Interactive Interface for DC Motor using GUI with Raspberry Pi Controller

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ABSTRACT: Raspberry Piis a series of small single board computer which provides all the expected abilities that implies at low power consumption level. Raspberry Pi can be used to control various motors like Stepper motor, Servo motor, Geared motor, DC motor. This paper presents an interactive module for understanding the use and effect of Raspberry Pi controller along with DC motor.The module uses GUI interface development through Python programming language which is used to control the movement of DC motor in two different direction that is clockwise and anticlockwise. Students and engineers can go through each step involved in it for effective learning. The GUI interface created includes button and movement of motor based on button click with values of motor set to high and low for movement along with coexistence of Raspberry Pi board. The paper will also lay emphasis on basic learning of DC Motor, Raspberry Pi board & Python Programming.

KEYWORDS: DC Motor, GUI interface, Raspberry Pi Board, Movement of motor based on button click through GUI interface.

I. INTRODUCTION

The paper describes the movement of DC Motor through GUI Interface in synchronicity with Raspberry Pi. The Raspberry Pi is a single computer board which is just a card in size, that can be used for many tasks that a computer can do like gaming, word processing, spreadsheets and also playing HD video. It was established by the Raspberry Pi foundation from the UK. It has been ready for public consumption since 2012 with the idea of making a low-cost educational microcomputer for students. The main purpose of designing the Raspberry Pi board is, to encourage learning, experimentation and innovation from basic to advance level for all those interested in computer hardware, embedded system and Internet of Things (IoT) based application development. The Raspberry Pi comes in two models, they are model A and model B. The main difference between model A and model B is USB port. Model A board consumes less power and that does not include an Ethernet port. But, the model B board includes an Ethernet port. This paper uses Model B with Ethernet port for future use to execute the DC Motor movement through "Internet of Things "(IoT). The Raspberry Pi comes with a set of open source technologies, i.e. communication and multimedia web technologies.The Raspberry Pi was designed for the Linux operating system, and many Linux distributions have a version optimized for the Raspberry Pi. There are11 operating systems that can load up into Raspberry Pi to get started for general purpose computing. These operating systems come with essential applications that start upon boot up. Raspbian, Ubuntu MATE, Snappy Ubuntu, Pidora, Linutop, SARPi, Arch Linux ARM, Gentoo Linux, FreeBSD, Kali Linux, RISC OS Pi. The most popular options are Raspbianwhich is based on the Debian operating system, and Pidorawhich is based on the Fedora operating system. Raspberry Pi can be programmed with many different programming Languages like SCRATCH,Python,HTML5, JavaScript, JQuery, Java, C, C++, PERL,ERLANG. The general circuit of Controller board is shown in Figure 1.below.
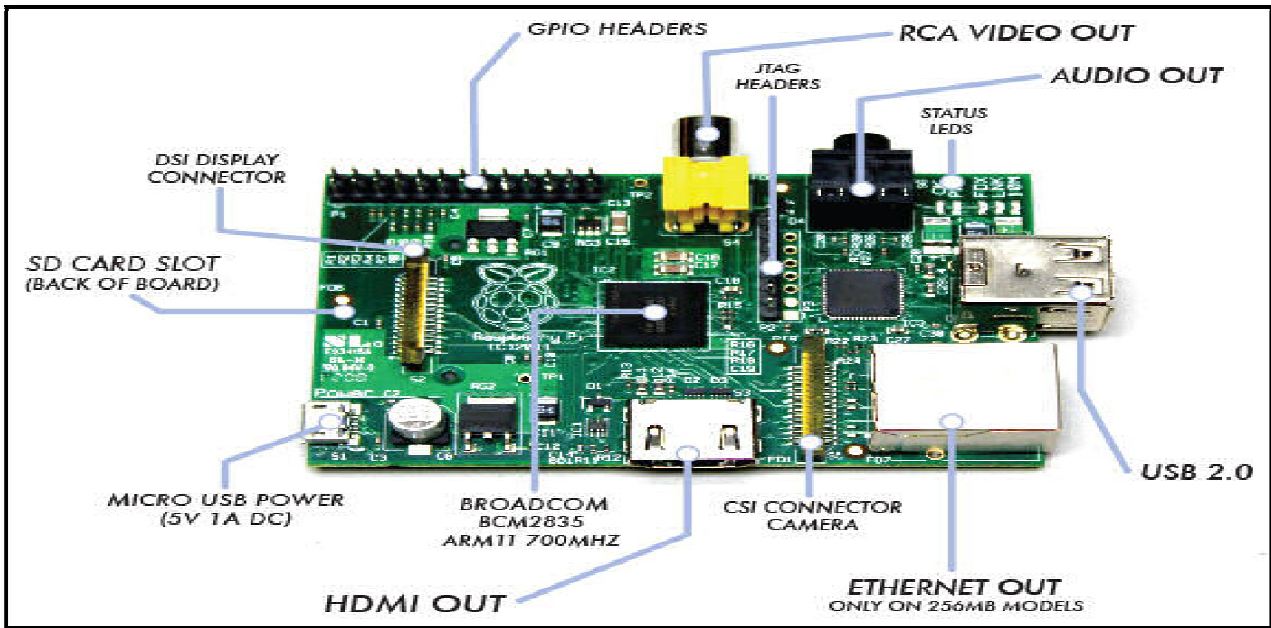
Figure.1) Raspberry Pi Circuit

