MUTUAL COUPLING ANALYSIS OF MOBILE BOT

Thejus Raj.H[1], Govarthan.K[2], Vivek.R[3], Thamarai.P[4]

[1, 2, 3] *UG Student, Dept. of Electronics and Communication Engineering, Bharath University, (India)*
[4] *Asst. Professor, Dept. of Electronics and Communication Engineering, Bharath University, (India)*

ABSTRACT

Inductive power transfer is being utilized as a part of various applications for exchanging power remotely. Inductively coupled chargers are being utilized for remote charging of MP3 Player etc. A mutual coupling for charging a versatile robot is considered. The endeavor is to study Wireless power exchange utilizing shared coupling or inductive coupling for it can exchange more power at a more prominent separation and this coupling is not impacted by the vicinity of human body, books and plastics. This innovation wipes out the disadvantages of existing wired innovation. In this undertaking, wireless power transfer is utilized as a part of charging the line follower robot which can be utilized for some applications as a part of our normal life.

Keywords – Mutual Coupling, Inductive Coupling, Wireless Power Transfer, Radio Frequency Power Transmission, Line Follower Robot

I. INTRODUCTION

As of late, wireless power transfer has gotten much consideration and been broadly mulled over. Wireless power transfer has numerous applications. Wireless Power Transfer Technology is a rising pattern on the planet today. Case in point, there are the frameworks that transfer vitality wirelessly to an electric auto, sensors covered in a divider, gadgets past a divider, and gadgets in the ground.

This innovation wipes out the disadvantages of existing wired innovation. In this undertaking, wireless power transfer is utilized as a part of charging the line follower robot which can be utilized for some applications as a part of our normal life.

II. PROPOSED SYSTEM

In this proposed system, wireless power transmission technology is implemented to charge the rechargeable battery of a line follower robot.

In the existing system, line follower robot is charged manually and hence the mobile robot i.e., line follower robot needs attention in order to function due to usage of charge ,and as it functions the charge available in it is used to navigate from one place to another.

Also automatic charging of the battery of the line follower robot is also not possible.
To beat these disadvantages we actualize wireless power transfer innovation by which the battery of the line follower robot will be charged wirelessly.

The working standard behind wireless power transmission is electromagnetic induction. Mutual coupling can happen in any high frequency structures when they are tuned or resonated to that high frequency. The current on one structure creates an electromagnetic field and that field in turn induces current on another structure exposed to that particular field. And also the second structure is coupled to the first one.

Wireless transmission is helpful in situations where interconnecting wires are badly arranged, dangerous, or outlandish. Wireless power transfer for a few applications, for example, wireless powered electric vehicle in stores, airplane terminals, departmental stores and so forth could be implemented.

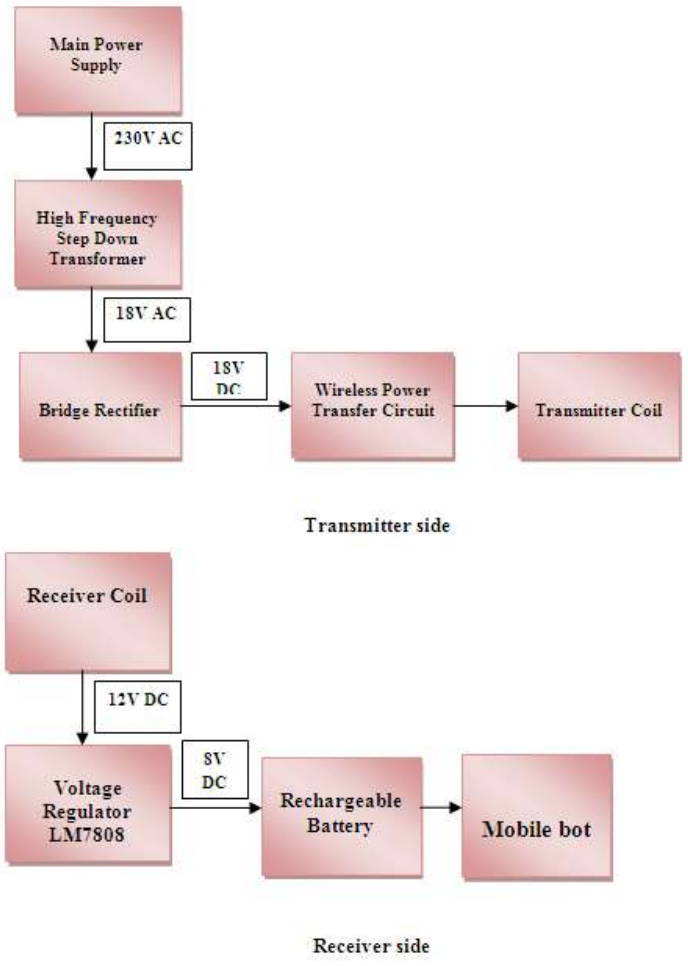


Figure 1 Block diagram of an Introduced System

2.1 Working of the proposed system

Alternating current 230V, 50 Hz mains is ventured down to low voltage alternating current by routine 50 Hz iron cored transformer which is then amended by an extension rectifier to grow around 14 volt DC. This DC is again made to alternating current by a PWM inverter utilizing half extension idea embodying 2 MOSFETs and 2 capacitors being exchanged at 40 KHz which is then sustained to a reverberating high recurrence loop going about as essential of an air center transformer. An alternate coordinating reverberating loop structured as auxiliary drives a heap separated at an air separation of 20 CMs. The general effectiveness of the power transfer for this situation is more than 90% for flawlessly coupled and coordinated arrangement resonators. Notwithstanding, essentially resonators with a Q of 1,000 ought to have the capacity to send control more than a separation 9 times the span of the gadgets with an effectiveness of 10%.

