant owns, 3) something the claimant is, 4) the claimant is at a particular place or at a particular time, and 5) authentication is established by a trusted third party. Authentication of a person's identity must be determined to ensure that the identity of the person or thing is true. This occurs when deciding whether to allow someone or something to do or get something. For example, in an ATM card transaction, the first thing that will be asked after the card is inserted is a PIN (Personal Identification Number), without an ATM card PIN it is useless, besides that the PIN is also combined with the user name and digit (code) of the ATM card which can be proven valid using Luhn Algorithm [9].

2.2. Luhn Algorithm

Luhn's algorithm is used to check the validity of a number based on the numbers that make up the number [10]. This algorithm is patented by Hans Peter Luhn [11]. An example of its implementation in daily life is the process of entering data on foodstuffs that we buy at small supermarkets (there are still using manual input, not using a barcode reader). Maybe sometimes we see the cashier enter the data incorrectly so that a little error message appears and then enters the item code listed on the item again. Have we ever wondered how computers judge digital errors? the answer is to use check digits, usually, the last digit of the item code is the result of a mathematical operation on the first few digits, so that if there is an input error it is immediately detected, for example, the item code is 76543234567 but what is entered is 76543234566 and the computer will assume this data is incorrect. Assuming that this check digit does not exist and that each item code is in sequence, the computer will assume that all entered data is correct.

The Luhn algorithm is used by all major banks that issue credit cards (Visa, MasterCard, Amex, Novus, and probably many other companies) [12]. This algorithm is also used on ATM cards, such as ATM cards of Bank BNI, BII, and other banks, as well as Telkom with TeCC (Telkom Calling Card). This check digit method requires 3 (three) steps to prove whether a card complies with the Luhn digit check algorithm, for cards with an even number of digits (eg Visa [16 digits], MasterCard [16 digits], and Novus [16 digits]) by as follows:

1. For each digit in an odd position (counting digits starting from the left with the far left is the 1st digit (D01, D02 … D16), multiply the value by 2 (two), if the result is more than 9, then the result is reduced by 9 (nine) Add up all the numbers that have been obtained.
2. For each digit in an even position, add up all the values and add the result with the result of step 1 (one).
3. If the result in step 2 (two) (the sum of the even digit values plus the result of the addition of step 1). If the result is divisible by 10 (ten), it means that the card number is valid.

For cards with an odd number of digits (eg VISA (13 digits), Amex (15 digits) the method is the same, only in step 1 (one) the digits are multiplied by even positions, and in step 2 (two) the digits are added up in odd position.

2.3. Analysis and Design

This research was conducted in six stages, firstly conducting a literature study related to credit cards, especially ATM cards such as knowing the number of digits of each credit card such as (VISA [16 digits], MasterCard [16 digits], Amex [15 digits], Novus [16 digits]), and maybe many others) and the differences in each ATM card as well as the analysis and formulation of the Luhn Algorithm for the problem of checking ATM card digits.

The second stage proceeds to the process of designing a check digit application. At this stage, the focus is on the overall design of the check digit application, starting with entering the digit number of the ATM card. In this process, the application will detect the input results, whether the input is a digit number or not. Then enter the validation process with the Luhn Algorithm which is carried out in three steps to prove whether a card meets the Luhn check digit Algorithm. The first step for a card with an even number of digits (16 digits) is:

1. For each digit in an odd position (calculation of digits starting from the left with the most left is the 1st digit), multiply the value by 2 (two), if the result is more than 9, then the result is reduced by 9 (Nine). Add up all the numbers that have been obtained.
2. For each digit in an even position, add up all the values and add the result with the result of step 1(one).

3. If the result in step 2 (two) (the sum of the even digit values plus the result of the addition of step 1). If the result is divisible by 10 (ten), it means that the card number is SAH (valid).

For cards with an odd number of digits (13 digits or 15 digits) the method is the same, only in step 1 (one), the digits are multiplied in the even positions, and in step 2 (two) the digits are added up are the odd positions. Next, is the process of checking whether the ATM card digit results are valid or not, if the validation results with the Luhn Algorithm are declared invalid, the application will provide a choice of the process of displaying the digit closest to the input digit number at the beginning. If the results of the Luhn Algorithm checking process are valid, then the application will display the results of the information that the ATM card digits are valid/valid as ATM cards.

The third stage is making a check digit application. Applications are made using web programming languages, namely HTML, PHP, and Javascripts, and display the application using a Cascading Style Sheet (CSS) display which can provide convenience in using the application. For the fourth stage, the implementation process is carried out on the web. In addition to the web, the fifth stage was also carried out, namely testing the validation feature and displaying the closest digit results. Finally, the sixth stage is the results and analysis of the test results. This research is focused on the process of testing the digits of the researcher's ATM card and checking with the Luhn Algorithm.

3. Results and Analysis

3.1. Implementation

At this stage, the testing process and implementation of the ATM card digit checking application are carried out. the implementation of the application is run on a local server using a web programming language and the user interface uses a Cascading Style Sheet (CSS) which makes it easy for users to run applications. The following is a display of the ATM card digit checking application as shown in Figure 1.

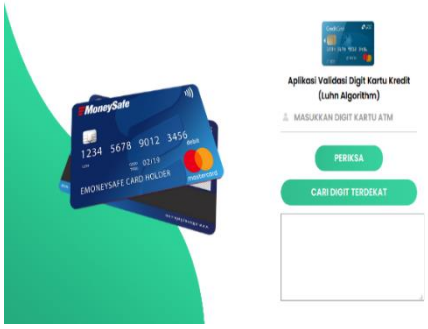


Figure 1. - ATM card digit checking application display.

