



Web Based Multi DC Servo Motor Monitoring, Controlling and Management Using Embedded System: A Survey

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ABSTRACT: This paper aims to present a review of various techniques used for DC servo motor control. In this work an effort is made to study the various method for monitor and control the multi DC servo motor using embedded system. Pulse width modulation for dc servo motor control using raspberry pi is explained and also discussed the various method for controlling the angle of dc servo motor. The advantages and disadvantages of the various techniques for DC servo motor control are mentioned in this paper. The major goal of the paper is to provide a comprehensive reference source for the researchers involved in multi DC servo motor control. This whole system is controlled by the raspberry pi unit.

KEYWORDS: Raspberry pi; Pulse width modulation; DC servo motor; Embedded web server

I. INTRODUCTION

In this paper various techniques for DC servo motor control are described. Design and implementation of this project using embedded system for intelligent monitoring is advance method to monitor and control Multi DC Servo Motor which designed here for the real time implementation. It supports online- supervision and control not only within Private Network (LAN) but also in Public Network (Internet) [6]. Using this system user can monitor and control angle of DC Servo Motor. It is possible to interface different kind of sensors with these modules and make various applications.

Using Embedded system it reduce cost as well as reduce the complexibility of Motor and also can do work as high efficiently. Real time data monitoring and controlling of device from distance location that is possible using Embedded System and web server.so various methods for controlling multi dc servo motor are explained in this paper. Pulse width modulation method in raspberry pi for controlling the angle of DC servo motor is discussed. This method has better performance compared to other referred methods. The advantages and disadvantages of the various methods for DC servo motor control are mentioned in this paper. This whole system is control by the Raspberry pi unit, which is low cost on board minicomputer [1].

II. REVIEWED METHODS FOR MULTI DC SERVO MOTOR CONTROL

A. Controlling Servo Motor Angle by Exploiting Kinect SDK:

In this method servo motor angle controlled by using Kinect SDK, remotelyas shown in figure 1. User can control servo motor angle by using right hand via Kinect and system is based on ATmega8 microcontroller. For operate the servo motor were used Kinect. Kinect is used for receive information from user and provide communication between user and computer then send information of angle of servo motor to microcontroller. For suitable interaction for controlling servo motor by user, was created Graphic User Interface in visual C# [1].

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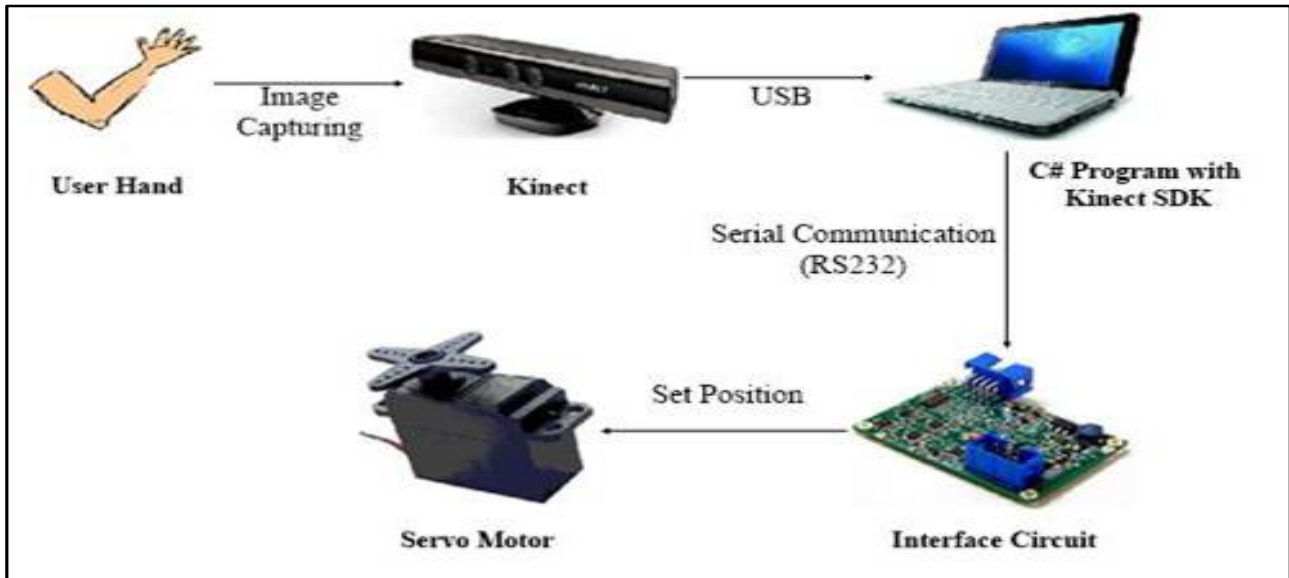


Fig.1. Scheme of whole process [1]

The major advantages of this method is servo motor controlled by users without any background, no training is needed to user for controlling servo motor like traditional controller. Disadvantage of this method is it cannot handle accurately.