II. RELATED WORK

The Raspberry Pi is not the only small computing device used these days, there are many more options available. It can be replaced with Allwinner A10, CuBox, and Arduino board. The advantage of using Raspberry Pi over other hardware is it is more portable, user friendly, available at low price, with greater CPU speed, Full HDMI Support, Wi-Fi availability and High Profile Graphics Processing Unit. The comparison between all the three boards is shown in the Table.1) given below.

Characteristics	Raspberry Pi	Allwinner A10	CuBox
1)Price	$25	$40	$129
2)Video	1080p hardware-accelerated video playback; HDMI or composite RCA	2160p hardware-accelerated video playback; 2 24-pin RGB/TTL interfaces, HDMI out	1080p video playback; HDMI
3)GPU	Broadcom VideoCore IV, OpenGL ES 2.0, 1080p30	MALI400MP OpenGL ES	OpenGL Embedded Standard 2.0 Graphics

	h.264/MPEG-4 AVC high-profile decode	2.0 GPU	Engine
4)Other	2×13 header pins for GPIO, SPI, I²C, UART, +3.3 V, +5 V	GPIO, I2C, PWM, Keyboard Matrix (8x8), built-in resistive touchscreen controller	Infrared receiver, microUSB for debug console

Table.1) Comparison among different specifications of boards. (Specification of Raspberry Pi changes with its newer version)

Unlike Arduino which is simply a microcontroller and does not run operating system but runs by writing specific lines of codes.

III. **HARDWARE METHODOLOGY**

A) Raspberry Pi

The Raspberry Pi used in this paper is a board with Quad Core 1.2GHz Broadcom BCM2837 64bit CPU, 1GB RAM, BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board, 40-pin extended GPIO,4 USB 2 ports,4 Pole stereo output and composite video port, Full size HDMI,DSI display port for connecting a Raspberry Pi touchscreen display, Micro SD port for loading operating system and storing data ,Upgraded switched Micro USB power source up to 2.5A.The above Raspberry Pi board is connected with L293D DC Motor.

