www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)
Budapest Institute

A New Design Protoype of Safety System on Traffic Light using Hydraulic Limiters Zebra Cross Automatic

Rahmad Rizki[1], Suwarno[2]
[1,2]*Universitas Muhammadiyah Sumatera Utara, Indonesia*

Abstract

Medan city is the third largest metropolitan city in Indonesia. Problems that occur in big cities, especially in the city of Medan itself, include the level of congestion and the level of violations of traffic signs which are quite high and the constraints of emergency vehicles on duty such as ambulances, fire engines and other emergency vehicles, especially on traffic lights. This paper described Emergency vehicles that will build a Security System Using Barriers on Zebra Crosses, especially in Microcontroller-Based Traffic Light. This system uses the RFID component RC522 as an emergency vehicle detector photodiode and laser diode as vehicle detection components above the zebra cross so that the barrier does not damage the vehicle. Servo motor as a barrier gate drive and Arduino Uno R3 as a component where each input command is received to be processed. Where if the emergency vehicle is passing through a traffic light with a red light, then the light will turn green. With this system, the emergency vehicle on duty is not late to its destination and the driver cannot break through the road divider when the red light is on and does not disturb pedestrians. feet to cross The application of the system is designed to be connected directly to Arduino so that the input signal can be processed and can produce the expected output on the performance of the system, namely the servo motor, and 6 LEDs on the traffic light 2 intersections.

Keywords
traffic lights; zebra cross; laser diode; hydraulic; microcontroller

I. Introduction

Medan city is the third largest metropolitan city in Indonesia, and in general, on average, everyone uses a vehicle to travel and carry out daily activities (Lubis et al., 2019). Problems that often occur in big cities, especially in Medan City itself, include the level of congestion and the high level of traffic sign violations, especially at traffic lights or often called red lights, where in fact there are still many road users who lack awareness and cross the line. barrier so that it interferes with the comfort of pedestrians who want to cross at the zebra cross and can also cause traffic accidents due to lack of compliance with traffic regulations (Xin et al., 2020). To overcome this problem. The benefit of the technology in question is to create an automatic zebra cross safety system on traffic lights using a hydraulic barrier. This system is designed using RFID modules, laser diodes, and photo diodes which are system inputs that send input signals to be processed by Arduino (Furqan, 2018).

The existence of the government is closely related to the function of public service. Progress in the field of technology and information is one of the challenges for the government in providing more effective, efficient and accountable services (Karyono and Agustina, 2019). The development of electronic technology has developed very rapidly and is not something foreign again, humans need help from something that works fast,

precise, thorough and tireless. Technological advances in the field of electronics will be able to answer the problems - even complex problems, with very high accuracy, speed and accuracy. Train as a means of mass transportation that has a large carrying capacity at once road, using a special path. But not infrequently we hear of train accidents fire at the railroad crossing. Which causes fatalities. Various factors that be the cause of this, one of which is the absence of a crossing gate or failure the latch closes when needed, due to operator failure to close the crossing (human error).

Therefore, it is necessary to develop an automatic control technology that can reduce the rate of accidents that occur and reduce dependence on humans (operator). The system works based on time and commands that have been programmed by an arduino uno microcontroller to control all sensors that have been installed so that they can run properly (Yusmartato et al., 2018). This system is later expected to be able to help overcome the problems above and can also be expected to be a solution in solving problems, working efficiently and effectively (Aryza et al., 2018).

Traffic lights are lights that control traffic flow installed at crossroads, pedestrian crossings (zebra crosses) and other places of traffic flow.Benefits derived from the use of the traffic light is for reduce conflict points of potential accidents and reduce delays by regulating past movement cross [1]. Currently, there are still many installations of ic light traffic using non-renewable energy sources. Even though these energy sources are considered unfriendly to the environment and is not readily available continuously and in time the energy source will exhausted. The price of this source of electrical energy is also increasing soar high from time to time along increasing human population. For this reason, it is necessary to have a source of electrical energy that can be used without using a power source non-renewable energy. Solar cells are a source of proper electricity as a source of energy in light ic traffic. Because on the highway is a good place and appropriate as receiving sunlight or ordinary energy

This is called the photovoltaic process. Where is the energy of light the sun will be converted into a source of electrical energy. Solar cells are a renewable energy source that Environmentally friendly and low maintenance costs. In addition, solar cells do not produce noise. Until cell Solar energy can be used as an alternative source of electricity for IC traffic light. The ability of solar panels to generate power highly dependent on changes in light intensity received by solar cells. There are many methods to maximize the use of solar panels, but there is a series electronics that can maximize solar panels that is a converter circuit [2]. From the problems above, it can be made a the concept of ic light traffic which is implemented in junction with a photovoltaic energy source. Based on this background, the title is made Battery Charging System Using Boost Converter and Photovoltaic in Light Traffic.

