AUTOMATIC STEERING SYSTEM
ON THE PROTOTYPE ELECTRIC CAR UMSIDA

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ABSTRACT

Currently the electronic device can not be separated from human life, especially is the gadget. Gadgets in daily activities is almost inseparable from our grasp, from children to adults. Many devices are now directly connected with android smartphone. Hence the idea to do some research occurred android smartphone is connected to a steering system of the car. In this case study is used as a prototype electric car UMSIDA. Here we create an electronic circuit that we put on the car steering system, which by using blutooth connection connects to an android smartphone that we use. As for the electronic devices we use Arduino is programmed using C language to run the motor that moves according to the input data transmitted via android smartphone. Where the results of tests show that the speed turns on bluetooth pairing process is more influenced by the android version and hardware high.

Keyword = Android Smartphone, Arduino Nano, DC Motor.

I. INTRODUCTION

1.1 Background

Along with the continued development of current technologies, which in the modern world urgently needed tools that could help mengefisiensi our work. So many invented a tool that aims to make it easier to humans in many ways. The more equipment that can also be controlled with a smartphone because smartphone, one of which has multiple sensors and devices that have already grown from the factory. So that it can communicate with the microcontroller then the smartphone can be used as a controller for a wide variety of electronic equipment. From here to materialize the idea to create the automation system the wheel on a prototype electric car UMSIDA.

II. RESEARCH METHODOLOGY

To complete this research there are several stages that are conducted are: the design of Hardware and software Design.

2.1 Design Of Hardware

Here we designed the nano, arduino microcontroller Assembly mounting component used for example bluetooth module HC-05, DC motors, and others.
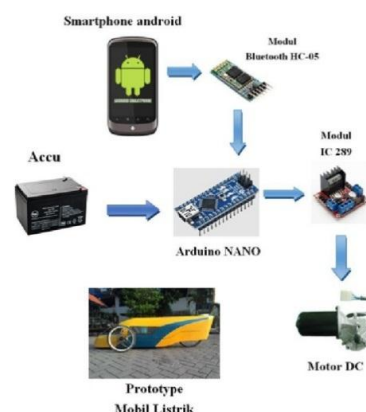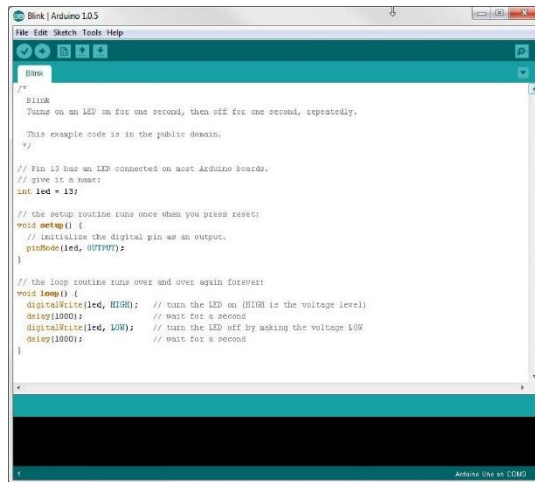

Figure 1 design of the Hardware

1. Initial Process begins with initial checking the connection between your smartphone with bluetooth HC-05.
2. If the bluetooth connection is already found, the next step in the program receive the microcontroller input from buttons on Smartphones that have been determined in advance.
3. The Microcontroller will send data serially to the L298N IC series.
4. Motor driver IC L298N as DC sends pulses to the motor digital DC.
5. Motor DC digital pulses received from IC L298N to   perform the   movement of the steering wheel

2.2 Design of Software

Here we design the program the arduino microcontroller by using the C language and the arduino ide software. Then compile it with the format * hex at once on the download into the arduino microcontroller. Following is the program of the arduino ide software and flowchart how to program..

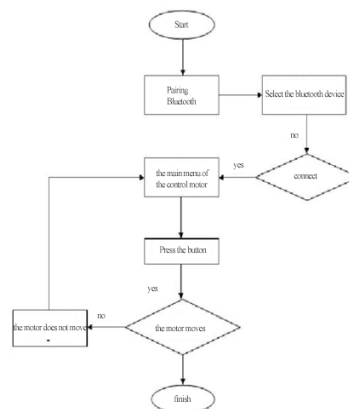Figure 2 the Arduino IDE Software

Figure 3 Flow Diagram Software

III. RESULTS AND DISCUSSION

3.1 Testing the component

A hardware device is supported by some of the series as well as the components of which are:

1. Testing the arduino microcontroller
2. Testing the bluetooth module HC-05
3. Testing module IC L298N
4. Testing the Boarduino application installation
5. Test switch
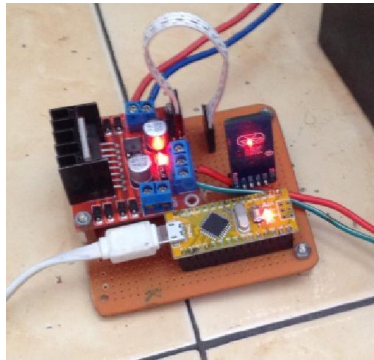
3.1.1 Arduino Test

Figure 4. Arduino Test

3.1.2 Testing the Bluetooth Model HC-05

This test is done to see if the Bluetooth Slave can receive information in a series sent by the Bluetooth Master and to know the extent to which Master Bluetooth can send data on the Bluetooth Slave which will be rendered on a microcontroller in a variety of conditions.

Figure 5. Testing Bluetooth HC 05

NO	distance (cm)	data sent				% Error
		P1	P2	P3	P4	
1	50 cm	yes	yes	yes	yes	0 %
2	330 cm	yes	yes	yes	yes	0 %
3	550 cm	yes	yes	yes	yes	0 %
4	730 cm	yes	yes	yes	yes	0 %
5	950 cm	yes	yes	yes	yes	0 %
6	1030 cm	yes	yes	yes	yes	0 %
7	1040 cm	yes	no	yes	yes	25 %
8	1045 cm	yes	no	yes	yes	25 %
9	1048 cm	yes	no	yes	no	50 %
10	1052 cm	no	no	no	no	100 %

Figure 6. Testing Data Blutooth Slave with Blutooth Master Without Barrier

NO	distance (cm)	data sent				% Error
		P1	P2	P3	P4	
1	50 cm	yes	yes	yes	yes	0 %
2	330 cm	yes	yes	yes	yes	0 %
3	550 cm	yes	yes	yes	yes	0 %
4	730 cm	yes	yes	yes	yes	0 %
5	950 cm	yes	no	yes	yes	25 %
6	1030 cm	no	no	yes	no	75 %
7	1040 cm	no	no	no	no	100 %
8	1045 cm	no	no	no	no	100 %
9	1048 cm	no	no	no	no	100 %
10	1052 cm	no	no	no	no	100 %

Figure 7. Testing Bluetooth Bluetooth and Slave Master with a plasticBarrier

3.1.3 Testing The Heating Element

Module L298N used as triggers of the direction of movement of the DC motor. On module L298N features 2 pin enable, 4 pieces of the input pin, output pin 4 pieces and which make it possible for us to control two DC motors, but at this time the driver circuit is only used 1 piece motor DC, so the pin is worn 1 motor 12 volt DC, 2 motor enable on (ENB/PIN 2) input drivers (IN3/PIN 3 and PIN 4/IN4) which is connected to the DC motor.
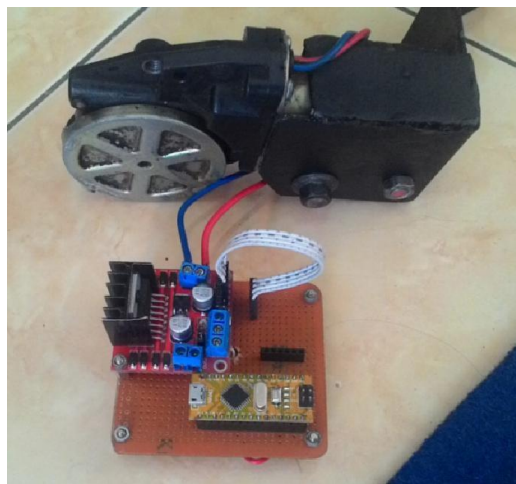

Figure 8. Circuit Module IC L298N And DC Motor

3.1.4 Test Application Installation Boarduino

To prove that android can be used to control steering system prototype electric car, then on android app installed previously Boarduino already didonwload of Play Store.

Figure 9. Boarduino Main Menu

Figure 10. When Bluetooth connected Boarduino applications

Figure 11. Boarduino application when not connected to a Bluetooth

3.1.5   The Overall Testing

Step stride:

1.   Prepare a prototype electric
2.   prepare accu 12v DC motor pengarak as the source.
3.   Turn on the power Switch.
4.   start Smartphone app Boarduino.
5.   Verify the device connection and bluetooth module android smartphone HC-05.