In the ATM card digit checking application, there are two processes, namely the checking process which functions to check the inputted digits, and the process of finding the digit closest to the inputted digit. The input process in this ATM card digit checking application is equipped with input checking feature, if the inputted is letters or characters other than numbers, the application will display an error message which means the user must re-enter the digits. The input process in the application is shown in Figure 2.

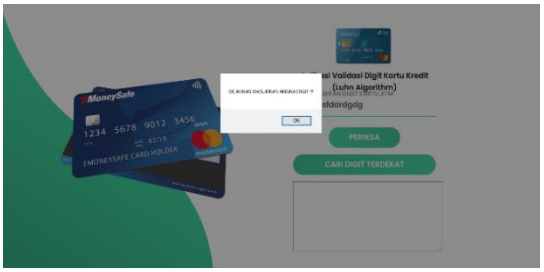
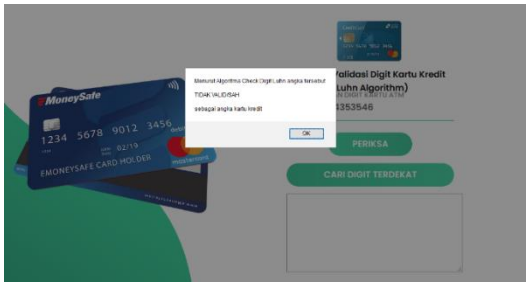


Figure 2. - The application display for the ATM card digit input process.

In the validation process or checking ATM card digits using the Luhn Algorithm, there are two output results, namely valid/ card digits, and invalid card digits as shown in Figure 3 (a) and (b).

a



b

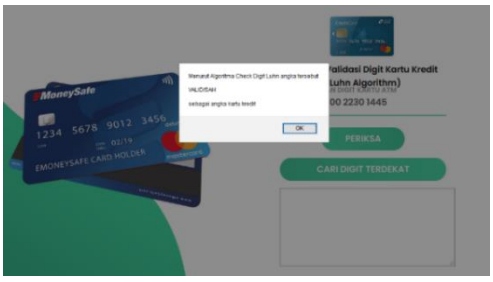


Figure 3. - a) ATM card validation notification (invalid); (b) Notification of ATM card digit validation (valid).

If the ATM card digit input is correct and valid, the application will display a validation notification in the form of a pop-up as information that the inputted digit is invalid Figure 3(a), whereas if the ATM digit entered is valid, the application will display a valid or valid validation notification. Figure 3(b). For the validation process of invalid or invalid ATM card digits, the application has a feature to display the nearest digit number from the invalid digit. The digits displayed in the nearest digit result are confirmed to be valid or valid as ATM card digits as shown in Figure 4.

Figure 2. - The application display for the ATM card digit input process.

3.2. Luhn Algorithm Validation Analysis

At this stage of testing, the analysis of the results of checking the ATM card digits is carried out using the Luhn Algorithm. The testing process was carried out on the researcher's ATM card with a BRI ATM card digit number in the name of Khairul Muttaqin (researcher) with card number: 5221 8400 2230 1445 Tests are carried out on these digits. Here are the steps:

- Step 1
  Multiply all odd digits by 2 (two) if the result is more than 9 (nine), then the result is reduced by 9 (nine) then add up in total
  D01 = 5 D09 = 2
  D03 = 2 D11 = 3
  D05 = 8 D13 = 1
  D07 = 0 D15 = 4
  If the operation is 2 (two) times and the result is greater than 9 (nine), then subtract 9 (nine), then we get:
  D01 = 5 x 2 = 10 because more than 9 then subtract 9 => 10 – 9 = 1
  D03 = 2 x 2 = 4
  D05 = 8 x 2 = 16 because more than 9 then minus 9=> 16 – 9 = 7
  D07 = 0 x 2 = 0
  D09 = 2 x 2 = 4
  D11 = 3 x 2 = 6
  D13 = 1x 2 = 2
  D15 = 4 x 2 = 8
  Sum D01 + D03 + D05 + D07 + D09 + D11 + D13 + D15 = 1 + 4 + 7 + 0 + 4 + 6 + 2 + 8 = 32
- Step 2
  Add up all digits in even positions.
  D02 = 2
  D04 = 1
  D06 = 4
  D08 = 0
  D10 = 2
  D12 = 0
  D14 = 4
  D16 = 5
  Sum D02 + D04 + D06 + D08 + D10 + D12 + D14 + D16 = 2 + 1 + 4 + 0 + 2 + 0 + 4 + 5 = 18
  Number of Steps 2 (two) + Number of Steps 1 (one) = 18 + 32 = 50
- Step 3
  The result of adding steps 2 (two) + step 1 (one) is divided by 10.
  divided by 10 => the result is divisible by 10. Then the ATM card in the name of Khairul Muttaqin (researcher) is Valid or SAH as an ATM card.

4. Conclusion

Based on the tests carried out, the implementation of the Luhn Algorithm for checking ATM card digits is an effective input data validation technique. The ATM card digit checking system using the Luhn algorithm has successfully displayed the results of the check digit validation of the credit card sample used. Overall, this system can be said to have been successfully implemented and used as a validation test application for checking ATM card digits as an initial check before users make transactions using an ATM card to avoid crimes (cybercrime) such as misuse and fraud of ATM card data by parties who do not responsible.

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