B) DC Motor

DC Motor is the equipment which converts electrical power to mechanical power. So it is widely used in many areas where its applications varies according to the type of DC motors, itranges from a small motor to a large metal motor with gear box. This paper makes use of a plastic motor in which its rotation is controlled with a L293D motor driver IC and that allows the motor to rotate in both the direction. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V.The DC motor should be powered only through a power supply or a suitable battery. This paper makes use of battery. The DC motor is connected with wires to Raspberry Pi Board which are configured on GPIO Pins of Pi Controller board and supply is given to motor driver IC through Battery. The connection of DC Motor with Pi Board is shown in Figure 2 given below.
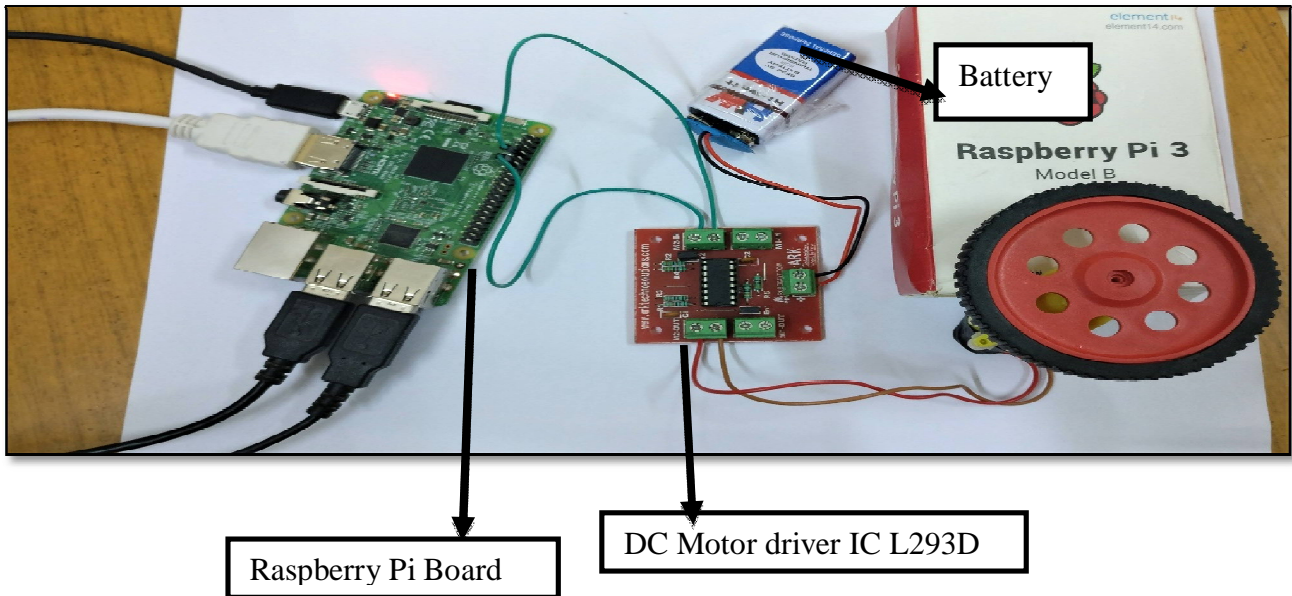
Figure.2) Connection of DC motor with Pi Controller Board

IV. SOFTWARE METHODOLOGY

For development of DC motor movement through GUI interface Python programming Language is used.Python is a very useful programming language that has an easy to read syntax, and allows programmers to use fewer lines of code than would be possible in languages such as assembly, C, or Java. The Python programming language actually started as a scripting language for Linux. Python programs are similar to shell scripts in that the files contain a series of commands that the computer executes from top to bottom.Unlike C programs, Python programs don't need to be compiled before running them. The only need is to install the Python interpreter on computer to run them. The Python interpreter is a program that reads Python files and executes the code.Like shell scripts, Python can automate tasks like batch renaming and moving large amounts of files. It can be used just like a command line with IDLE, Python's REPL (read, eval, print, loop) function.Python can also be used to program things like: Web applications,Desktop applications and utilities, Special GUIs, Small databases, 2D games. This paper uses Python Programming Language to develop GUI Interface for moving the DC Motor in clockwise and Anti-clock wise direction.

PROPOSED ALGORITHM

1. Initialize the GPIO module.
2. Set naming modes to name all pins on board.
3. Set board pins as output.
4. Create an frame of GUI interface and add button with click event to move the motor in respective direction and display message as "Motor Button Pressed" followed by the movement of motor in clockwise direction first and then Anticlockwise direction.
5. Create a widget in GUI for visibility of button at run time.
6. Set GPIO pins to 2 values TRUE & FALSE
7. Clockwise Direction:-Set the GPIO enable pin to TRUE followed by FALSE
8. Anticlockwise Direction:-Set the GPIO enable pins to FALSE follow by TRUE

