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Arduino Uno-based Automated Height Measurement and Visitor Counter Prototype

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ABSTRACT

In the tourism industry, there are many interesting rides for visitors. Certain rides have terms and conditions for visitors to enter the rides. One example is the height requirement, if visitors want to enter an Ontang Earrings ride. To make it easier for officers to measure the height of each visitor who wants to enter and add a security system for visitors, this tool was made. This tool is processed with Arduino Uno and programmed using C language as a controller component. Ultrasonic as an entry sensor to measure the height of visitors. The LCD will display the visitor's height, notification of whether visitors are allowed to enter the ride or not as well as the passengers who are filled and available on the ride. Servo entry will open if the height conditions are met and incoming visitors will be counted as additional passengers on the ride. The IR Obstacle sensor is used as an exit sensor for visitors inside the vehicle to open the servo out. Each visitor who leaves will be counted as a reduction in passengers on the ride. Based on the results of research and tool testing, it shows that the working mechanism of the Arduino Uno-based Prototype Height Measurement and Automatic Visitor Counter can work as expected.

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1. INTRODUCTION

In the recreation area, there are lots of interesting game rides to try and we often see the long line of visitors causing long waiting times to be able to enjoy these rides. Meanwhile, the number of visitors who want to be able to enjoy the rides at one time has a limit. And there are some special game rides that require visitors to be able to enjoy these rides to meet certain terms and conditions [1,3,6]. One of them is on the Ontang - Earrings game, the requirement for visitors to enjoy this vehicle is height.

Visitors who come to enjoy the rides must be in accordance with the capacity of the rides and have sufficient height to meet the operational requirements of the game in order to minimize accidents on the rides [2,6,9]. That way the officers must count and measure the entire height of visitors who enter to enjoy the game rides. Then this will be very inconvenient and tiring for officers.

Then the thing that must be considered is the officer's error in his work will increase the risk of accidents for visitors to the rides because they do not meet the operational requirements that have been determined to be able to run the rides. To overcome the above, the author designed a tool called "Prototype of Height Measuring and Automatic Visitor Counter Based on Arduino Uno" by using ultrasonic sensors as a simulation to measure the height of visitors, as well as servos as barriers to the entrance of the rides which will open automatically according to the limits. specified height.

2. RESEARCH METHOD

The method used is the observation method where the ultrasonic sensor HC-SR04 is used to measure the height of visitors and count those who enter. Data from the sensor is processed by Arduino Uno, where Arduino is a minimum system that is open source, the output is a display of the height of visitors and the number of visitors who are in the rides on the LCD, the motion of the dc motor that closes or opens the gate depending on the height and the number of visitors inside the ride. The gate will open when the sensor detects a height equal to or higher than 10cm, also available the output in the form of a display on the LCD in the form of the height of the visitor who will enter and the display "WAHANA PENUH" if the visitor in the vehicle has fulfilled the capacity on this tool, which is 10 people.

3. RESULTS AND DISCUSSION

3.1 Block Diagram Circuit Analysis

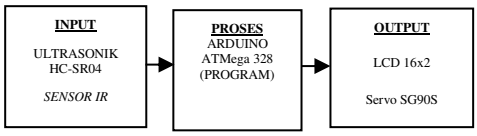

Figure 1. Block Diagram

3.2 Input Block

This block is an input block, where the input to the automatic control of the visitor counter based on height is obtained from two kinds of sensors. The first sensor is the ultrasonic sensor HC-SR04 which is used at the entrance. This ultrasonic sensor HC-SR04 is also known as a distance sensor, this sensor can measure the distance of objects that are in front of it. This sensor has a frequency signal obtained from the transmitter and receiver. The transmitter part of the sensor will issue a frequency wave, if there is an object in front of the sensor, then the signal will be reflected and received by the receiver.

