RC Car Using LabVIEW And Arduino

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Abstract— Radio controlled cars have been commonly being sold as toys for a long time and they are popular at that too. R.C Car is one of the major attractions for the toys markets. However, these toys are not limited to just the toy market. R.C Car in itself can provide a huge opportunity for a new generation of students to learn the basic building blocks of robotics and robotics design. RC car can usually be found in two types of configurations. This configuration is namely known as the wired configuration as well as the wireless configuration, not only that but depending upon the configuration we are employing, the complexity of the circuit will increase or decrease. [1]
The history of the RC car began in the 1960's when the first company originated from Britain produced the first commercial RC Car. They did so with the help with the nitrogen gas. Years down the line the Japanese were the first one to make a working RC car which was able to run on electricity" [1]
RC cars are fun DIY projects that can include as much as or little the user want to implement in their design. The basic design of the RC Car contain the chassis, the wheels and the Dc motor foot their operation. However for more challenging students Rc cars can also Include IR sensors, Proximity Sensors etc. [1]

Keywords—***2-Wheel-Drives. 4-Wheel Drive, LabVIEW, Arduino, All Directional R.C cars***

I. INTRODUCTION

Remote controlled cars contain various elements and components that are used in collaboration with each other to make for a working project. The common elements which we are going to use include the L298N motor Driver, the LM35 temperature sensor and the SR04 Ultrasonic Sensor. Lab VIEW virtual simulation software is used to control and monitor the RC car. The R.C Car has been interfaced with LabVIEW with the help of the arduino Uno. With the help Linux library in LabVIEW software we are able to control the speed of the car and also its direction. With LM35 temperature sensor we are able to monitor car's environmental temperature.HC-SR04 is the Ultrasonic sensor which is able to help in distinguishing the distance between the closest obstacle and the R.C Car. If the temperature increases the maximum threshold limit, a red light will light up and the cooling fan will automatically switch on. And by using a Boolean expression in LabVIEW setup we are able to turn the car in left and right directions. So in total the car can move in any direction with variable speed which can be controlled with the help of the self-designed front panel of the Lab VIEW virtual simulation software.

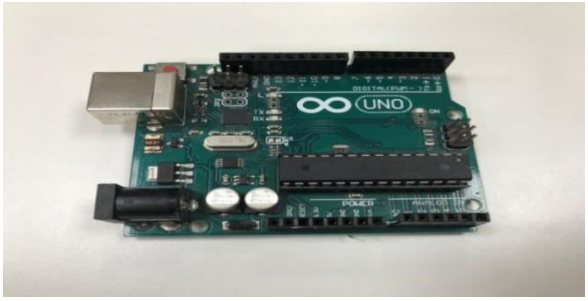
A. *LabVIEW*

It is designed and developed by National Instruments. It is a virtual simulation software/platform for applications that need test, measurement, and control with rapid access to hardware and data insights using virtualization as the major key. It offers a graphical programming approach that helps the user to visualize both software and hardware. The graphical language to be used is known as "G". This software helps to take one's project to the next level because of its strong virtualization power which helps to complete all the software as well as the hardware aspects.

B. *ARDUINO*

Arduino is considered to be the base of IOT (INTERNET OF THINGS) in an industry. Over the period of time it is seen that arduino, as one whole technology, is very adaptive and dynamic in nature, which usually moulds its self very easily and conveniently in accordance to its application in wireless automation. It is considered to be the backbone of wireless automation and monitoring control. Arduino provides an open source environment to electronics which can be used very easily. Invented at the Ivrea Interaction Design Institute, arduino is an easy tool used for fast prototyping, aimed at students to excel in electronics and programming. It helps us to understand and learn to implement electronics and programming simultaneously. Arduino is considered to be an edge over the other systems because of the following advantages-cheap, platform independent designing, easy and user-friendly programming environment, open source and extensible software as shown in FIGURE 1[2].

FIGURE(1)…ARDUINO UNO BOARD.



II. METHODOLOGY

Initially our main goal was to change the speed and direction of DC motor using Lab VIEW, However as we kept exploring the software more and familiarized ourselves with its function we were able to determine that we can pack as much more that our original design and make it more feature rich. Hence we were able to add Bluetooth connectivity, Ultrasonic monitoring system, temperature sensor all onto to our already developed motorized vehicle.

