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SMART ALERT

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ABSTRACT

Motorcycles are the biggest contributor to driving accidents in Indonesia. Some of the accidents that occurred were caused by the negligence of passengers who did not pay attention to the clothes worn when riding a motorcycle. Generally, this happens to women who wear long headscarves or skirts that are too deep so that the hijab or skirt gets into the fingers or chain of the motorcycle until it becomes entangled and causes a single accident or even a series of accidents. According to Ghani (2018) published by detikNews, such an incident occurred in one of the Bayongbong Districts, Garut, where a mother and her child fell from a motorcycle and were run over by an elf car, both of whom died instantly at the scene. The long robe worn by the mother was wrapped in a motorcycle chain. As a result they fell from the motorbike but from the same direction the elf drove and crushed the mother's body. Conditions like this must be handled by proper precautions so that there are no more single or consecutive accidents caused by the entanglement of the hijab or the skirt worn by the passenger. This prevention can be done through an innovation that was created under the name Smart Alert as an effort to prevent the passenger's skirt or hijab from being wrapped around a motorcycle chain or spokes. Smart Alert will display the distance from the detected skirt or hijab. When it detects an object to be entangled, Smart Alert will issue a signal in the form of a blinking LED at a distance of ≤15 cm and <10 cm. If the object is within a distance of ≤10 cm dan <5 cm, the LED will turn on and the buzzer will sound simultaneously. However, when an object is detected within a range of ≤5 cm the system of Smart Alert will count down for 3 seconds. If within that time period the object to be entangled is detected again, the Smart Alert system will automatically disconnect the positive connection between the battery on the motorcycle and the coil so that the engine turns off and the motor stops automatically. Smart Alert as a smart tool that can anticipate the winding of the skirt when riding is placed at the bottom near the motorcycle chain. Smart Alert is expected to take on the role of being one of the technological innovations in the automotive industry that prioritizes passenger safety so that driving accidents can be avoided and minimized.

Keywords: Accident; Buzzer; Passenger; LED; Smart Alert

1. INTRODUCTION

Motorcycles are a means of transportation that are commonly used in the territory of Indonesia, along with the times, the population of motorcycle users is increasing every year and the demand is increasing. In 2019, the number of motorized vehicles in West Sumatra Province for this type of motorcycle only amounted to 2,172,373 units [1][2][21]. Several well-known brands produce motorized vehicles with the same working principle, namely having an engine as a power source, a transmission as a power and moment converter and wheels as a motorcycle propulsion [22][23][24][25]. However, most automotive manufacturers prioritize aspects of power, speed and model only in their designs, while safety aspects are rarely a major concern by automotive manufacturers today[26][27][28][29]. The more people who own a motorcycle, the more the possibility of accidents while driving. Be it a single accident or a series of accidents with other

vehicles. This can be seen during the 2015-2019 period, the number of traffic accidents increased by an average of 4.87 percent per year [3][4].

Motorcycles are the biggest contributor to driving accidents in Indonesia. Some of the accidents that occurred were caused by the negligence of passengers who did not pay attention to the clothes worn when riding a motorcycle. Often the clothes or clothes worn are too long, resulting in a single accident. This generally occurs in women who wear a long headscarf or skirts that are too deep so that the headscarf or skirt gets into the fingers or chain of the motorcycle until it becomes tangled and causes an accident. Conditions like this must be handled by proper precautions so that there are no more single or consecutive accidents caused by the entanglement of the hijab or the skirt worn by the passenger. This prevention can be done through an innovation in the form of a device that prevents the hijab or hijab skirt from being wrapped around the fingers or a motorcycle chain in the form of an alarm marker.

This tool is an innovation designed under the name Smart Alert as an effort to prevent the passenger's skirt or hijab from being wrapped around a motorcycle chain or spokes. Smart Alert utilizes several simple electronic components such as batteries, sensors, microcontrollers, buzzers and LEDs as a circuit. This distance detecting device is fully controlled by a microcontroller with an ultrasonic sensor to detect the distance on one side and its supporting components. With the Smart Alert, the potential for accidents can be avoided and minimized thereby reducing the number of driving accidents in Indonesia.

