

Android Operated Wireless Dc Drive With Speed Varying Function

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Abstract: The proposed system describes how to control the speed of working dc drive using an android application of android smart phone. The system displays the speed in terms of duty cycle on mobile screen as well as on LCD (liquid crystal display). The objective behind this project was to reduce the gap between human, machine and physical world. The proposed embedded system is interfaced with a Bluetooth module using UART communication protocol. The instructions from android mobile are processed by microcontroller and the speed of motor changes according to the sent instructions. This has immense applications in industries as well as in domestic motor based products and devices like fan. It can control the speed of motor with precision.

Keywords: Android smart-phone, Bluetooth module, UART (Universal asynchronous receiver transmitter), MCU (Microcontroller unit), Duty cycle, LCD (liquid crystal display).

I. INTRODUCTION

Today, life is becoming simpler and comfortable with developing technologies and integrating it to day to day appliances. This has increased the accuracy and saves our time and effort. One such example of developed technology is today's smart-phones. A smart-phone is an efficient and affordable mobile phone built on a mobile computing platform available with different operating systems like Symbian, Bada, Android OS, windows etc. Android OS launched in 2008, is the most popular OS among all available mobile operating systems. Android platform due to its open architecture revolutionized the application development field for cell phone, opening new doors for technical exploration [1,3]. These smart-phones comes with smart features like Bluetooth, Wi-Fi and camera which makes it a lot more advance than a feature phones. Bluetooth which is mainly used for data exchange, created by telecom vendor company Ericsson in 1994[4]. This technology has revolutionized the way electronic devices were working those days. It transformed them from wired devices to wireless devices. Bluetooth devices can communicate with each other if they are placed in the working area of Bluetooth technology which is in general 8-10 meters [5]. This feature and other similar technological developments converted the smart-phones into all-purpose device [6]. Smart-phones have become an integral part of human life these days that's why a lot of efforts are being made to integrate smart-phone feature with the embedded system. This work involves the integration of microcontroller wirelessly with smart-phone. This is an effort

to combine all the popular and easily available technologies like smart-phones, Android, day-to-day appliances and Bluetooth for more effortless control of working of electronics and electrical devices. In the proposed system, android app on the smart-phone is controlling DC Drive after successful integration with the designed embedded system.

II. HARDWARE DISCRPTION

Microcontroller is a small and low-cost computer built on a single integrated circuit having a memory unit, a processor core and programmable input/output peripherals used for the purpose of dealing with automatically controlled products and devices. ATmega16 is also a microcontroller used in the designed circuit to control the working of system. It is a high-performance, Low-power Atmel® AVR® 8-bit Microcontroller with 16 Kbytes of In-System Self-programmable Flash program memory, 512 Bytes of EEPROM and 1 Kbyte of Internal SRAM.

LCD is an electronic display module which is widely used in electronics instruments. Alphanumeric 16x2 LCD display was used to interface with the embedded system. It can display 16 characters per line and having two lines that means it can display total of 32 characters at a time. Unlike seven segment display it can display special characters as well as custom characters. It is also economical and easily interface-able.

A motor (5 V and 1 A) was interfaced which runs according to instructions given to it by MCU. An Android smart-phone is used as controller with installed android application name 'Bluetooth module CI (HyperTerminal)'.

A HC-05 Bluetooth module is a transparent wireless serial connection setup which is easy to interface and used as Bluetooth Serial Port Protocol (SSP) module. It is highly equipped with Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4 GHz radio trans-receiver and baseband. It equips the interfaced circuit with a wireless connection and enables it to connect to any Bluetooth device with SSP like smart-phones or laptops.

III. SOFTWARE DISCRPTION

The code written for the proposed embedded system is written in embedded C language. Embedded C compiler based software CV-AVR was used to create its hex (binary file, this file is going to be burned in MCU) file. The simulation system which is used to test the prepared code has been prepared in Proteus 8 professional software. After successful testing of prepared embedded code, the hex file of the code is burned into MCU Atmega16 using software name khazama AVR burner.

An Android application 'Bluetooth module CI' was used for communication between designed circuit and smart-phone.

