

The Design of hand gesture robot software based on wireless technology

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Abstract—Recently, wireless communication is growing rapidly because it is highly efficient use, one of them (wireless technology) that frequently use is the device that can be integrated with another device. The communication between the robot is the information delivery process to do an order. The communication between the robot is an important component on robot interaction and its biosphere. In robot system, the hand gesture robot delivers the order to the robot to move by following the order that has been determined by its master. So the communication between the robot through the wireless technology is happening. The form of this communication is an order to the robot to follow the hand gesture. The benefit of this robot communication is the efficiency to finish the task. This robot is using an Arduino application program, so that it will be easier for the making of hand gesture robot software based on wireless technology.

Keywords—*Arduino, Artificial Intelligent, Robot, Sensor and Transducer, Wireless.*

I. INTRODUCTION (HEADING 1)

Robot Derived from the word "robota" which in Czech means slave, worker or porter. The first time the word of "robota" was introduced by Karl Capek on 1921 at theatrical stage called RUR (Rossum Universal Robot), it tells us about a machine that resembles like a human that can work tirelessly who then rebelled and controlled the human. The term "robot" then became famous and used to replace the term known at that time "automation".

The development of technology makes the human want to develop more and want to know more to see the development of sophisticated technology. Robot is one of the fascinating inventions in history. Robot is a mechanical thing that can perform physical tasks, either using human control or using pre-defined programs or artificial intelligence. By the time, the role of robot is more important, not only on industrial sector but also on another sector such as Medical, agriculture even the military sector. Robot holds an important role in human life. Almost no branch of technological industry is not using the robot system. In modern industry, robots have taken over positions of workers in factories. [6,12]

While robots according to Webster, the robot is an automatic tool that can mimic the human movement. While the term Robotics based on Webster is: "Technology related to the design, manufacture, and operate the robots. The key element first "Robot" words are; a set of equipment/devices/machine, Programmable, Work automatically, Able to do task due a program.

The robot technology is a device that can help a human as a device which has several advantages. To make a smart robot we have to make a consideration which usually becomes an obstacle to design a robot. The factor like a movement stability may not be achieved. To solve that problem, we should do some studying and at a time, design a robot with consideration and choose some parts to build an exact robot with a specification as needed. So the goals of robot such as intelligence, stability, reliability, and speed can be achieved.

With that consideration, so the design of robot which can be controlled by our hand. The control of this robot is based on our hand movement that can make people easier to handle it. Based on the background of the problem then the author makes a tool that is The Design of hand gesture robot software based on wireless technology. The purpose of making a robot is to replace the human power and work that cannot be done by human. Besides that, robot is programmed to work automatically. The benefit of robot system compared to human power; Strong; Tirelessly; Can work with high pressure; Resistant at the danger environment. [15]

II. SUPPORTING THEORY

2.1 The Arduino Uno

Arduino software that is used is driver and IDE, even though there still another useful software which can be used during the development. IDE or Integrated Development Environment is a special program for a computer so that it can make a design or program sketch on an Arduino board. IDE is a special software that is written with Java. [2]

The arduino IDE consists of :

1. Program Editor

A window that lets users write and edit programs in processing language.

2. Compiler

A module that converts the program code into binary code however a microcontroller will not be able to understand the processing language.

3. Uploader

A module that consist of binary code from a computer into memory inside an arduino board.[2]

Serial and Parallel Data Communication

There are two serial data communication, sync serial data communication and async serial data communication, on a sync serial data communication, clock is sent alongside with a serial data, while async serial data, clock is not send alongside with serial data. But raised one by one on transmitter and receiver. This serial data communication is done by UART (*Universal Asynchronous Receiver/Transmitter*). IC UART is make for changing parallel data into serial data and then turning back into parallel data.

In UART, the baud rate and clock phase on a transmitter and receiver should sync. For that, it needed synchronization between the transmitter and receiver. This is done by the 'Start' bit and the 'Stop' bit. When the transmission line is in idle state, the UART output is in logic '1'. When the transmitter wants to transmit data, the UART output will be set to logic '0' for a single bit time.

The signal on receiver known as start signal which use to sync the clock phase so that it will sync with the clock phase transmitter. Next, the data will be transmitted serially from the lowest bit (bit 0) to the highest bit. And then the 'stop' signal will be sent as the end of serial data transmission.[2]

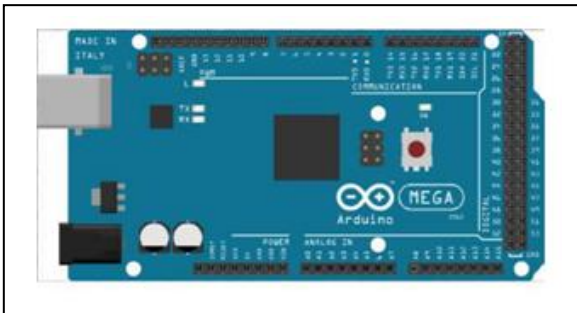


Fig.1 The microcontroller Arduino Mega 2560.

