Design of automatization of trolley cover based on microcontroller AT Mega 8535 as a learning media at ATKP Medan

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Abstract. As an air transportation service and the operation of flight operations, airports must be arranged in an integrated operational system and capable of providing balanced transportation services. Inside the airport there are equipment that can improve service to aircraft passengers, one of which is a trolley. For this reason, maintenance of these trolleys is necessary and even to develop into. The study used experimental methods of integrating AT Mega microcontrollers, and prototype trolley covers connected with servo motors as the main drivers of the gates. From the research is concluded that this prototype has been successfully designed and between the tools can function properly so that the trolley-writing movement is fully controllable. This automatic trolley has a part that functions to open and close the trolley door automatically. This is very important, because this trolley will work on its own or automatically arrive at the final destination, so the door to close the trolley is very necessary to avoid losing passenger goods. With this design, it is expected to be able to improve services within the airport and as a learning media in the field.

1. Introduction
Technological developments have experienced very rapid development, especially in the field of electronic instruments which are already popular in the community and are not something foreign. The progress of electronic technology is able to overcome even complex problems, with precision and very high speed and accuracy [1,2]. Various equipment can be operated or used with the help of robots. Science and technology are progressing along with the times. The airport requires reliable and adequate facilities and infrastructure for the safety, security and comfort of the passengers. Convenience for passengers at the airport is an important aspect that must be considered in the operation of airport operations.

Inside the airport there are equipment that can improve service to aircraft passengers, one of which is a trolley [3-5]. Trolleys are used by passengers to carry items to the check-in counter, within the departure terminal. Counter check-in is one of the very important stages that must be passed in the service of air passengers at airport terminals. For this reason, maintenance of these trolleys is necessary and even to develop into a trolley robot. Automation is increasingly desirable nowadays. One in their field is the carrying of goods. Usually people are required to push the trolley. However, if there is a trolley that can run automatically, the activity of carrying goods will be easier [6].
2. Methods
Research was conducted using the method of experimental approach, namely by conducting various experiments conducted repeatedly until the conclusion and the results of the previous research. Prior to research, the design was first performed using an Atmega microcontroller and a prototype trolley cover [7].

A microcontroller is a computer built on one chip and can be connected to a device (hardware) and control functions. Because the microcontroller is an electronic component in which there is a series of microprocessors, memory (RAM / ROM) and I / O, the circuit is contained in the chip level or commonly called a single chip microcomputer. On the microcontroller there are components of the microprocessor with interconnected internal busses. These components are RAM, ROM, timer, parallel and serial I / O components, and interrupt controller. There are several types of microcontrollers, namely ATMEGA8535, AT89S51.

AVR microcontrollers have quite complete features. Starting from the program memory capacity and data memory is quite large, interruptions, timers / counters, PWM, USART, TWI, analog comparator, internal EEPROM and also the internal ADC are all in ATMEGA8535.

A program is a collection of instructions that are used to set a computer to perform certain actions. Without a program, the computer really can't do anything [8]. That is why it is often said that computers cover three important aspects, in the form of hardware, software, in this case in the form of programs, and brain ware or people who play a role in computer operations and software development [9][10][11]. In other words, the program is an important part of the computer that regulates the computer in order to take action in accordance with the will of the author [12].

Software is the most core part of a microcontroller system. Because the microcontroller hardware will function if the software in the form of instructions (functions) has been given to it. In this writing the author uses programming with C language to write a list of programs that will operate the microcontroller [13]. C is a very short computer language.

DC motors are the most widely used motors in everyday life. DC motor is a machine that functions to convert direct current electricity into motion or mechanical energy [14]. The basic construction of a DC motor consists of 2 main parts, namely the rotor and stator. The rotor is a rotating part or armature, in the form of a coil where an electric current can flow. While the stator is a fixed part and produces a magnetic field from the coil. Most motors used in the game; cars are DC motors [15]. This causes the production of DC motors to be larger than other motors. A DC motor has wire coils mounted in the slots of a cylinder.

An electric motor is an electromagnetic device that converts electrical energy into mechanical energy. This mechanical energy is used for, for example, turning the pump impeller, fan or blower, moving the compressor, lifting material, etc. Electric motors are also used at home (mixers, electric drills, wind fans) and in the industry. Electric motors are sometimes called industrial "work horses" because it is estimated that motorcycles use about 70% of the total electrical load in the industry. Voltage regulator functions as a voltage filter to suit your needs. Therefore, usually in a power supply circuit, the voltage regulator IC is always used to stabilize the voltage output. The rectifier circuit is good enough if the ripple voltage is small, but there are stability problems. If the voltage of the PLN rises / falls, the output voltage will also go up / down, if the current is getting bigger it turns out that the output dc voltage also goes [16].

2.1. Framework of thinking
The working principle of a microcontroller learning tool is how to provide convenience for the layman to try to conduct microcontroller learning such as previous research (2015) ever conducted at the University of Serang Jaya Using microcontroller as a design build learning tool.