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Our main goal hence became to make a self sufficient radio controlled car with some automatic features.

III. Components Used

The common components which are required for the successful implementation of the project was L298N Motor Driver, the LM35 Temperature Sensors.

A. *LM35 Temperature Sensor*

LM35 temperature sensors are "precision integrated-circuit temperature devices" where the temperature and output voltage are linearly proportional to each other. The vital characteristic of LM35 temperature sensors over any other temperature measuring device is that the user is not able to subtract a higher constant value from the Kelvin scale to the conversion of the scale into centigrade . The LM35 provides accuracies of ±¼°C at room temperature and ±¾°Cover a full −55°C to 150°C temperature range.[3]

B. *HC-Sr04 Ultrasonic Sensor*

HC-SR04 Ultrasonic (US) sensor has namely 4 pins which are defined as follows: there is the Vcc , Ground, Echo and the Trig Pin. These sensors are quite popular for similar projects as they are easy to implement and quite inexpensive. Furthermore the Ultrasonic sensor has 2 eye like structure which are used for Transmitting and receiving.The sensor depends upon the basic formula:

Distance = Speed × Time

The Ultrasonic sensor transmits a wave of the following type , This wave then travels in the air and when it strikes an object it is able to reflect back. The time difference between the moment the ultrasonic sensor transmits and to that of where it receives it back is noted and displayed.

- Operating voltage: +5V
- Measuring Distance(Theoretical): 2cm to 450cm
- Measuring Distance(Practical): 2cm to 80cm
- Accurate to: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz [4]

Figure (2)… HC-SR04 Ultrasonic Sensor

C. *Abbreviations and Acronyms*

- PWM-PULSE WIDTH MODULATION
- Vrms - Root mean square voltage
- M: motor
- LabVIEW- Laboratory Virtual Instrument Engineering Workbench
- Dc - Direct Current

IV. Implementation of the Project

A. *Designflow*

Robotics is an emerging branch of Science and is continually being expanded daily. The first basic specification that every robot requires is the ability of movement. Hence this inspired us to start our vision small nut productive. Hence our first goal was to simply understand how to control the speed of the motor. As we proceeded with this project, we realised the capabilities of LabVIEW and we developed our interest in it and decided to do more and that was when we decided to make a R.C car. Controlling the speed of four motors in various combinations could give us what we needed to make a car move and on and on this very principle we started making the car. With this we started with our project, and after facing some problems we finally achieved our target.

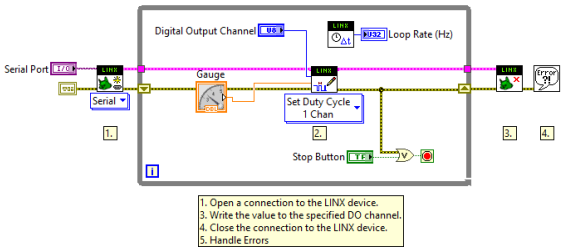

Figure (3)… Lab VIEW Design. (BLOCK DIAGRAM)[13]

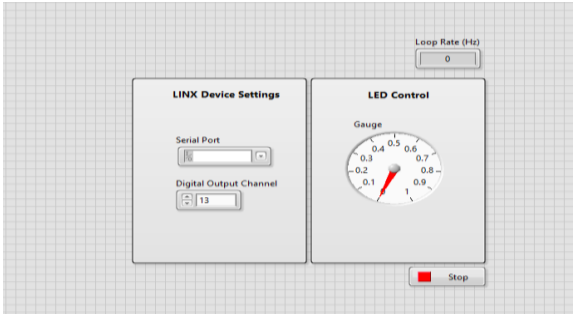

Figure (4)… LabVIEW Design. (FRONT PANEL)[13]

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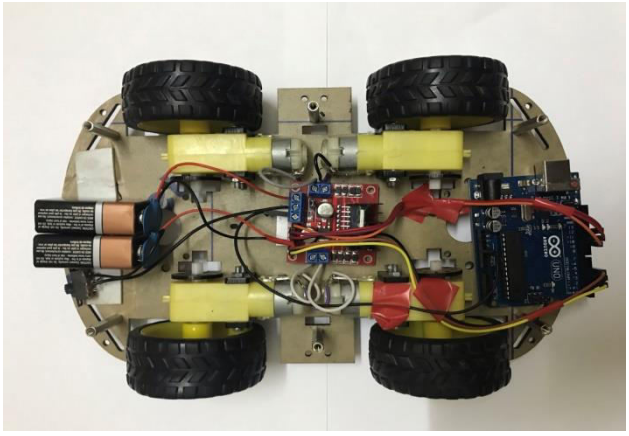
The basic goal of this project was that we were using PWM channel which are found on the Arduino Uno board having their own dedicated channels. The PWM channels allowed us to change the speed of the Dc Motor.