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V. RESULTS

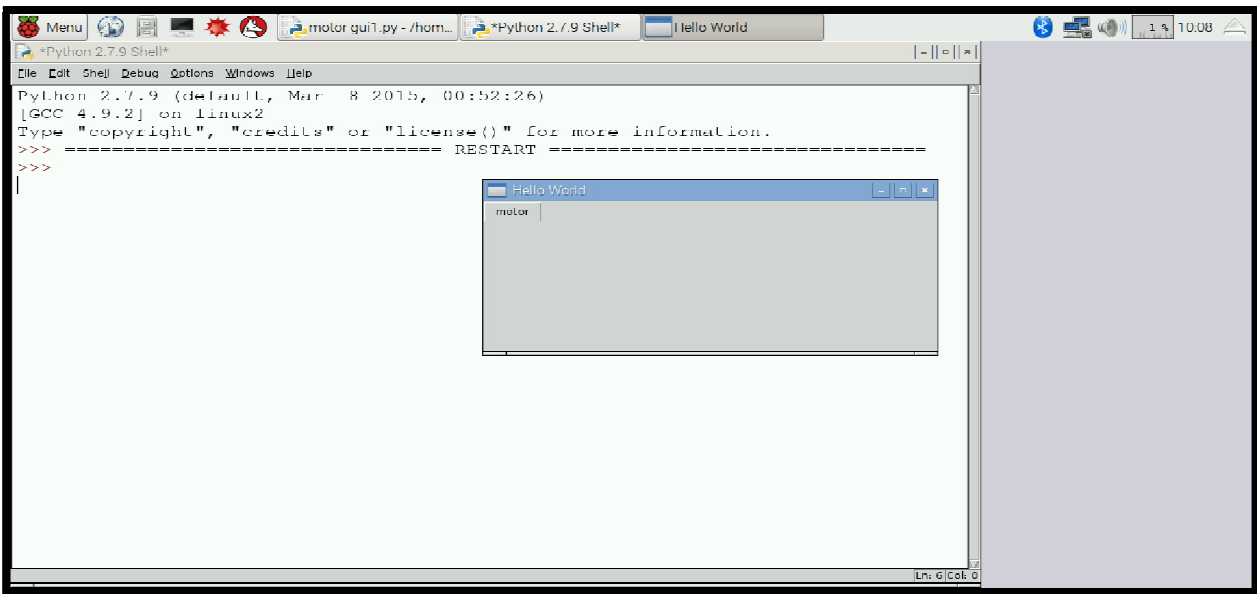On Execution of above algorithm the output is displayed on the screen as shown in following screen.

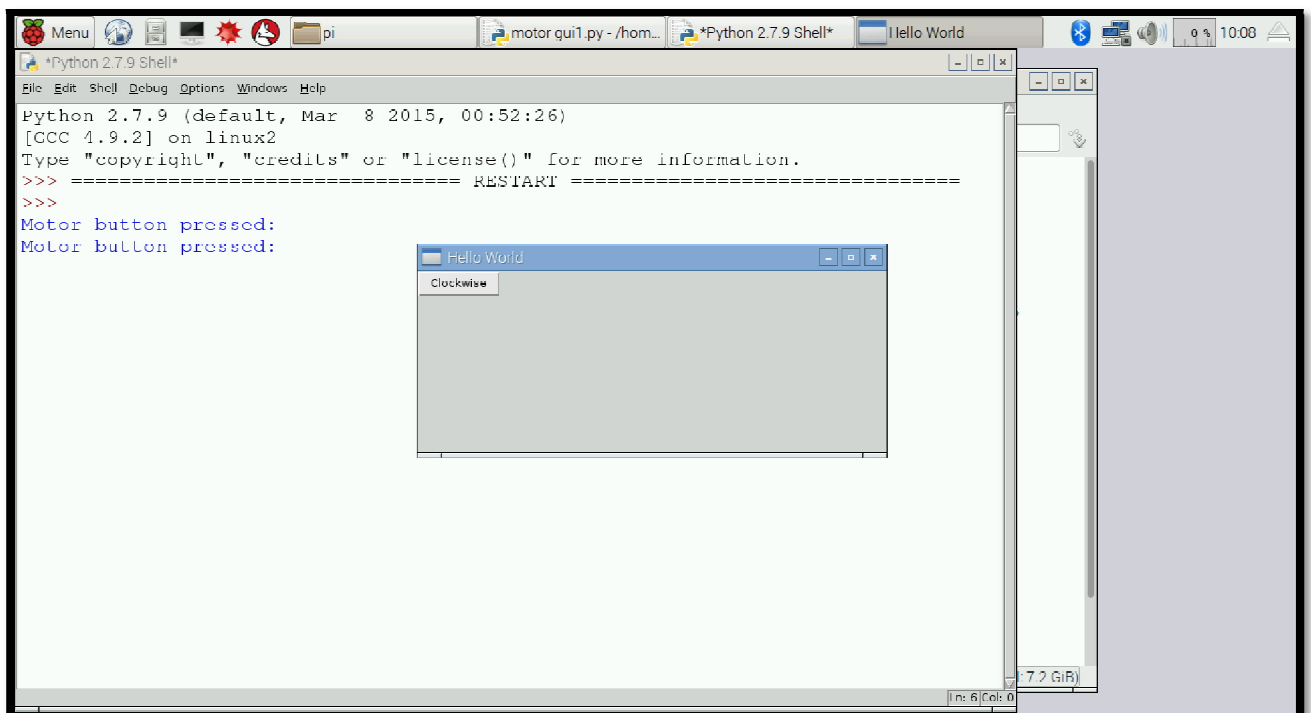Figure 3.1) Press the motor Button to display the message as "Motor Button pressed.