IV. WORKING

As the proposed embedded system is powered on, it is required to pair with the android smart-phone using Bluetooth.

An instruction is sent using android mobile phone to the Bluetooth module placed on the proposed embedded system. This instruction is passed to the MCU via UART. Now the message is processed and a corresponding PWM signal is generated to run the motor. A formula in MCU calculates the duty cycle of PWM which depends upon the received instruction. Duty cycle is formulated as given in the equation 1.

$$\text{Duty cycle} = \frac{t_{on}}{t_{on} + t_{off}} * 100 \% \quad \dots (1)$$

where, t_{on} = time for which circuit is on

t_{off} = time for which circuit is off

Now this generated PWM signal is sent to general input/output port to which motor is connected and thus the speed of motor is varied. At the same time percentage of duty cycle is displayed on the LCD for the person near the device to check the status, it is also sent to the Bluetooth module which transmits this value (duty cycle percentage) to the android mobile phone display. The instruction set to control the speed of DC Drive wirelessly is as follows:

'P' or 'p':- To power the motor

'S' or 's' :- To stop the motor at any instant

'+' :- To increase the duty cycle or speed of the motor

'-' :- To decrease the duty cycle or speed of the motor

The duty cycle in this designed system is set to vary by 1.953% on each increase or decrease instruction. The simulation results are shown in figure (2-5) below.