B. R.C CAR USING LabVIEW

The basic implementation of our given project included a method in which we are able to run the program in such a method that not only are we able to control the speed but even the direction of the motor in which it is rotating. There are mainly two methods in which the motor is able to rotate, namely the clockwise and anti-clockwise direction. The clockwise direction gives the capability to the vehicle as a whole to move forward and the anti-clockwise direction gives the capability to the vehicle as a whole to move backwards. We used the L298N motor driver to the control the speed and the direction of the given vehicle. The right hand side motor was connected to one terminal while the left hand motor was connected to the second one.

The first challenge we faced was to switch the system between a 2 wheel drive and a 4 wheel drive. To compact this problem we were able to incorporate the case structure in the Lab VIEW Block Diagram. Hence the case structure allowed us to incorporate a switch which allowed us to quickly change between 4 wheel drive for the forward and reverse function and 2 wheel drive or directional drive for the directional function.

Further improvements to the project were also made which allowed us to incorporate a temperature sensor and a RGB light for the car temperature sensor followed by an ultrasonic sensor placed on top of a servo motor for 180° collision detection.



Figure(5)…Radio controlled car Lower Part

One of the major disadvantages which we found as we were working on our design was that we were not able to use the read and write commands simultaneously in LabVIEW when it was associated with the Arduino Uno Board. Hence at this stage 2 choices were available, (1) To write the whole coding in Arduino and use LabVIEW as a Data acquisition tool, (2) To Use multiple Arduino for multiple different functions.

Figure (6)…Radio Controlled car Upper Part

Hence with the new goals in mind we were able to create the following block diagrams to run our give project.