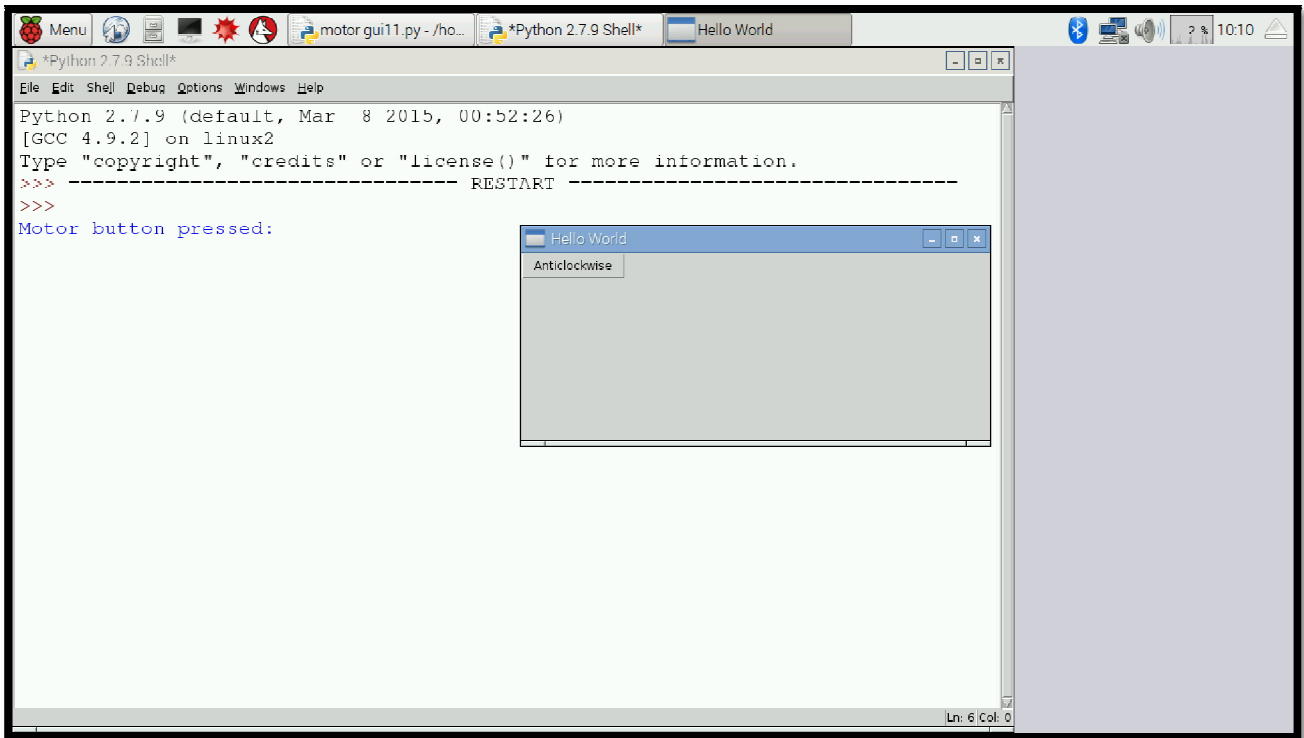Figure 3.2.)Movement of motor in Clock Wise Direction.

Figure 3.3)Movement of motor in AntiClock wise Direction.

VI. CONCLUSION AND FUTURE WORK

This paper concludes that DC Motor can be moved in both the directions by creating an interactive GUI interface and integrating it with Raspberry Pi board by writing simple lines of code using Python programming language. Further in future any type of DC motor can be used for its movement by using different motor driver IC.we can also change the motor in any direction by using CAYENNE Application in collaboration with Internet of Things by mobile phones. We can also apply triggers on the direction of the motor which notifies the user about the direction with its proper angle on smart mobile phones by using same application which is available for free to user on play store.

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BIOGRAPHY

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