This ultrasonic has 2 (two) pins, trigger and echo, this trig pin is connected to the 2PWM pin on the arduino to produce ultrasonic waves and the reflected wave is received by the ultrasonic echo pin which is also connected to pin 3 PWM on the arduino. After that the trig pin sends data by sending waves and the echo pin receives data by receiving waves to arduino. This sensor is used as input because this sensor serves to measure the height of visitors who are standing right under the sensor. The visitor height limit on this prototype tool has been determined in the program. Visitors who reach the height limit of 10 to 20 cm will be added as a counter for calculating the total number of incoming visitors.

The second sensor is an IR Obstacle sensor, a sensor to detect obstacles / something blocking this sensor using infrared light reflection. How it works, when there is an object blocking the sensor at a certain distance (ranging from 2cm to 500cm. This object will reflect infrared light from the IR transmitter, and be captured by the sensor receiver. When the object is not there or the distance is not reached by the transmitter, then there is no reflection light, the receiver does not give a signal. Conversely, if there are objects or objects that are reflected, so that the receiver gets reflected light, then the receiver gives a signal.

3.2 Process Block

In the process block section to process or process the workings. The input data received by the ultrasonic sensor and the IR Obstacle Sensor will be sent to the microcontroller. The data received is in the form of digital or analog signals. The data received will be processed by Arduino Uno in accordance with the program functions that have been designed and flashed into the ATMega 328 microcontroller.

The microcontroller will receive the data obtained from this sensor whether it is high or low logic. Then the logically received data will be processed and adjusted to the logic in the program listing that has been created. If the IR Obstacle Sensor is blocked, the digital logic received on the Arduino Uno will be high, and if the IR Obstacle Sensor is not blocked, it will be low.

3.3 Output Block

The output block is the part where the results of the data signal processing in the process block will be displayed. The output that will appear on the automatic control device for calculating visitors to the rides based on height is a message display on the LCD (Liquid Crystal Display), moving the servo entry / exit bars. The output displayed is divided into two parts, namely the incoming sensor output and the outgoing sensor output.

At the output of the incoming sensor displays a notification message on the LCD in the form of the height of the visitor and whether the visitor is allowed to enter the vehicle or not when the visitor is standing under the ultrasonic sensor. If the visitor's height exceeds the minimum limit of the lowest range, then the output that appears is a message on the LCD and the movement of the doorstop is open. Then the latch will be delayed to close again. On the other hand, if the visitor's height is less than the minimum height required to enter the ride, the output displayed is a message on the LCD and the doorstop remains closed.

Furthermore, at the output of the sensor, there is an IR Obstacle Sensor as a sensor [7]. If the IR Obstacle Sensor is blocked by an object, the output that will be generated is the opening of the exit bar for visitors and the LCD will display a message on the number of visitors that are filled and available. If the obstacle object leaves the IR Obstacle Sensor, the exit bar is closed again.