C. Block Diagrams Used

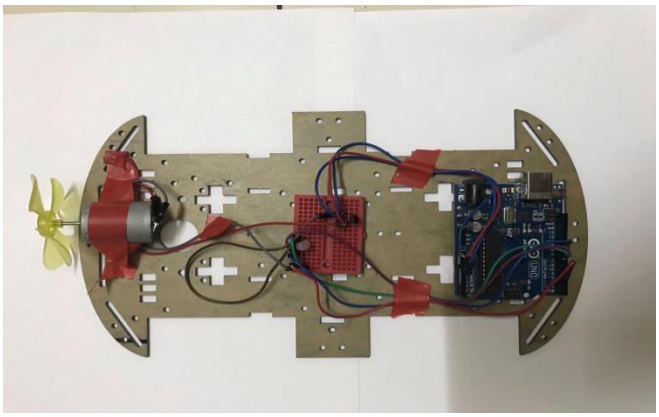


Figure (7)…Case (True) for the Radio controlled

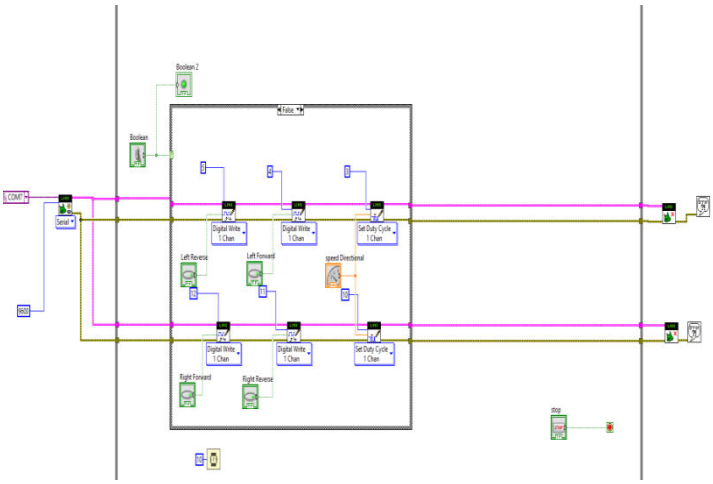
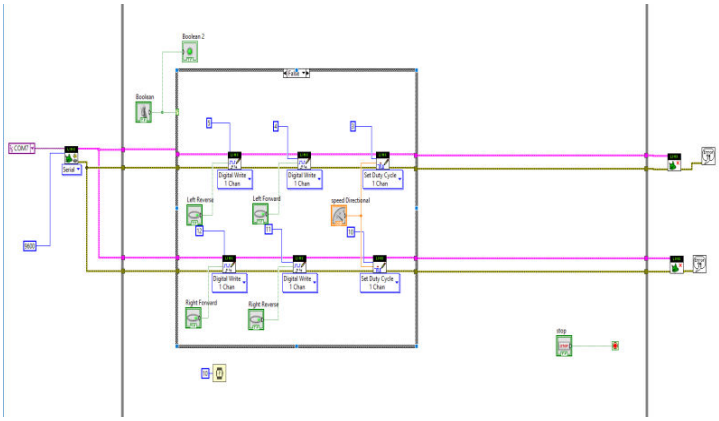


Figure (8)…Case (False) for the Radio Controlled Car



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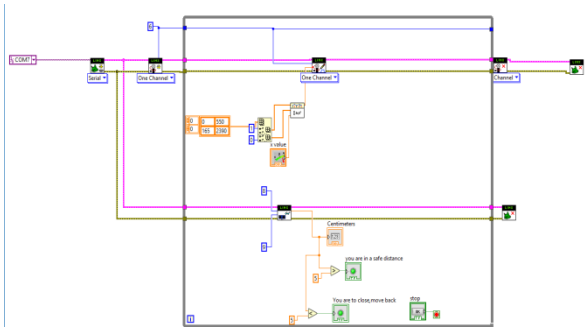


Figure (8)…Ultrasonic Range Finder of the Radio controlled

D. Front Panels

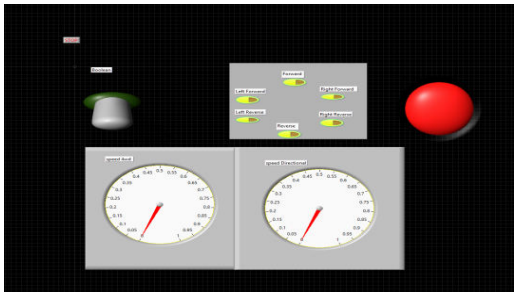
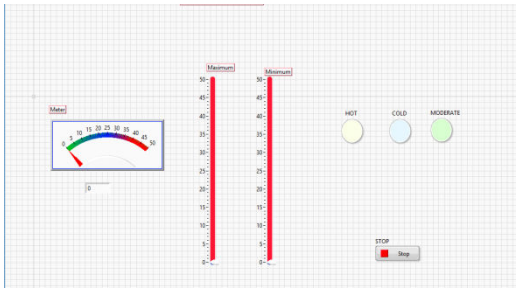


Figure (9)…Radio controlled controller



Figure(10)… Temperature controller[6]

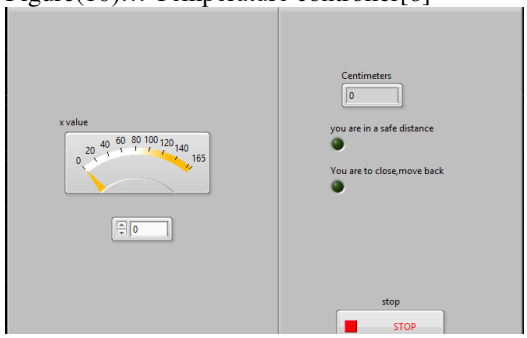


Figure (11)…Ultrasonic Range Finder of the Radio controlled

E. Final product

Throughout the development cycle of the given product continuous challenges were faced by our team. These challenges included the

- Batteries being not strong enough to power ON the product
- Batteries discharging to quickly
- L298N motor being short circuited on 2 different occasions.
- Bluetooth connectivity not being achieved.

However despite being all major problems we were finally able to make a product on which we can be proud of.