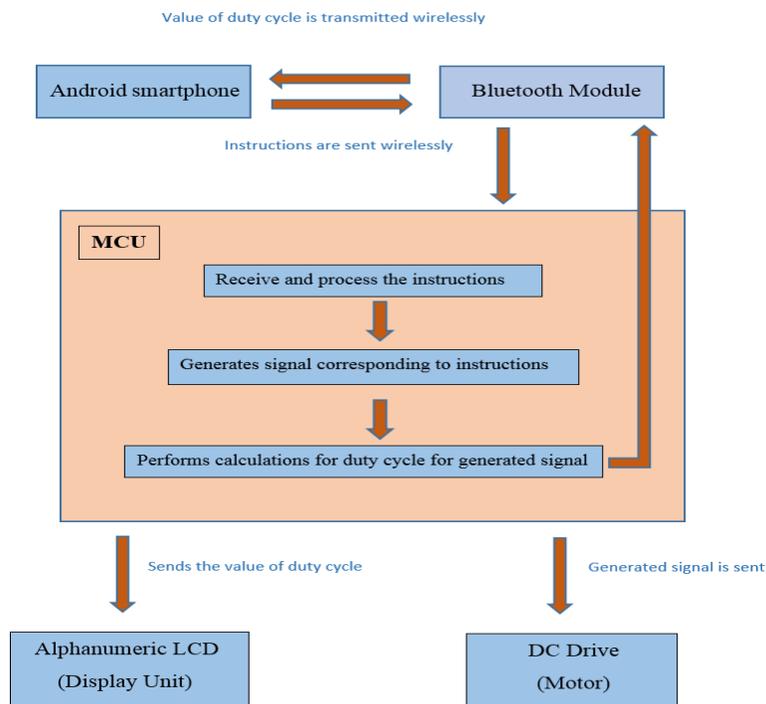


Figure.1: Working of proposed Embedded System

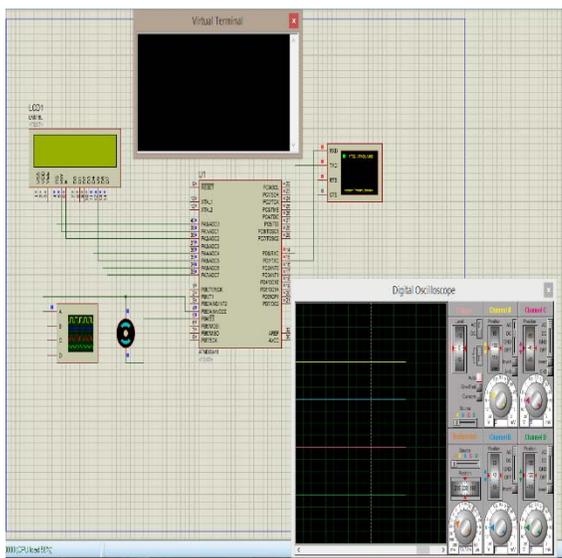


Figure.2: Initialization in Proteus 8 professional

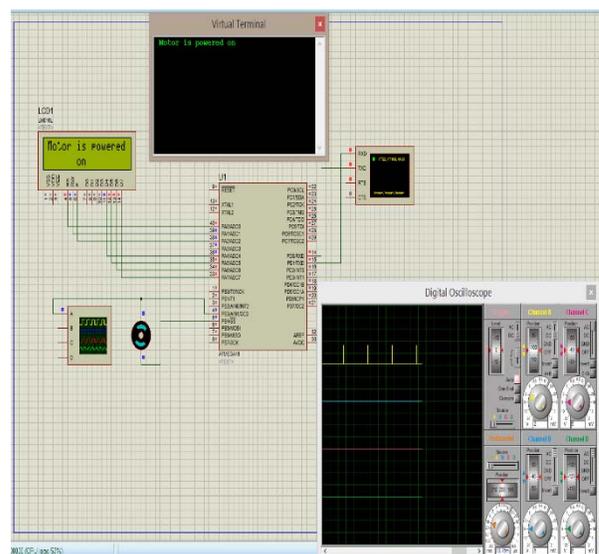


Figure.3: When system is powered on

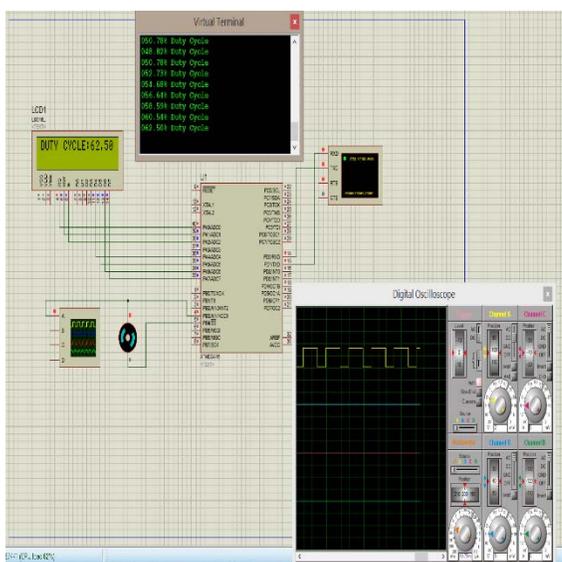


Figure.4: When system duty cycle is varied

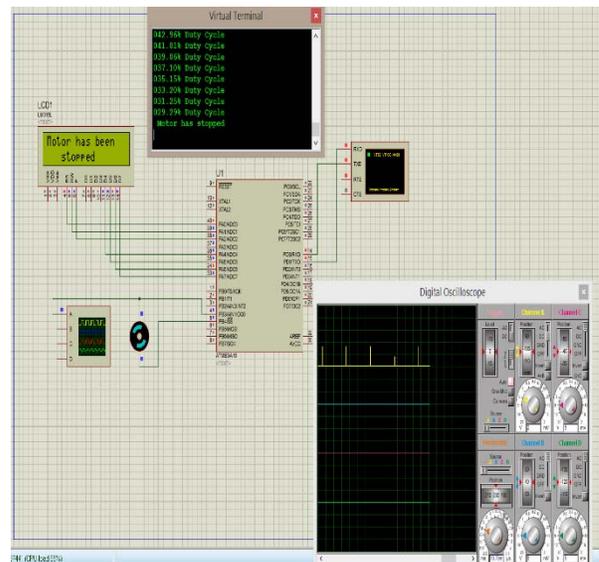


Figure.5: When system is stopped

V. CONCLUSION

The proposed system can control the speed of DC Drive wirelessly with help of any Bluetooth enabled device including android mobile, laptop, tablets etc. It can be used in industries, in controlling speed of motors, fans and also intensity of bulbs (smart home applications). This will increase the accuracy; ease the controlling of surrounding appliances and also saves time.

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