Trolley is one of the airport facilities that serve to support the convenience of airport users or passengers. So that this tool is very necessary, in order to create a better airport service. At this time trolleys are needed by passengers, because passengers usually carry a lot of goods to travel to their destination. For this reason, trolleys are needed so that maintenance of these items must be carried out even to develop the trolley automatically. Passengers do not need to manually push the trolley, where it
is expected that this trolley will work automatically until the check-in counter. Counter check-in is one of the very important stages that must be passed in the service of air.

On this automatic trolley there is a part that serves to open and close the trolley door automatically. This is very important because this trolley will work on its own or automatically arrive at the final destination, so the door to close the trolley is very necessary to avoid losing passenger goods. With this design, it is expected to improve services within the airport.

3. Result and Analysis

At this time the conditions at the airport for the purpose of lifting passenger goods, the tool used to carry goods to the check-in room is to use a trolley. Trolleys at the airport still use manual methods that are driven or driven directly by passengers. Then if the items are carried a lot, then passengers will have difficulty pushing the trolley to the check-in room.

The desired condition is when the passenger arrives at the airport directly there is an automatic trolley. First of all, the visitors who have arrived at the airport and put the items that were taken and took the ID card contained in the place of the card provided. Then the visitor enters the ID card in the ID card slot, to open the lid from the trolley, the visitor must enter security code and choose what airline is the destination. After the visitor enters the item he is carrying, there is a process of weighing the goods, after weighing the goods is completed and in accordance with the provisions of the scales, the visitor presses the close button so that the trolley door closes again and will move forward following the black line on the floor. The trolley will continue to follow the line with no barrier in front of the trolley. If the ultrasonic sensor detects an obstacle or an obstacle then the trolley will stop and sound the alarm until the barrier in front of the trolley no longer exists. After the barrier is gone and the alarm is off, the trolley goes back to automatically following the line. When arriving at the x-ray there is a deviation that makes the trolley stop and the visitor ejects the item empty and automatically the trolley goes to the front of the x-ray to receive the item back from the x-ray. After all items are entered into the x-ray, the trolley will run to the check-in room. After arriving at the check-in room, the trolley will run towards the check-in counter which airline has been chosen. After the item is removed from the trolley and the id card is removed from the slot, the trolley will return to its initial position.

In this design, the first source of power supply is a battery with a capacity of 12 v dc. And with the power supply circuit using a voltage lowering or LM 7805 regulator IC, so it will produce 5 v dc output. From the power supply then the data will be processed by the microcontroller using C language. The microcontroller processes the given data in the form of commands or programs. With these commands, the microcontroller will provide output to the servo motor to open and close the door.

Servo motors require a voltage of 5 v dc to work, and this voltage is received from vcc. Servo motors will work in accordance with the timer or modular pulse width (PWM) provided by the microcontroller. In this design the PWM is used to open the door from trolley which is at level 12 of 255 a timer counter2 while to close the door trolley is used at level 18 of 255 a timer counter2. The motor will work according to the order given at that level.

In the AT Mega 8535 microcontroller, the port used to adjust the servo motor is on port D, which is on pin 21. Pin 21 on the microcontroller is a pin that functions as the output of compare register 2 (OCR2), where OCR is a comparison of TCNT2. When TCNT2 reaches the level that is ordered, OCR2 will capture the signal, and directly input the servo motor. Thus, the servo motor will work according to the command of pin 21, whether the motor works to open the door or to close the door trolley.

From the results of the discussion and the workings of the circuit that has been designed, some conclusions can be drawn, including the opening and closing of the trolley can work if there is input given by the microcontroller on the servo motor, by making this automatic trolley easier for passengers without having to push the trolley because the trolley has run automatically until the check-in counter, with this automatic trolley will advance the development of increasingly advanced and modern technology in the airport, by making this automatic trolley, we can understand and understand the programming language namely C language, and after the whole series is successful, this tool can be used as a learning media in laboratory navigation lessons in practice so that it will arouse the spirit of cadets to apply the theoretical knowledge.
From the results of the discussion and the workings of the tool, the authors can provide advice including automatic trolleys using sophisticated electronic equipment so that people who use this trolley must understand and follow the procedures for using the trolley, automatic trolleys using dry battery power so that the deadline or the ability of dry batteries will be reduced when often used, therefore there must be maintenance or refill of the dry battery, with the development of technology, the cadets should be equipped with a variety of the latest science learning media so that it makes it easier for cadets to apply theory to laboratory practices regarding electrical equipment at the airport. This will also motivate cadets to be more enthusiastic to explore knowledge according to the latest developments in technology that develops, especially airport.

4. Conclusion
From the results of the discussion and how the series work has been designed then there can be several conclusions, among others:
1. The opening plan and door of the trolley can work if there is input given by microcontroller on the servo motor.
2. By making this automatic trolley can facilitate passengers without having to drive the trolley because the trolley is already running automatically until the check-in counter.
3. With the existence of this automatic trolley will advance the development of advanced and modern technology in the airport.
4. This suite of learning tools can be developed for other application development.
5. By creating this automatic trolley, we can understand and understand from the programming language of the C language.

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