The auxiliary coil adds to a voltage of 40 KHz at 12volt while it is kept separated from the essential coil where air is utilized as the core. The yield of the auxiliary can likewise be given to a high frequency bridge rectifier that can convey DC which could then be controlled to keep up a steady voltage to a DC motor or present to nourish to adaptable customized robot for its working. A line follower robot is an autonomous robot which follows either black line in white area or white line in a black area.

A. High frequency transformers

The uses of high frequency transformers include Electric power transmission over long distances.
High-voltage direct-current HVDC power transmission frameworks. Some Large, exceptionally developed force transformers are utilized for electric curve heaters utilized as a part of steelmaking. Turning transformers are composed with the goal that one slowing down while alternate stays stationary. Common use was the video head system as used in VHS and Beta video tape players.
The high frequency transformers used here are used to step down the voltage from a high voltage to a low voltage.

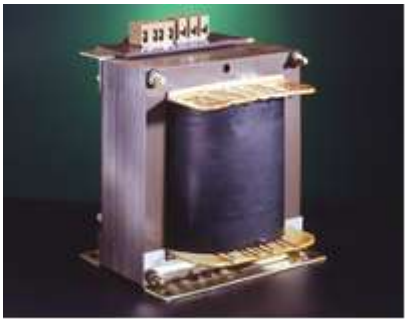


Figure 2 High frequency transformers

B. Voltage regulators

A voltage regulator is used where the system is in need of fixed or constant output voltage .the voltage regulators used here are 7808 and 7815 are used in the output and input side respectively. The voltages available allow these regulators to be used in logic systems, instrumentation and other electronic gadget or equipment. These regulators can be made to obtain adjustable voltages and currents external components for various other applications.

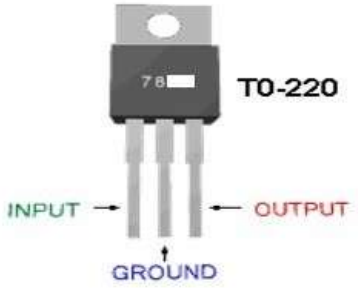


Figure 3 Series Voltage Regulators

C. Pulse Width Modulators (SG3524)

The SG3524 has inbuilt all the required functions for maintaining power supplies inverters or any switching devices. Their main application is for high power-output functioning .it can be used as a single –ended or for push-pull applications whichever necessary. The operation of the IC is done by the timing resistor and capacitor. And the IC has inbuilt 5v voltage regulator for reference purpose.it has also oscillator, error amplifier flip-flops etc.

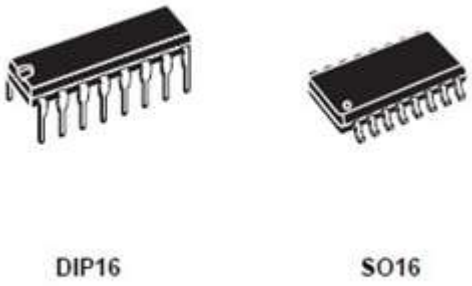
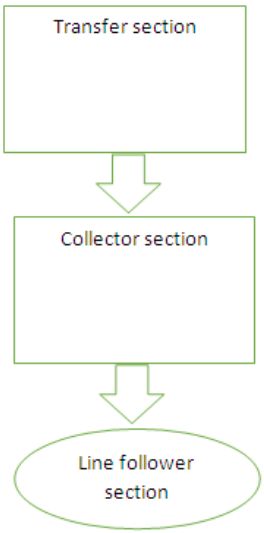


Figure 4 PWM IC

III. MATERIALS AND METHODS

This system involves three modules. They are the transfer section, collector section and the line follower section. The introduced system is a simple and low-cost and can be easily implemented and installed in any type of robot that can be of use in our daily life. The system will require a high frequency transformer, pulse width modulator, inductive coils and line follower robot as their major parts for its working.



IV. RESULTS AND DISCUSSIONS

Based on exploratory result, the Mutual Coupling Analysis of Mobile Bot has much perspective in separation, scope of recurrence and result demonstrates that closer the separation, the voltage transferred is higher.

The distance at which the power can be transmitted without much distortion is 20 cm with 12 Volt at the output for charging the battery at the line follower module.

The wireless power transfer is very little influenced by protecting materials, for example, the vicinity of human body, cardboards, plastic materials and so forth.

The outcome also demonstrates, the wireless power transfer suitably actualizes for charging the bot of your own interest and within a reasonable distance.

V. CONCLUSION

This paper has concluded designing, developing and building a simple wirelessly charging a battery of a line follower robot using active and passive components and sensors .The Mutual Coupling Analysis of Mobile Bot has been built and test runs have been carried out for the analysis of the system. The system developed is expected to continue to deliver power for the proper functioning in times of need. It is envisaged that the system is able to overcome the problem of manual charging of battery of the line follower robot and also it can be implemented with further advancements to make progress in many areas of robotics and communication.

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