B. Client-Server based Remote Motor Control System Using LabVIEW:

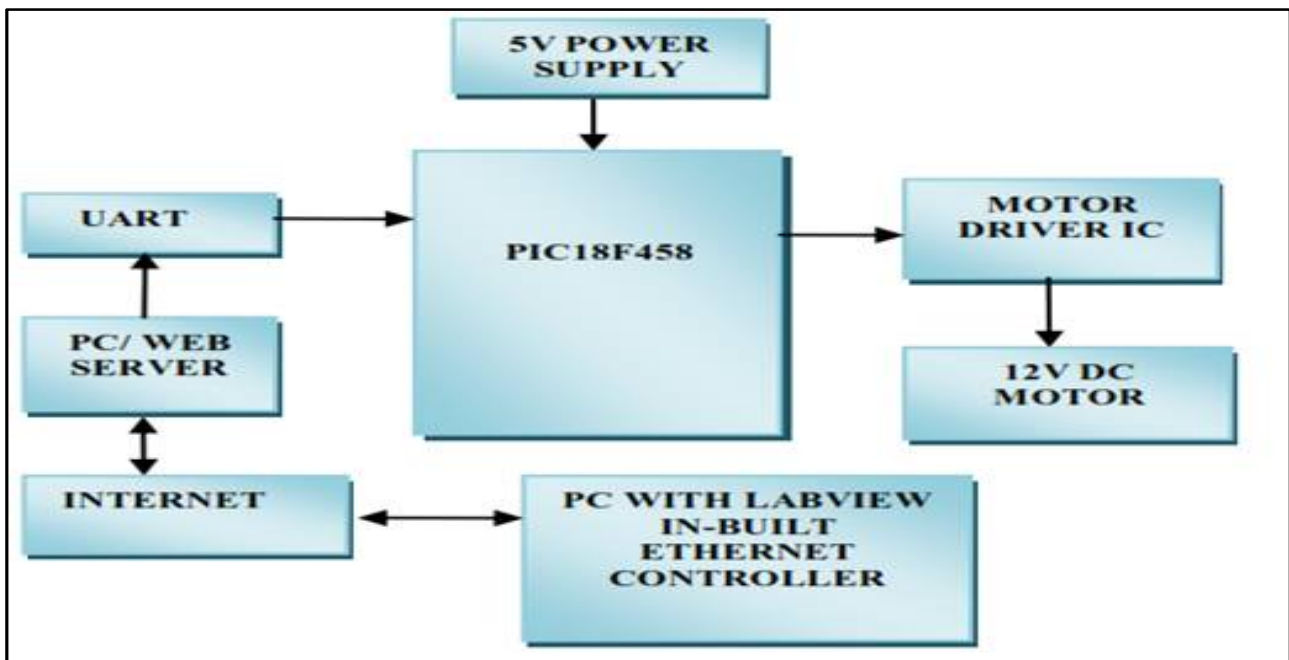


Fig.2. Scheme of whole process [2]

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In this method, the server system which contains PIC Microcontroller module which is connected to the internet so that motor can be monitored and controlled from remote places, the client system runs on LabVIEW platform is also connected to the same internet as shown in figure 2. By typing the IP address of server system on the client side the user gets connected to the remote system and proceeds the monitoring and controlling process. Here the command is entered in PC with LabVIEW which is used as interface software for communicate with microcontroller by accessing the IP address of server system.

The major advantages of this method is -with the help of LabVIEW software the system provides high accuracy and flexibility. Disadvantage of this system is not portable [2].

C. Pulse Width Modulation for DC servo motor control using Raspberry Pi:

1. Pulse width modulation:

Servos are controlled by sending them a pulse of variable width. The control wire is used to send this pulse. The parameters for this pulse are that it has a minimum pulse, a maximum pulse, and a repetition rate. Given the rotation constraints of the servo, neutral is defined to be the position where the servo has exactly the same amount of potential rotation in the clockwise direction as it does in the counter clockwise direction. It is important to note that different servos will have different constraints on their rotation but they all have a neutral position, and that position is always around 1.5 milliseconds (ms).

The angle is determined by the duration of a pulse that is applied to the control wire. This is called Pulse width Modulation. The servo expects to see a pulse every 20 ms. The length of the pulse will determine how far the motor turns. For example, a 1.5 ms pulse will make the motor turn to the 90 degree position (neutral position) shown in figure 3.