Data were analyzed using the descriptive analysis method, with the main objective being to explain phenomena and insights from problems that arise in the object of research. The results of this descriptive analysis will be the main information in the preparation of network optimization related to urban traffic congestion control, both in the form of mathematical models and analytical models. Based on the resulting optimization theoretical model, the analysis and system design steps are carried out. The system development method used is a prototype. According to Raymond McLeod (2001), a prototype is defined as a tool that provides ideas for makers and potential users about how the system functions in its complete form, resulting in prototyping. a and prototyping process Prototyping is to be called a simple software modeling process that allows the user to have a basic overview of the program as well as perform initial testing. Prototyping provides facilities for developers and users to interact with each other during the

manufacturing process so that developers can easily model the software to be made. Prototyping is one of the most widely used software development methods. The processes contained in the Prototype method are as follows: 1) Gathering requirements: developers and clients meet and determine common goals, known needs, and subsequent descriptions. will be needed 2) Design: the design is done quickly and the design represents all known aspects of the software, and this design forms the basis for prototyping. 3) Prototype Evaluation: the client evaluates the prototype created and used to clarify software requirements. To model software, the prototyping method has been staged in the development process. These stages determine the success of software. Software developers must pay attention to the stages in the prototyping method so that the final software can be accepted by the user.

II. Research Methods

2.1 Block Diagram Prototype

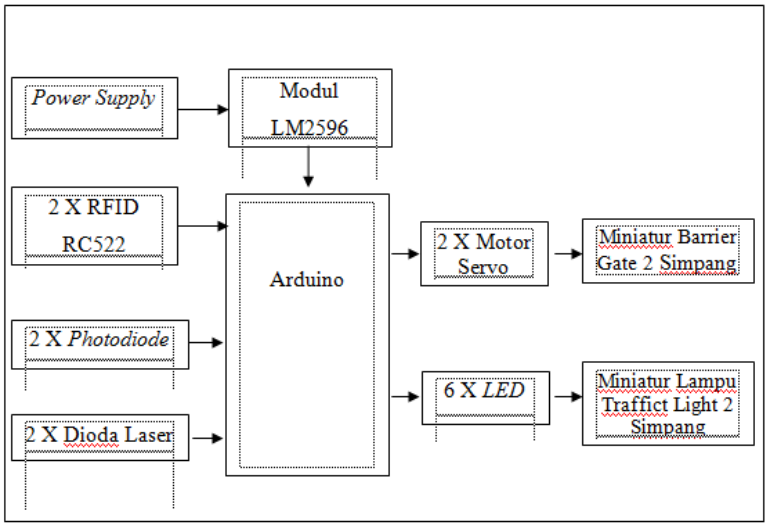

Figure 1. *Block Diagram*

According to Wiyancoko (2010: 120): A prototype is an original type, form, or example of something other than something that serves as an example, basis, or standard for things of that category same. The most representative prototype examples combine attributes from a category. A prototype is also a typical example of a category functioning as a yardstick against something in its surroundings. In many fields, there is great uncertainty as to whether the new design will do what you want.

A prototype is often used as part of the product design process to allows designers to have the ability to explore design alternatives, theory, and performance tests confirm before starting production of a new product.

2.2 Control System

A Control system is a process of regulating or controlling one or more quantities (variable, parameter) so that it is at a price or in a price summary (range) certain. Another term for control systems or control techniques is regulatory engineering, system control, or control system.

In general, there are four aspects related to the control system, namely input, outputs, systems, and processes. Input (input) is an external stimulus that is applied to a control

system to obtain certain responses from the regulatory system. The output is the actual response obtained from a control system. This response can be the same as input or may also not be the same as the response to the input.