Figure 12. Electric car steering system and application Boarduino

3.1.6   The test results with 5 Android Smartphone

Android Smartphone that is used in this test are taken from a wide variety of hardware such as a Dual-core, Quad-core, and Octa-core. For the version of android gingerbread is low because most applications can only be run on the version, and the most high is a version of the smartphone, making marsmallow used and the specifications for testing are as the following table. with a series of arduino, and this is done by changing the distance between android smartphone with a series on arduino prototype electric car steering system.

No	Type Smartphone Android	CPU	RAM	OS
1	SAMSUNG GALAXY MINI	600 MHz ARMv6, Qualcomm MSM7227	384 MB	2.3.3 (Gingerbread)
2	ANDROMAX I2	Quad-core 1,2 GHz, GPU Adreno 203	1 GB	4.3.3 (Jelly Bean)
3	ASUS ZENFONE 4	Dual-core 1,2 GHz, Intel Atom Z2520	1 GB	4.4.2 (Kitkat)
4	VIVO Y51	Quad-core 1,2 GHz, Snapdragon 410	2 GB	5.0.2 (Lollipop)
5	LENOVO VIBE K4 NOTE	Octa-core 1,3 GHz Cortex A53, Mediatex MT6753	3 GB	6.0.0 (Marshmallow)

Figure 13. Android Smartphone type tested

Observations note that all devices android smartphone can be used to control steering system prototype electric cars with good for connected with series of arduino. Further testing is underway to find out the time required in the process of pairing android smartphone with a series of arduino, and this is done by changing the distance between android smartphone with a series on arduino prototype electric car steering system.

No	Type Smartphone Android	Jarak Dan Waktu Pairing					
		1 Meter	2 Meter	4 Meter	6 Meter	8 Meter	10 Meter
1	SAMSUNG GALAXY MINI	00:02:02	00:02:48	00:02:72	00:03:01	00:03:57	00:04:32
2	ANDROMAX I2	00:02:01	00:02:21	00:02:85	00:03:16	00:03:65	00:04:24
3	ASUS ZENFONE 4	00:01:56	00:02:10	00:02:45	00:02:43	00:03:81	00:04:15
4	VIVO Y51	00:01:34	00:02:22	00:02:12	00:02:63	00:03:05	00:03:26
5	LENOVO VIBE K4 NOTE	00:01:18	00:01:55	00:01:79	00:02:14	00:02:62	00:02:73

Figure 14. Testing Android Pairing to a series of Arduino

From Figure 14 if calculated again on average per smartphone android from the average time per distance pairing on all devices android smartphone as below:

SAMSUNG GALAXY MINI: 0:03:02 ANDROMAX I2:0: 03:02
ASUS ZENFONE 4:0: 02:75
VIVO Y51:0: 02:44
LENOVO VIBE K4 40 NOTE: 0:02:00

The results of the calculation shows the sequence of versions of android, SAMSUNG GALAXY MINI lowest version OS IE 2.3.3 (Gingerbread) and LENOVO VIBE K4 40 NOTE OS version 6.0.0 (Marshmallow) the most high. The data of the average calculation results indicate that the higher the version of android smartphones and hardware, then the pairing time getting smaller or faster.

IV. CONCLUSIONS AND SUGGESTIONS

CONCLUSION

1. the steering system can be controlled by either using the minimal gingerbread version of android Smartphones (2.3.0) via a bluetooth connection.
2. The distance between the control circuits with arduino android smartphone has no effect besarkecepatan pairing process.
3. The speed of the process of pairing is more influenced by the android version and hardware.

SUGGESTIONS

1. Because the system sets the arduino has many ports are not in use, plus a tool that should be controlled by android smartphone, for example, gas pedal systems, electrical systems and other.
2. this research tool can be developed with other tools and media data transmission using a Wi-Fi network or using the internet so the range becomes more remote.

V. REFERENCES

[1] Yuwono Marta Dinata, 2015, "Arduino itu Mudah", Elex Media Komputindo,
[2] M Bangun Agung, 2014, " Arduino For Beginners"
[3] NAZRUDDIN SAFAAT H, 2012, "BUKU PEMROGRAMAN ANDROID (SMARTPHONE/TABLET PC) EDISI KE 2"
[4] Nalaprana Nugroho, 2015, "Analisa Motor DC sebagai Penggerak Mobil Listrik", E journal UNSRI