2. LITERATURE REVIEW

2.1 Buzzer and LEDs

Buzzer is an electronic component that functions to convert electrical vibrations into sound vibrations so that this tool will emit a sound as an alarm. Basically the working principle of a buzzer is almost the same as a loud speaker, so the buzzer also consists of a coil attached to the diaphragm and then the coil is energized so that it becomes an electromagnet, the coil will be attracted in or out, depending on the direction of the current and the polarity of the magnet, because the coil mounted on the diaphragm, every movement of the coil will move the diaphragm back and forth so that the air vibrates which will produce sound [5][6][30].

LED is a component that can emit light. LED is another invention after the diode. The structure is similar to that of a diode, but it was later discovered that electrons striking a P-N junction also release heat energy and light energy [7][8][9][10]. The characteristics of the LEDs are the same as those of the rectifier diodes. The difference is that the diode dissipates energy in the form of heat, while the LED dissipates energy in the form of light. The advantages of using LEDs are solid structure, small size, long service life not affected by on/off switching, easy to use and easy to obtain.

LEDs are widely used as displays or indicators in both audio and control machines because they are durable and are not affected by on/off switching [11][12][13]. Smart Alert will be programmed to give a warning in the form of an alarm in the form of an LED and buzzer when the skirt or hijab is 10 cm from the sensor.

2.2 Ultrasonic Sensor

Ultrasonic sensor is a sensor that works based on the working principle of sound wave reflection and is used to detect the presence of an object or certain object in front of the working frequency in the area above the sound wave from 20 KHz to 2 MHz [14][15]. Ultrasonic sensors have the ability to detect objects farther away, especially for hard objects. On hard objects that have a rough surface, waves will be reflected more strongly than objects with smooth or soft surfaces. The working principle of the ultrasonic sensor includes: first, the signal emitted by ultrasonic transmitters with frequencies above 20 kHz, usually used to measure the distance of objects is 40 kHz. The signal is generated by an ultrasonic transmitter circuit; second, the emitted signal will then propagate as a signal/sound wave with a speed of sound ranging from 340m/s. The signal will then be reflected and will be received back by the ultrasonic receiver; third, after the signal arrives at the ultrasonic receiver the signal will be processed to calculate the distance. The distance is calculated based on the formula $S = 340.t/2$ where S is the distance between the ultrasonic sensor and the reflected plane, and t is the time difference between transmitting the ultrasonic wave until it is received back by the ultrasonic receiver [16][17][18].

2.3 Microconntroller (ATMEGA328)

Arduino ATMEGA328 is the most widely used Arduino type. Especially for beginners, it is highly recommended to use this type of Arduino Uno because there are lots of references that discuss Arduino Uno regarding its use and program. The latest version is Arduino Uno R3 (Revision 3), using ATMEGA328 as its microcontroller, has 14 digital I/O pins and 6 analog input pins. For programming, it is enough to use a USB type A to To type B connection [19][20].

3. EXPERIMENTAL

The data needed in the development of the Smart Alert tool are matters relating to an idea about the problems of accidents in Indonesia and what are the causes. The Library Research method is used as a method of collecting data by reading and reviewing literature both printed and online related to the problems raised. Then the existing materials are used as the basic theory that complements to create new tools, this is done so that the products that have been created can be developed more deeply and objectively.

The steps or stages used during research and development of Smart Alert tools are planning, observation and literature study, tool design, survey of materials and tools, procurement of tools and

materials, tool manufacture/assembly, tool testing, tool revision, tool socialization, survey acceptance and completion..

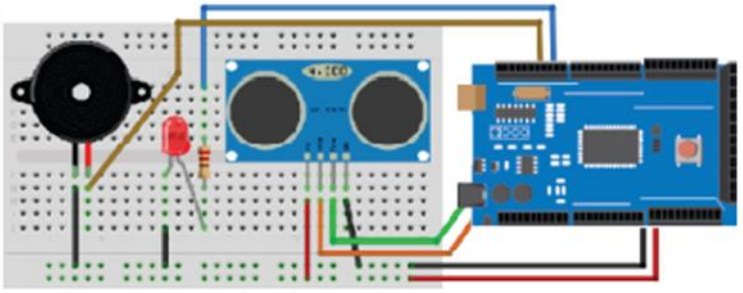

Figure 1. Smart Alert Circuit

(Source : Courtesy of Dedi Mulyono, et al)

4. RESULTS AND DISCUSSION

4.1 Results

Based on the design that has been designed, Smart Alert is programmed to detect skirts or hijabs that are close to the spokes or motorcycle chains. At a distance of less than 15 cm from the sensor, the LED will light up. When the skirt or hijab is at a distance of less than 10 cm, the LED and buzzer are simultaneously on or on. However, if the distance is less than 5 cm, the Relay Normally Open and the engine of the motorcycle is off.