Data were collected through field observations and interviews with experts. Observation is a method of collecting data through direct observation or careful and direct observation in the field or research location. In this case, researchers based on their research design need to visit the research location to directly observe various things or conditions that exist in the field. The discovery of science always begins with observation and returns to observation to prove the truth of the science.

While the interview is an important part to obtain information about the experience of the participants. Interviewers can influence the level of depth of information about a topic. Interviews were used as a follow-up to the respondents to investigate their responses. Preliminary data will be collected to describe factors relevant to congestion problems that occur in the traffic network. The primary data of the research are the number of vehicles that pass on the highway, the capacity of the road, and the traffic light setting model. In addition to observations and interviews, researchers will also conduct a study of literature and other secondary data, especially at the Department of Transportation and Communication and Information Technology of North Sumatra.

2.3 Entire Circuit

The circuit that becomes the system is a combination of several automatic clothesline safety system programs designed on the Arduino, the sensors installed on the Arduino will work on their respective functions and can work as planned. Circuit The whole system can be seen in Figure 2.

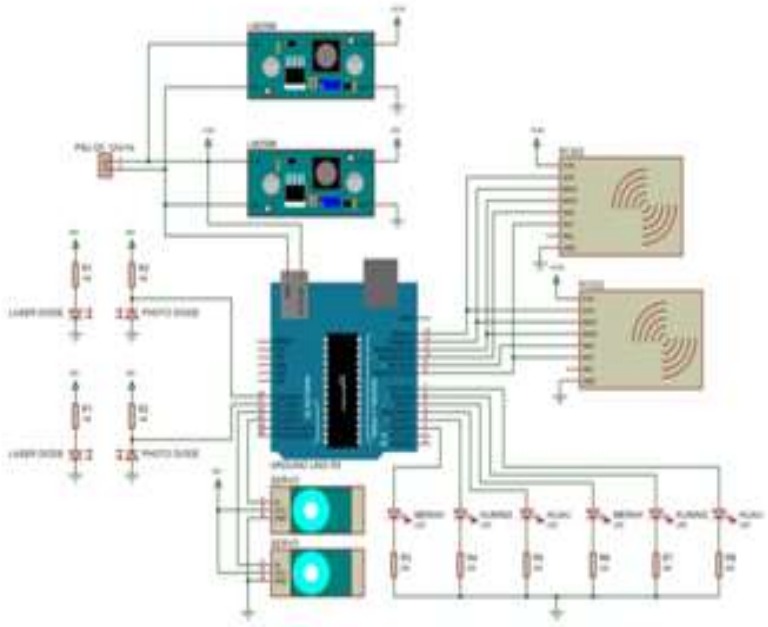

Figure 2. *Overall Circuit*

2.4 Final Result of Design

The final result of this design is a physical form of a prototype system or tool that is made which will later be used as a container or place for installing the components used.

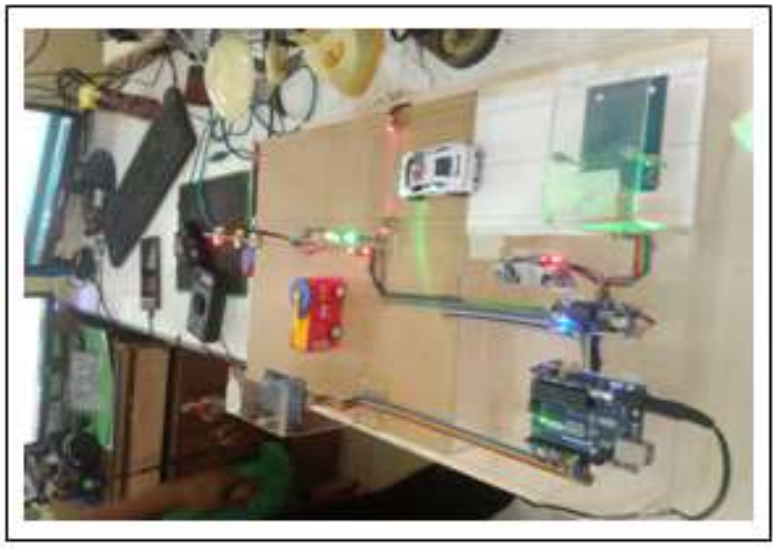

Figure 3. *Tool Position View From Above*

2.5 Hardware Design

This prototype uses three sensors mounted on the edge of the railroad tracks. Sensor the main thing is the sound sensor will detect the sound generated from the train siren, the second sensor is an infrared sensor that will detect a passing train, where this sensor is enabled as a backup of the sound sensor and the third sensor if the train has crossed the doorstep automatically whole.