3.4 Detailed Circuit Analysis

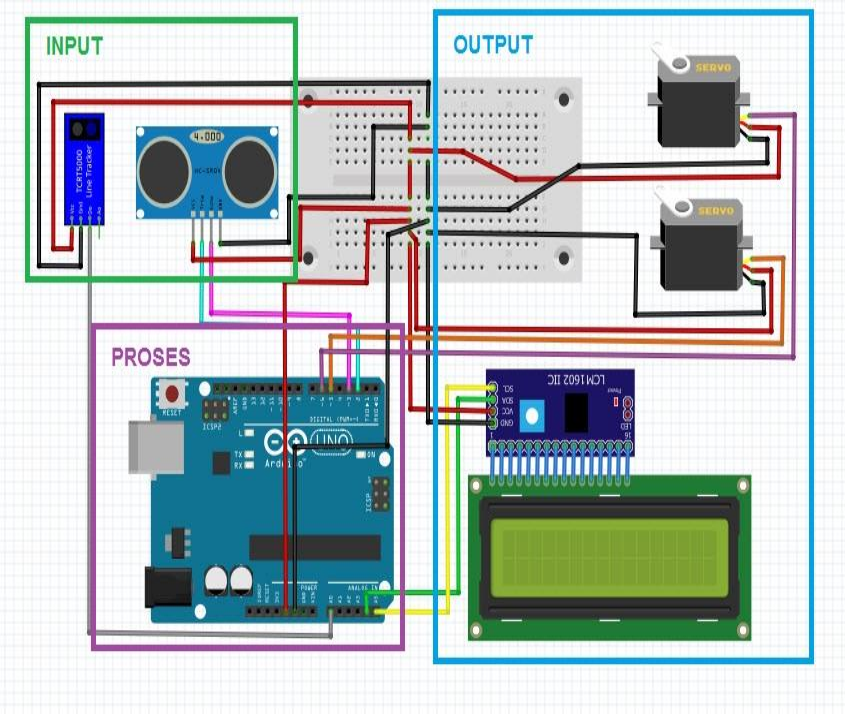

Figure 2. Circuit Schematic

In a series of prototype height measurements and an Arduino-based automatic visitor counter, an activator of +5V is given. Then the voltage current will activate the microcontroller. Arduino ATMega328 has 3 pins +5 V. The activator and ground servo pins of the entrance and exit bars are connected to the +5 V pin and ground on the Arduino. The input crossbar servo data pin is connected to Arduino pin 5 while the outgoing crossbar servo data pin is connected to Arduino pin 6. These two data pins are connected to receive output conditions. The trigger pin of the ultrasonic sensor HC-SR04 is connected to pin 2 which functions to trigger the frequency that is issued through the transmitter, while the pinecho is connected to pin 3 of the Arduino PWM which functions to receive frequency reflections from the transmitter and then enters the receiver when there is an object in front.

The IR Obstacle Sensor Digital Output Pin is connected to Arduino digital pin 13 and ground. The IR Obstacle sensor is used as a sensor to open the bar out of the vehicle.