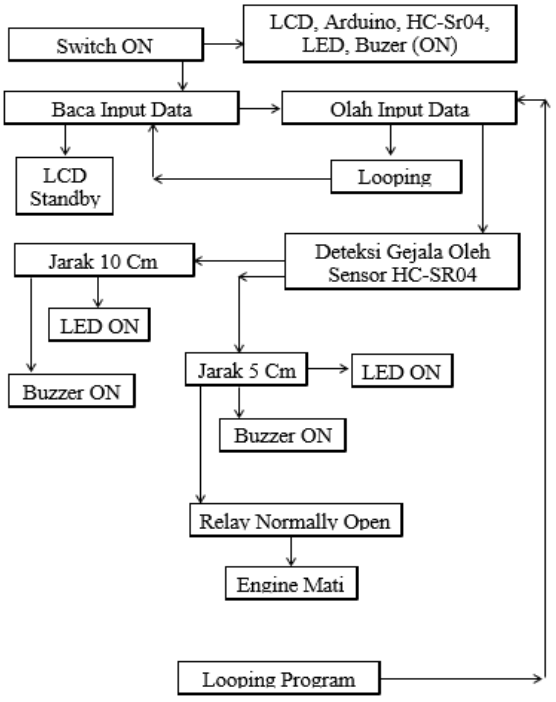

Figure 2. Smart Alert Work System Diagram

(Source : Courtesy of Dedi Mulyono, et al)

In Figure 2 it can be seen that Smart Alert provides Switch On as the start of the running program. Switch On will signal the LCD, Arduino, sensors, LEDs and buzzer to be in standby. The symptom detector or the object to be entangled is detected by the ultrasonic sensor (HC-SR04). If the object is still within approximately 10 cm, the LED and buzzer will turn on to signal to the driver. However, if the detected distance is less than 5 cm, then the LED and buzzer are On and Relay Normally Open so that the engine of the motorcycle will die. The Smart Alert sensor is placed facing the horizontal side to avoid damage to the sensor in the event of rain.

Figure 3 is the position of the Smart Alert buzzer and the position of the LED and LCD Smart Alert located on the driver's dashboard. This position has been considered so that the buzzer can be optimally heard by the rider and the LED and LCD can be seen directly when the skirt or hijab is detected by the ultrasonic sensor. The LCD of Smart Alert will display the distance from the detected skirt or hijab.

Figure 3. position of Smart Alert Buzzer and LED and LCD Smart Alert

(Source : Courtesy of Dedi Mulyono, et al)

After the design of the Smart Alert is complete, testing is carried out to see the success of the program and the success of the tool. The test results of Smart Alert can be seen in this table.

Table 1 Smart Alert Test Results

Distance (cm)	Information	Output *Smart Alert*		Engine state
		LED	*Buzzer*	
15	Not detected	*On*	*Off*	*On*
14	Not detected	*On*	*Off*	*On*
13	Not detected	*On*	*Off*	*On*
12	Not detected	*On*	*Off*	*On*
11	Not detected	*On*	*Off*	*On*
10	Detected	*On*	*On*	*On*
9	Detected	*On*	*On*	*On*
8	Detected	*On*	*On*	*On*
7	Detected	*On*	*On*	*On*
6	Detected	*On*	*On*	*On*
5	Detected	*On*	*On*	*Off*
4	Detected	*On*	*On*	*Off*

3	Detected	*On*	*On*	*Off*
2	Detected	*On*	*On*	*Off*
1	Detected	*On*	*On*	*Off*

(Source : Courtesy of Dedi Mulyono, et al)

4.2 Disscussion

Smart Alert is a form of implementation of K3 (Security, Health, and Safety) that every driver must pay attention to. Often a driver neglects the safety of a passenger. There are many cases circulating regarding accidents that killed only the passengers because the skirt or hijab was wrapped around the fingers or the motorcycle chain. Smart Alert was designed because considering this is very important for safety so that passenger negligence like this can be minimized and intensive prevention is carried out. Prior to the existence of this tool, the only form of prevention was to warn passengers by saying that the skirt or hijab of the passenger was almost wrapped in the fingers or chain before driving, such a method was not effective which caused many accidents.