The working principle of the sound sensor is when it receives input in the form of frequency in dB then the filter circuit will be active to pass the frequency. While the sound sensor will value 1 or high when there is a barrier and a value of 0 or low when there is no barrier or pu otherwise will be worth 1 when there are no obstacles and 0 when there are obstacles.

The microcontroller functions as a controller of this tool which will receive and process data inputs and outputs. The data sent from the first sensor will be processed by the microcontroller to turn on the red traffic light indicator and the servo motor will close the latch. If the sensor first sensor fails, the second sensor will function the same as the first sensor.

Sensor The third will activate if the train has passed through the doorstop completely, where this sensor is set in a biased manner, meaning that when there are no obstacles, the doorstop will open and will send data to the microcontroller to turn on the green traffic light indicator

III. Results and Discussion

3.1 Power Suplay Regulator Circuit Testing LM2596

An example of testing the power supply to ensure the power supply is in good condition, testing is required. The test was carried out using a volt meter measuring instrument with a scale of 20 volts dc. The black probe on the measuring instrument is connected to ground and the red probe directly to the pin to be measured or the positive pin. The following below is a picture of the power supply test can be seen in Figure 4.

Figure 4*. Power Supply Test*

Table 1. Power Supply Test

Nama Komponen	Volt Meter	PIN	V-Out
Power Supply	*Probe* Hitam	GND	12,09 Volt
	Probe Merah	VCC	20 Volt

3.2 LM2596 . Regulator Circuit Testing

Tests on the regulator are carried out on the two components of the regulator used, namely regulator 1 and regulator 2. The following is a discussion of the testing of regulator components.

a. Regulatory Circuit Test 1

The following test is a form of testing the components of the LM2596 regulator circuit. After testing by measuring the voltage, it was found that all the pins used were functioning and running. In testing the LM2596 regulator circuit, the input regulator 1 test and the regulator 1 output test were carried out. You can see the picture of the LM2596 regulator circuit test in Figure 5.

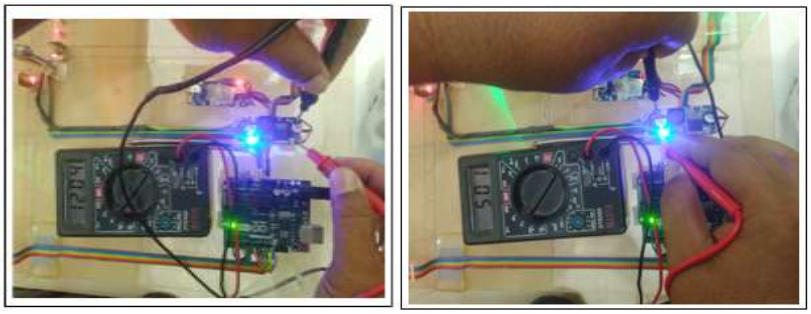

Figure 5. *LM2596 Regulator Input Test and output test (1)*

The picture above is a test of the input voltage regulator LM2596 (1) by displaying the input voltage result of 12.04 volts. The following below also displays an image of the LM2596 regulator output voltage test in Figure 5.

Table 2. Regulatory Testing 1 LM2596

Nama Komponen	*Input* Tegangan	*Output* Tegangan
Regulator LM2596	12,04 volt	5.01 volt

The picture above is a test of the output voltage regulator LM2596 (1) by displaying the output voltage of 5.01 volts. By displaying the test image above, it can be concluded that the input output regulator LM2596 (1) runs as desired.

b. Test 2. Regulator Circuit

The following test is a form of testing the components of the LM2596 regulator circuit. After testing by measuring the voltage, it was found that all the pins used were functioning and running. In testing the LM2596 regulator circuit, the input regulator 2 test and the output regulator 2 test were carried out. It can be seen in the LM25 regulator circuit test picture in Figure 6.