3.5 Flowchart

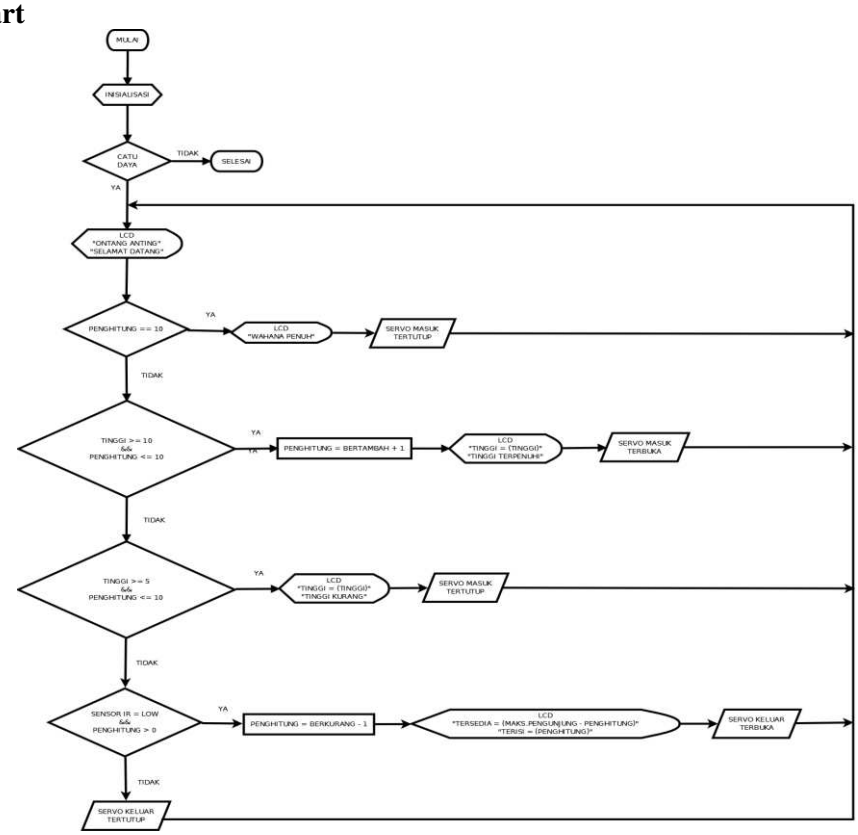

Figure 3. Flowchart circuit

The workflow starts from the analysis of the program needed to provide initial conditions for the tool, so that the workings of this tool can function properly [5,8]. The initial program analysis given is in the form of assigning values to the visitor calculation variables, declaring data pins on the microcontroller, sensors, input and output. Then the workflow enters the power supply section. If no power supply is provided then the tool will not activate and the workflow is complete. However, if the power supply is provided, it will activate all the components in the device. Then on the LCD display, the initial display "*ONTANG ANTING*" will appear on line 1 and "WELCOME" on line 2. In the first decision box, the program will read whether the counter is worth 10, if YES it will display the display "WAHANA PENUH" and continue on the workflow below. If NO the workflow goes directly to the second part of the decision box.

In the decision box, the two sensors will measure the height of the visitor who is standing right under it. If YES the height is more than or equal to 10 cm and the value of the counter variable is still less than the value of the maximum visitor variable which is worth 10, then in the workflow process box, the value of the counter variable will increase by 1, because in the program initialization section, the initial value of the counter variable is 0. Then the workflow is continued with a display from the LCD in the form of the message "HIGH = (high_visitors)" on line 1 and "HIGH TERPENUHI" on line 2. After that, the workflow is continued to the output box in the form of servo movement of the entrance bar opening and delay a few moments later enter at the next output the entrance bar is closed. Meanwhile, if the visitor's height does not match, the workflow will go directly to the third decision box.

In the third decision box, the sensor will again measure the visitor's height. If the visitor's height is more than or equal to 5 cm to less than 10 cm, the tool's workflow will only display an LCD display in the form of the message "HIGH = (high_visitor)" on line 1 and a warning in the form of "HIGH LESS" on line 2 and the servo the entry bar remains closed. Then enter the fourth decision box. In this section the program workflow shows the condition if the IR Obstacle sensor is low and the counter value is less than 0, the condition is met or YES, then in the process box workflow the counter variable value will decrease by 1 from the previous value. Then the next workflow will display a

display on the LCD in the form of a message on the number of visitors "AVAILABLE = (maximum_visitors minus counter)" on line 1 and passengers who have "FILLED = (counter)" on line 2 of the LCD. The workflow is then continued with the output box in the form of the movement of the servo bar coming out open, a few moments delay and the servo bar coming out closed again, the LED is off. If the condition of the IR Obstcale sensor is not suitable or NOT, the servo bar exit remains closed. After the workflow ends at the closed output servo output, the tool workflow will return to the power supply decision box section. If the power supply remains active, the workflow of the tool will continue to operate according to its function. Conversely, if the power supply is not active, the tool stops operating and is finished.

4. CONCLUSION

Based on the design, testing and analysis that have been carried out, several conclusions are obtained, including the following: After the test steps are carried out, the tool can function properly. This prototype can be developed in the tourism industry, because the application of this tool can be used on rides that have a high risk of danger. The measuring ability of the HC-SR04 ultrasonic sensor in measuring distances can reach about 2 cm - 400 cm depending on the quality of the sensor. While the distance range required in measuring the prototype height only requires a small-scale distance of 20 cm. In measuring height, visitors must be right under the ultrasonic sensor, because the sensor is sensitive to changes in standing. Thus, the accuracy of the placement of the visitor's standing position is needed in measuring height. This tool will select the height that is allowed to enter the vehicle. The height of the visitor and the message whether the visitor is allowed or not will be displayed on the LCD. Visitors who enter and exit the vehicle will be counted on the calculation variable. The entry sensor will calculate the sum of incoming visitors, while the exit sensor (IR Obstacle) will calculate the reduction of passengers on the ride. The maximum number of passengers who can enter the ride is 10 people. In the manufacture and up to the testing stage of the tool, the authors found obstacles that were felt to be overcome by paying attention to the following things: Because this tool only uses a distance sensor as a height measurement, but in its development it can be added with a weight sensor as a condition for visitors to enter certain rides. To make it easier to maintain the rides, you can add a counter for the number of visitors within the specified timeframe. In order to know how many visitors have enjoyed the rides.

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