2.2 Microcontroller AVR ATmega8

The microcontroller is a computer system that all or most of the elements are packaged in one chip IC, so often referred to single chip microcomputer. Further, the microcontroller is a computer system that has one or more very specific tasks, in contrast with PC (Personal Computer) which has various functions. The other difference is the ratio of RAM and ROM are very different between a computer with a microcontroller.

For the ATmega8 can only work at a voltage of between 4.5-5.5 V.



Fig. 2 Microcontroller ATmega8

Parallel Port or printer port actually consists of three parts, each named after its work in implementing the printing on the printer. The three-part is the Data Port (DP), a Printer Control (PC) and the Printer Status (PS). DP is used to send the data to be printed by printers, PCS is used to send control codes from the computer to the printer, the control code misalya for rolled paper, and PS is used to transmit printer status codes to the computer, for example to inform you that the paper has run out.[12]

USBasp programmer is a device that used to write a program on ATMEL AVR microcontroller. By using this device, we an fill the hex file that already compiled (created) by some of software like Codevision AVR.[12]

Acclerometer

Accelerometer is a tranduser that serves to measure acceleration, detect and measure vibration, or to measure the acceleration due to earth's gravity. Accelerometers can also be used to measure vibrations that occur in vehicles, buildings, machines, and can also be used to measure vibrations occurring in the earth, vibration of machinery, dynamic distance, and speed with or without earth gravitational influence.

Acceleration is a state of speed with time. Increasing a speed in a time span is called acceleration. If the speed decreases from the previous speed, it is called deceleration. Acceleration also depends on the direction / orientation because it is a decrease in velocity which is the vector quantity. Changing the direction of the movement of an object will cause acceleration as well.

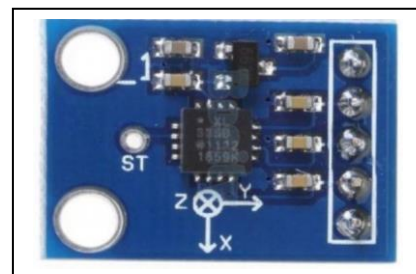


Fig. 3 Sensor Accelerometer

Driver Motor for use IC L293D

To drive a DC motor is typically requires a large current, for the use of IC L293D consisting of a transistor amplifier circuit or use as a power amplifier IC controller motoPr round. IC L293D serves to control a DC motor, then just give the corresponding pulse or logic at IN_1 - IN_2 , with the amplified output OUT_1 - OUT_2 . [13]

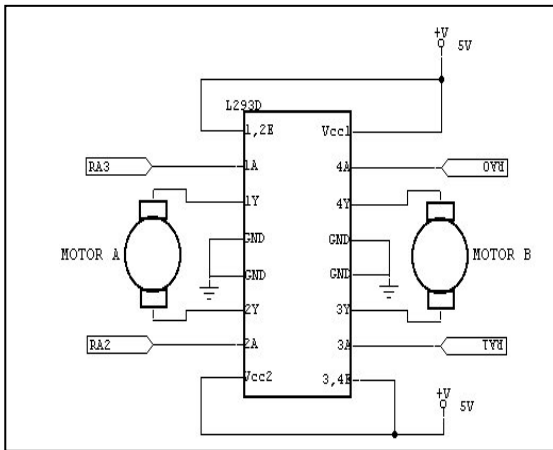


Fig. 4 Driver of IC L293D circuit for DC motors

III. RESULT AND DISCUSSION

The test results on the data axis x and y axis. The test results indicate the value, as follows; Testing the axis $x = 0^\circ$ and axis $y = 0^\circ$, on testing the x axis and the y axis at value 0° in neutral. So there is no command for a description of the tool motion. This State is called a tool at the time of the stop condition or silent.

The test results on the data axis y (forward direction)

1. Testing on axis $y = 10^\circ$

At a time when the movement of the hand to order forward, the slope of the 10° movement does not occur, then the State is still in a State of silent or neutral.

2. Testing on axis $y = 15^\circ$

Advance orders with the tilt of 15° , there is a change of motion with the limit values of $y = 357$ - 368 .

3. Testing on axis $y = 20^\circ$

The slope of the 20° tilt movements occur when the movement of the hand to order ahead, with a limit value of $y = 358$ - 360 .

4. Testing on axis $y = 25^\circ$

The slope of the 25° tilt movements occur when the movement of the hand to order ahead, with a limit value of $y = 363$ - 367 .

5. Testing on axis $y = 30^\circ$

30° slope movements occur when the movement of the hand to order ahead, with a limit value of $y = 357$ - 360 .