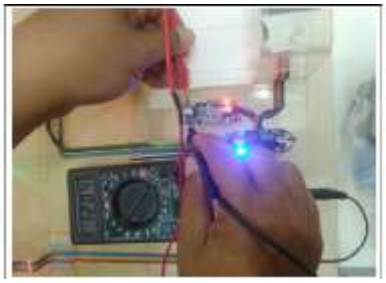

Figure 6. *LM2596 Regulator Input Test (2)*

The picture above is a test of the input voltage regulator LM2596 (2) by displaying the results of the input voltage of 12.04 volts. The following below also displays a picture of the LM2596 regulator output voltage test in Figure 7.

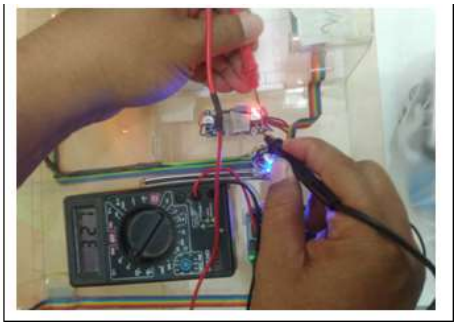

Figure 7. *LM2596 Regulator Output Testing (2)*

3.3 RC522 RFID Circuit Testing

In this test is a form of testing the program embedded in the RFID RC522 component. After testing. The test image on the RC522 RFID circuit can be seen in Figure 8.

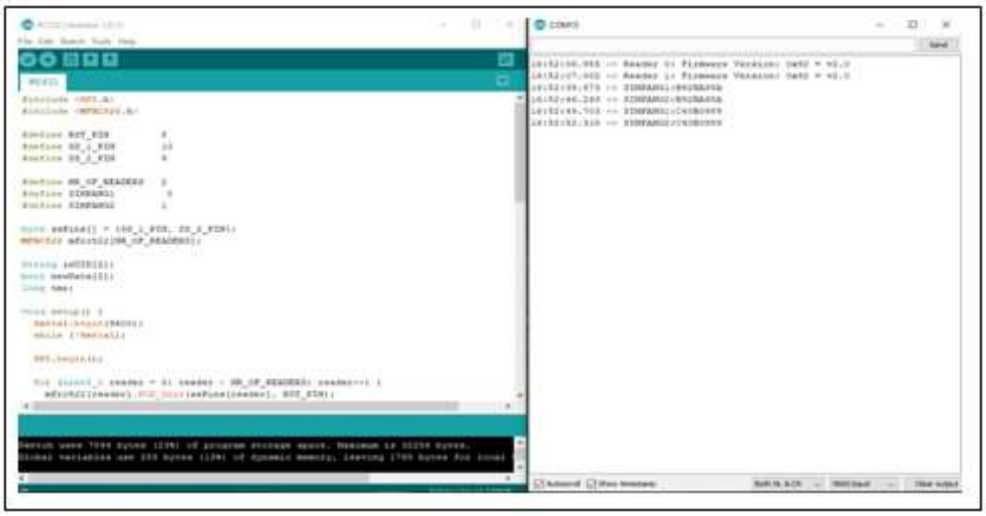

Figure 8. *Testing Program Running RC522 RFID Circuit*

3.4 Hydraulic Test (Barrier) Intersection

The test is carried out when the barrier conditions rise and fall. The following below is a picture of the display of the barrier test on the system which can be seen in Figures 9 and 10.