This tool is an innovation that was created as an effort to prevent the passenger's skirt or hijab from being wrapped around a motorcycle chain or spokes. Smart Alert utilizes several simple electronic components such as batteries, sensors, microcontrollers, buzzers and LEDs as a circuit. The battery is the main component in this tool which functions as a supplier of electrical energy which will be the main source of power in the Smart Alert system. While the sensor is a component that functions as a collector of information from the state, where the situation here will be in accordance with the type of sensor used. Smart Alert is created using an ultrasonic sensor that functions to detect the distance from an object. The ultrasonic sensor module (PING sensor) is the main input of the circuit that emits ultrasonic waves after receiving a trigger from the microcontroller. After receiving the reflected wave, the PING sensor module will send a signal back to the microcontroller. The microcontroller is a device that functions as a receiver and data processor from the sensor and will forward the signal to the actuator, where the actuator on this Smart Alert is the buzzer and the LED as a signaler.

Based on the test results which can be seen in table 1 and in accordance with the program used by Smart Alert, when it detects an object to be entangled, Smart Alert will issue a sign in the form of a blinking LED at a distance of 15 cm and <10 cm, as can be seen in Figure 6 If the object is within a distance of 10 cm and <5 cm, the LED will turn on and the buzzer will sound simultaneously. However, when an object is detected within a range of 5 cm the system of Smart Alert will count down for 3 seconds. If within that time period the object to be entangled is detected again, the Smart Alert system will automatically disconnect the positive connection between the battery on the motorcycle and the coil so that the engine turns off and the motor stops automatically.

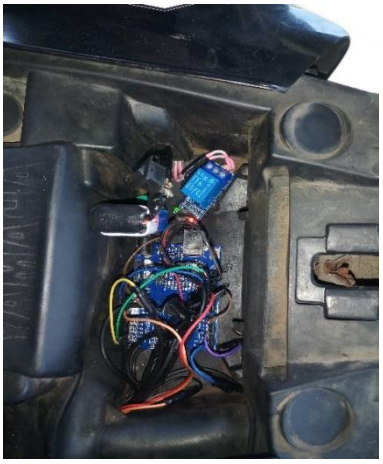

Figure 4. LED and LCD display when detecting a skirt or hijab at a distance of less than 15 cm.
(Source : Courtesy of Dedi Mulyono, et al)

Smart Alert as a smart tool that can anticipate the winding of the skirt while riding is placed at the bottom near the motorcycle chain. This tool is designed as minimally and efficiently as possible so that it does not affect the initial design created by the manufacturer of the vehicle itself.

The advantage of Smart Alert is that it will be a deterrent against the danger of entangling a hijab or skirt on a chain or motorcycle fingers while driving. This tool will help remind drivers and passengers to be more aware of their safety. The sound issued by Smart Alert will be heard quickly before the passenger's skirt or hijab gets caught in the chain or fingers. While the light from the LED will be a marker that is easily visible when the buzzer is not heard if the situation around the driver is very noisy. With Smart Alert, the potential for accidents can be avoided and minimized.

Another advantage is that the detection sensor used in Smart Alert is a water-resistant component. So that when it rains or splashes water on the sensor, the sensor will not be affected or damaged by water. The addition of several components in the manufacture of Smart Alert itself such as buzzers, indicator lights and circuits on the vehicle's electrical safety system does not affect the security circuit created by the vehicle manufacturer, so Smart Alert is safe from an electrical point of view that will not interfere with the motorcycle's electrical system.

5. CONCLUSION

Smart Alert is an innovation designed by utilizing several simple electronic components such as batteries, sensors, microcontrollers, buzzers and LEDs as a series that is programmed to give a warning in the form of an alarm in the form of an LED and a buzzer that can anticipate the winding of a skirt or hijab while driving. Smart Alert is placed at the bottom near the motorcycle chain. This tool is designed as minimally and efficiently as possible so that it does not affect the safety circuit and the initial design created by the manufacturer of the vehicle itself.

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