The test results on the data axis-y (reverse direction)

1. Testing on y-axis $= 10^\circ$

At a time when the movement backwards, ordered to hand the slope of the 10° movement does not occur, then the State is still in a State of silent or neutral.

2. Testing on axis $y = -15^\circ$

Command retreating with the tilt of 15° , yet there is a change of motion. So on the results of the simulation command retreated yet perform.

3. Testing on axis $y = -20^\circ$

The slope of the 20° tilt movements are still not going to ordered retreat, then the State is still silent.

4. Testing on axis $y = -25^\circ$

The slope of the 25° tilt movements occur when the movement backwards, ordered to hand with limit value $y = 299$ - 301 .

5. Testing on the axis $-y = 30^\circ$

The slope of the 30° slope movements occur when the movement backwards, ordered to hand with limit value $y = 295$ - 302 .

The test results on the data axis-x (left)

1. Testing on the x-axis $= 10^\circ$

At a time when the movement of the hand to instruct to the left, the slope of the 10° movement does not occur, then the State is still in a State of silent or neutral.

2. Testing on the x-axis $= 15^\circ$

Motion commands to the left with a slope of 15° , yet there is a change of motion. So on the results of a simulation of the command to the left has yet to appear.

3. Testing on the x-axis $= 20^\circ$

The slope of the 20° tilt movements occur when the movement of the hand to instruct to the left, but the simulated results not showing motion commands to the left.

4. Testing on the x-axis $= 25^\circ$

The slope of the 25° tilt movements occur when the movement of the hand to instruct to the left, with a limit value of $x = 298$ - 303 .

5. Testing on the x-axis $= 30^\circ$

The slope of the 30° slope movements occur when the movement of the hand to instruct to the left, with the limit values of $x = 296$ - 300 .

The test results on the data axis x (right)

1. Testing on the axis $x = 10^\circ$

At a time when the movement of the hand to the right, to order the slope of the 10° movement does not occur, then the State is still in a State of silent or neutral.

2. Testing on the axis $x = 15^\circ$

Motion commands to the right with a slope of 15° , yet there is a change of motion. So on the simulated results command to the right not to appear.

3. Testing on the axis $x = 20^\circ$

The slope of the 20° tilt movements occur when the movement of the hand to motion command to the right motion changes has not occurred. So on the simulated results command to the right not to appear.

4. Testing on the axis $x = 25^\circ$

The slope of the 25° tilt movements occur when the movement of the hand to ordered to the right, with a limit value of $x = 355$ - 363 .

5. Testing on the axis $x = 30^\circ$

The slope of the 30 ° slope movements occur when the movement of the hand to ordered to the right, with a limit value of $x = 354-368$.

Shape of the Graph of x axis and y axis

After doing the above simulations against the x axis and the y axis.it will created tables and charts from the threshold value has been obtained in simulations.

Table 1. The Threshold value on the y axis

Y	THRESHOLD VALUE	
10°	342	345
15°	357	368
20°	358	360
25°	363	367
30°	357	360

Table 2. The Threshold value on the y-axis

-Y	THRESHOLD VALUE	
10°	319	320
15°	309	312
20°	303	305
25°	299	303
30°	295	301

Table 3. Threshold values on the x-axis

-X	THRESHOLD VALUE	
10°	318	321
15°	309	311
20°	305	307
25°	298	303
30°	296	300

Table 4. Threshold values on the x axis

X	THRESHOLD VALUE	
10°	329	333
15°	324	327
20°	324	327
25°	355	363
30°	354	368

At the time of the simulation there are threshold values or numbers. The threshold value is the boundary value of a parameter of the specified job to know the performance of a device. Activation parameters for the x axis and the y axis is the value that has been created in programming is a 299-368. So, the use of the arduino IDE software 1.0.3 to perform the process of charging the program code (upload sketch) and burn the bootloader

Process program code (upload sketch) is used to enter a program code that has been created in order to get into microcontroller with the help of the bootloader. In this process only needs to provide the power supply on the arduino Board (9-12VDC) and connects to the PC via USB connection.

Burn the bootloader Process is the process of filling the bootloader into the microcontroller with the help of external programmers. As for the function of the bootloader is to assist the process of charging the program code (upload sketch) via the USB port. About the external program used in this process is the external programmer that is supported by the Arduino IDE.

IV. CONCLUSION

After doing the testing and data capture, and analyze the design of software on hand gesture-based wireless has been made, the conclusion can be drawn as follows :

The specified Angle from 0 ° to 30 ° slope to determine the activation of robot motion or running the appropriate command forward, backward, turn right and turn left.

The threshold Values used 299 to 368, with a value of 299 as center or reference in mempersentasikan the value axis x and y axis.

Simulation is done in order to become a digital analog mengkonfersi to read ankimiringan accelerometer axis x axis and y axis horizontally.

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