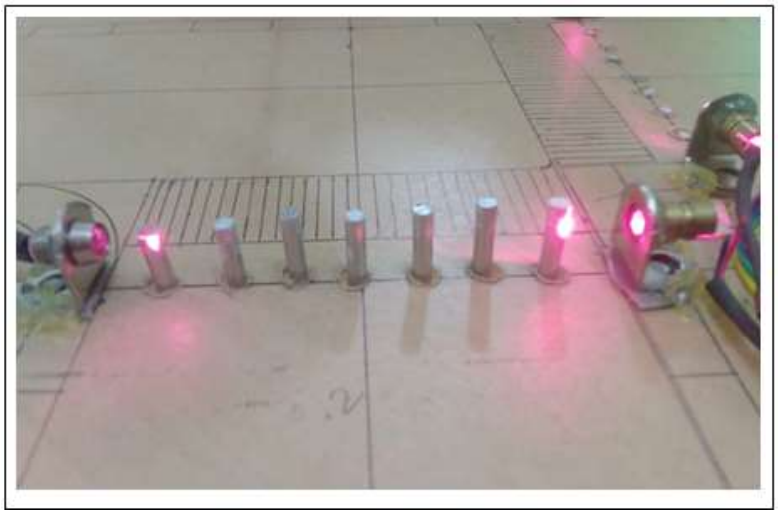

Figure 9. *Hydraulic Condition (Barrier) Up*

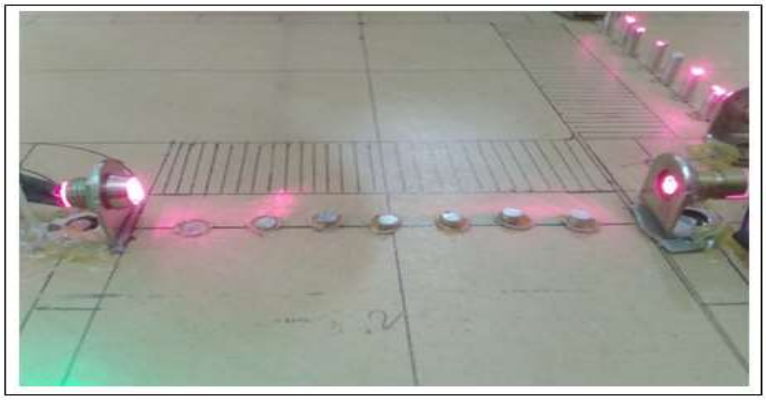

Figure 10*. Hydraulic Condition (Barrier) Down*

IV. Conclusion

From the results of testing the zebra cross automatic safety system on traffic lights using the built barrier gate, the following conclusions can be drawn:

1 The system uses RC522 RFID components, photo diodes and laser diodes that function as object detectors on the device.
2 The application of input components is that each component used is connected directly to the microcontroller so that the received input signal can be processed to produce output on the system.
3. The application of the system is designed to be connected directly to the microcontroller so that the input signal can be processed and can produce the expected output on the performance of the system, namely the servo motor which is used as a barrier gate driver at 2 intersections, and 6 LEDs at the traffic light at 2 intersections.
4. The distance of the vehicle in the system built with a road divider is less than 2 meters.
5. With this system, the journey of the emergency vehicle is not hampered while on duty. If the emergency vehicle is passing through a traffic light with a red light, the light will turn green. With this system, the emergency vehicle on duty is not late to its destination and the driver cannot break through the road divider when the red light is on and does not disturb pedestrians. who want to cross.

References

Aryza, S., Irwanto, M., Khairunizam, W., Lubis, Z., Putri, M., Ramadhan, A., Hulu, F. N., Wibowo, P., Novalianda, S., & Rahim, R. (2018). An effect sensitivity harmonics of rotor induction motors based on fuzzy logic. *International Journal of Engineering and Technology(UAE)*, *7*(2.13 Special Issue 13), 418–420. https://doi.org/10.14419/ijet.v7i2.13.16936

Furqan, S. A. and M. I. and Z. L. and A. P. U. S. and R. R. and M. (2018). A Novelty Design Of Minimization Of Electrical Losses In A Vector Controlled Induction Machine Drive. *IOP Conference Series: Materials Science and Engineering*, *300*(1), 12067. http://stacks.iop.org/1757-899X/300/i=1/a=012067

Karyono, O., Agustina, K. (2019). Determining the Priority Strategy in the Implementation of E-Government through Swot Analysis Model. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)* Volume 2, No 2, Page: 66-74.

Lubis, A. H., Amelia, W. R., Ramadhani, S. N., Pane, A. A., & Aryza, S. (2019). Indonesian millennials' behavior intention to online shopping through instagram. *International Journal of Scientific and Technology Research*, *8*(11).

Xin, L. U., Xiong, Z., Shuaiwei, Q., & Xiao, P. A. N. (2020). *陆 昕 1 † 周 雄 1 钱帅伟 1*. *53*(8), 675–680.

Yusmartato, Y., Lubis, Z., Arza, S., Pelawi, Z., Armansah, A., Hasibuan, A., & Asaad, M. (2018). New method for locker door with face security system using backpropagation algorithm. *International Journal of Engineering and Technology(UAE)*, *7*(2.13 Special Issue 13), 402–405. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85051454531&partnerID=40&md5=1e88ca4792d9050fff86818ec31ee1bd