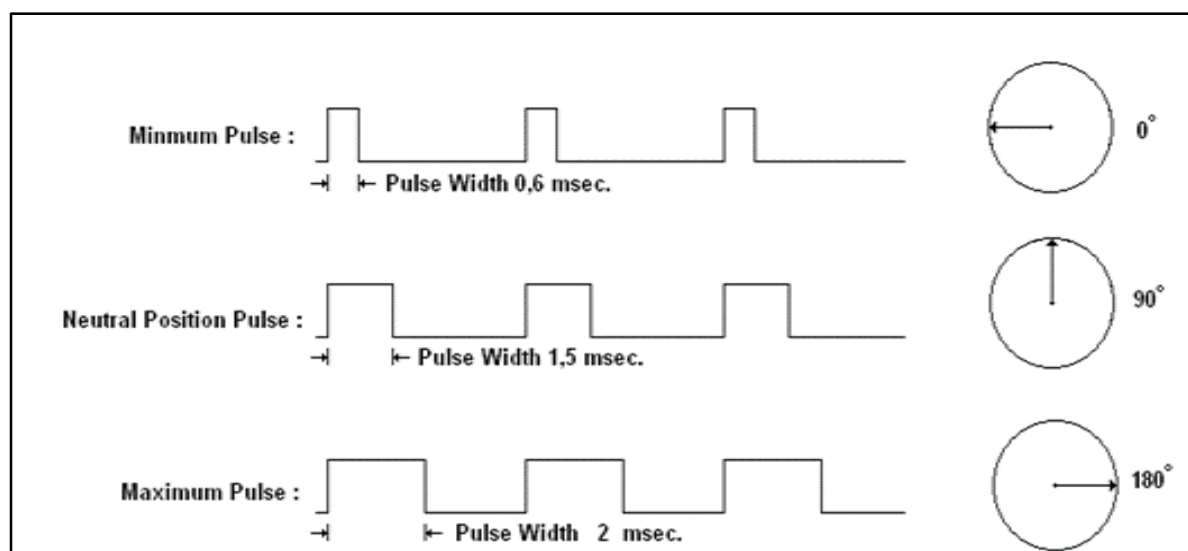


Fig. 3. Pulse Width Modulation [13]

When these servos are commanded to move they will move to the position and hold that position. If an external force pushes against the servo while the servo is holding a position, the servo will resist from moving out of that position.

The maximum amount of force the servo can exert is the torque rating of the servo. Servos will not hold their position forever though; the position pulse must be repeated to instruct the servo to stay in position.

When a pulse is sent to a servo motor that is less than about 0.6 ms the servo motor does not rotate to any position and holds its output shaft at zero degree. If the pulse is wider than 0.6 ms the servo motor rotates. For example, if pulse width is equal to 1.5 ms Servo motor will rotate 90 degrees and for pulse width is equal or greater than 2 ms, servo motor will make rotation of 180 degrees [13].

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2. Pulse width modulation in raspberry pi

In Raspberry Pi we do not specify a pulse width, but we specify a Duty Cycle. So, we can use the following relationship:

Duty Cycle = Pulse Width / Period

Remember that Period = 1/frequency, so: Duty Cycle = Pulse Width / (1/frequency) = Pulse Width * frequency

The Pulse Width that will give us a full left position is 1 millisecond. We now calculate the applied Duty Cycle to give us the desired position:

Duty Cycle = Pulse Width * frequency = .001 * 50 = .05 = 5%

So, for a 50 Hz signal, if we set the Duty Cycle to 5, then we should see the servo move to the full left position.

Similarly, if we set Duty Cycle to 7.5, we should get the middle position, and if we set it to 10 we should be in the full right position. You can get all the intermediate positions by linearly scaling between 5 and 10.

If we want the servo in the full left position, we should set the Duty Cycle to 5%, if we want to go to the middle position, we want a Duty Cycle of 7.5, if we want the full right position, we want a duty cycle of 10. Remember, it is not Duty Cycle that actually controls servo position, it is Pulse Width. We are creating Duty Cycles to give us the desired Pulse Width.

The advantage of this method is - accuracy is high compare to above methods, user can make portable system and user can control multi dc servo motor using raspberry pi [9][11].

III. HARDWARE DESCRIPTION

Raspberry pi2 model B:

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. The Raspberry Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, C++, Java, Perl and Ruby. The video controller is capable of standard modern TV resolutions, such as HD and Full HD, and higher or lower monitor resolutions and older standard CRT TV resolutions [6].

Raspberry Pi2 runs Linux based operating systems and there is a specialized version of Linux based kernel known as Raspian which can run almost all programs which are Linux compatible. Hence in this project we have used python. As shown in figure 4 Raspberry pi2 model has 1 GB RAM and 900MHz quad-core ARM Cortex-A7 CPU and locking microSD card slot. Raspberry Pi2 model B has four USB ports.



Fig. 4. Raspberry pi2 model B [6]



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These USB ports are used for interfacing of camera, keyboard and Wi-Fi dongle. It provide one LAN port for communication. It has 40 GPIO pins for input and outputs, so user can control multi DC servo motor. It has one HDMI port. It can play 1080p resolution videos without lagging. It has a low price relatively as compared to machines in the market. Using embedded web server user can control the DC servo motor through internet [9][10].

IV. CONCLUSION

This paper provides the overview of the various techniques used for DC servo motor control. Among various methods for DC servo motor control pulse width modulation using raspberry pi has better advantages compare to other methods. So using this method by typing the IP address of server system user can monitor and control the multi dc servo motor any time anywhere through the web browser.

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BIOGRAPHY

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