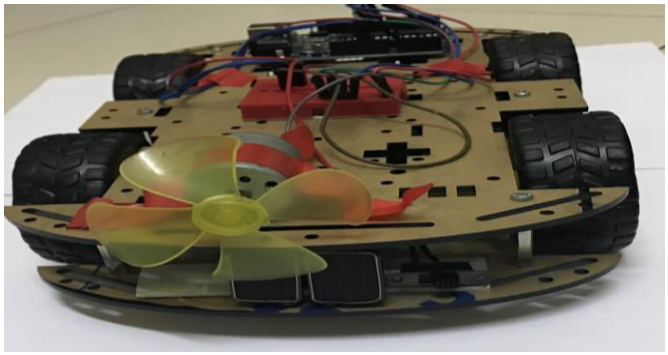


Figure (13)…Final Product

V. Related Work Section

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VI. Flow Chart

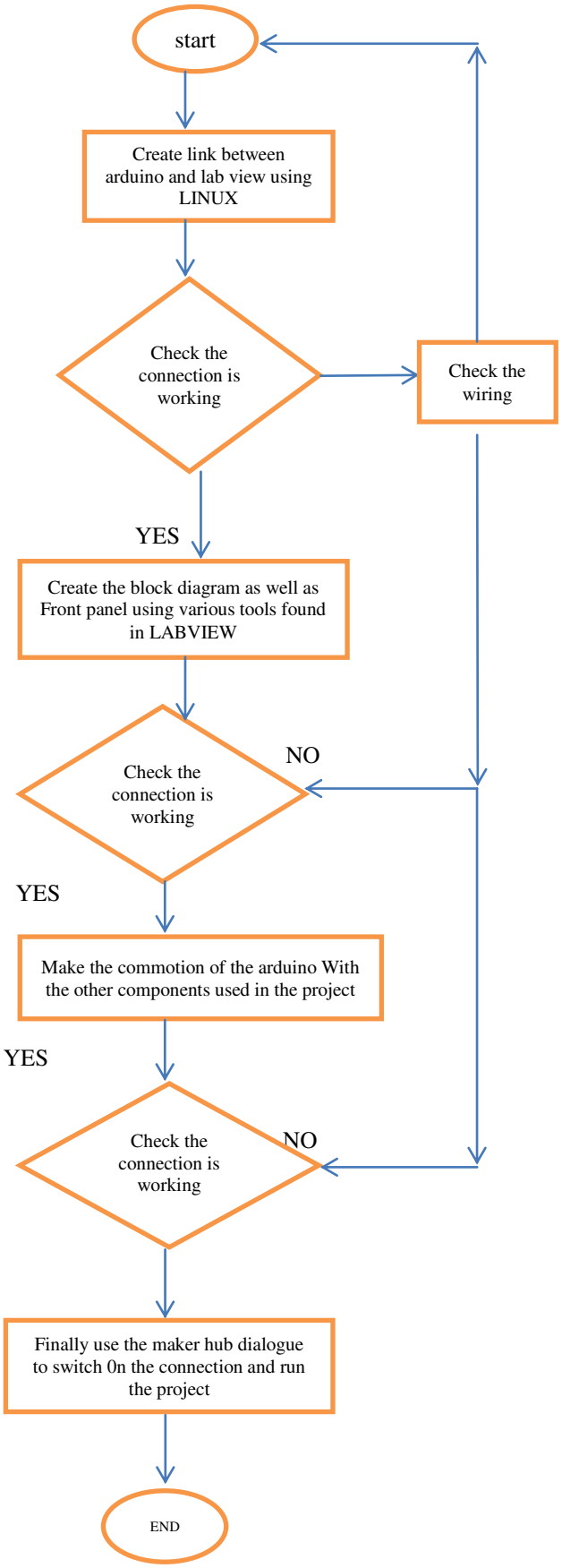

Figure (14)…Stepwise Working Of The Project

VII. Conclusion

LabVIEW is excellent software for implementation of designs in the Engineering Ecosystems. However there are many considerations to be made before getting in hand with LabVIEW. Also LabVIEW has trouble in reading and writing data from a source at a same time, which leads to not a lot of devices being connected to the LabVIEW at once without increasing the numbers of arduino being used. All-in-all LabVIEW is excellent software. However due to some of its shortcoming it is still not being used by the majority as of yet.

VIII. References

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IX. Acknowledgement

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